

Belize National Spatial Data Infrastructure

REQUIREMENTS ANALYSIS

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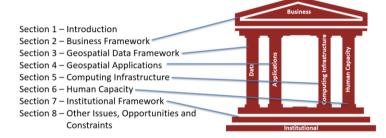
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EXECUTIVE SUMMARY

This Requirements Analysis report provides a comprehensive overview of the elements that the Belize National Spatial Data Infrastructure (BNSDI) will need to address for it to become a fully functioning, permanent fixture in the Government of Belize. This covers the full range of program requirements that can be classified roughly into business, technical and institutional frameworks and their interdependencies. Information collected and compiled in the previous Stakeholder Situation Update Survey, Data Inventory and Assessment and e-Merging Technology Reports has informed the current report. International best practices in national efforts of a similar scope have been used as a frame of reference that has been extended and adapted to reflect the specific context in Belize.

The requirements covered in this report are represented in the adjacent diagram and subsequent listings below:



Business Framework. Describes business areas across government

that have specific areas of relevance to the BNSDSI. This is based on approximately 370 major functional business areas carried out by the more than 60 entities involved, and more than 1700 geospatial activities that have been identified that could support this full range of potential applications of GIS and the BNSDI. The 13 major clusters of business activities identified include the following:

- Land/Sea Use Planning and Development
- Land Administration
- Utilities and Infrastructure
- Community Facilities and Services
- Transportation and Transit
- Public Safety and Security
- Public Health and Welfare
- Natural and Cultural Resource Management
- Education and Research
- Economic Development and Finance
- Political and Government Affairs
- Business and Industry
- Emergency Planning and Response

Geospatial Data Framework. The Fundamental Geospatial Data Set (FGDS) developed within the "Data Inventory and Assessment" report is summarized here for ease of cross-referencing against the other interdependent framework components. The framework includes the 6 Classes of information listed below which are further broken down into more than 50

data themes and over 225 individual data topics, conceptually covering the full range of information topics needed in common across the BNSDI community.

- Basemap
- Areas
- Environmental
- Utilities
- Transportation
- Facilities

Geospatial Applications. The study also identified 12 software applications that are needed in common across multiple BNSDI stakeholders including:

- Data Publishing and Dissemination
- Data and Application Service Discovery and Access
- Spatially Enabled Enterprise Applications
- Spatially Enabled eGovernment Services
- Field GIS Access and Data Collection
- Vehicle Tracking
- Spatially Enhanced National Statistics
- Development Project Formulation Spatial Analysis System
- Spatially Enabled Investment Project Tracking System
- Spatially Enabled SDG Executive Dashboard
- BNSDI Community Engagement Platform
- Volunteered Geographic Information Platform

Computing Infrastructure. This section outlines the computing infrastructure requirements of the different types of facilities that will comprise the BNSDI, including:

- Nodes
- Networks
- Enterprise
- Security
- Standards and Architecture

Human Capacity. This section outlines the human capacity requirements of the different types of roles that will comprise the BNSDI, including:

Information and Communications Technology

- General computing skills
- Systems and database administration
- Software development
- GeoNode administration

<u>GIS</u>

- GeoNode users
- Application users
- GIS Technicians

- GIS Analysts
- GIS Super Users

BNSDI Management

- Partnership brokering
- Strategic planning
- Legal and financial
- Standards
- Stakeholder community engagement
- Business process engineering

Institutional Framework. This section outlines the institutional areas that will need to be addressed in the BNSDI, including:

Strategy

- Alignment with National Strategy
- Vision, Mission & Objectives
- Implementation Approach

Policy and Regulatory

- Alignment with Existing Policy Frameworks
- Decree Strengthening
- Legal and Regulatory Review
- Data Access Policy
- Information Security Policy
- Intellectual Property Policy
- Privacy Policy
- Public-Private Partnerships

Governance

- BNSDI Executive Governance
- BNSDI Facilitation
- BNSDI Technical Representation
- Data Custodianship
- PSIP Coordination

Operations

- Cross-agency business process coordination
- Configuration management
- Service level management
- Performance monitoring and assessment

<u>Finance</u>

- Government financial management;
- Interagency benefit and payment;
- Commercial benefit and payment;
- Public and private partnership arrangements;
- Outsourcing;
- Public benefit and payment.

This report provides the framework of requirements that are to be addressed in the Program Design report to be produced later.

Note: Most of the information presented in this document was collected and recorded in 2014. In late 2015 there was an election and administrative re-structuring of the government that changed the configuration of several Ministries. While some administrative structures have changed, the basic functions carried out by government remain largely the same. Since the purpose of this exercise is to reflect the aggregate requirements of representative stakeholders, the information in this report has not been reconfigured to reflect government restructuring.

1 INTRODUCTION

1.1 Background

This BNSDI Requirements Analysis report provides a synthesis of requirements that need to be met by the Belize National Spatial Data Infrastructure (BNSDI) program. This report is one component of a structured work program for the planning, design, and implementation of the BNSDI. The position of this report relative to the entire work program is illustrated in the Figure below.

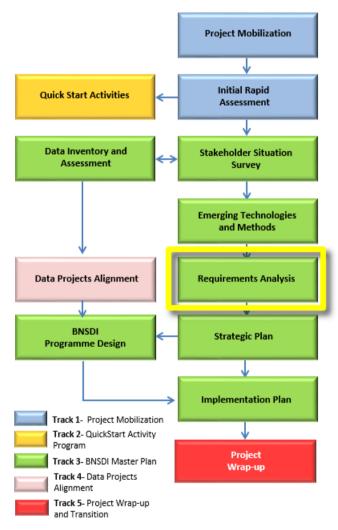


Figure 1 – Work Program Illustration

The synthesis of requirements outlined in this report draws upon three contributing activities, including:

BNSDI Stakeholder Situation Update Survey. The BNSDI Stakeholder Survey involved over 60 units of government and other sectors and identified over 370 major functional areas that are or could benefit from GIS and the BNSDI. The study also

outlined over 1700 specific applications of GIS and the BNSDI that would directly benefit and streamline those functional areas identified, as well as other information and findings.

Data Inventory and Assessment. The Data Inventory and Assessment provides a listing of the over geospatial data resources that were identified in the conduct of the BNSDI Stakeholder Situation Update Survey activity. This document provides a summary of the information available for over 35 data themes that are further broken down into over 140 specific geospatial data topics and then grouped to nearly 100 fundamental geospatial datasets that are needed in common among the BNSDI stakeholder community.

e-Merging Technologies and Methods. This report outlines a wide range of emerging technologies and methods that have implications for the form and function of the BNSDI in the future. This report outlines a broad range of technologies, applications and enabling policies and methods, from new advanced space platforms for remote sensing, to unmanned aerial vehicle (UAV) survey techniques, to the many uses of social media and crowd sourcing, to the policies and incentives needed to catalyze innovations within the Country, among many other areas. The results of that analysis have been incorporated to this report where appropriate.

1.2 Purpose of this document

In this report, the results of the previous tasks have been compiled to a synthesized form that will define the broad requirements that will need to be addressed in some manner in the BNSDI program. This includes a comparison of common requirements and issues across the stakeholder community, and a comparison of the current situation with "best practice" experiences and standards from the international community, as well as relevant emerging technologies and methods that could add value to the future BNSDI.

The timeframe and resource constraints of the current project dictated the amount of time and effort that could be effectively invested in reviewing the current situation with GIS in Belize and readiness for the Country to undertake and derive benefits from the BNSDI. The needs of over 60 units of government and other institutional, civil society and private sector entities in Belize were explored to provide a reasonably comprehensive view of GIS and BNSDI uses and potential future requirements. It was not possible to cover all sectors and interests, many of which could be valuable contributors and beneficiaries of the BNSDI in the near to medium term. By incorporating the "Best Practice" framework used in this document it is also then possible to indicate how GIS may benefit all of the key societal sectors in Belize, including those that have not been directly assessed in the context of the current study.

The findings of this analysis are documented here in a form that characterizes the existing situation, identifies the gaps between the current state and international sound practice, and summarizes the issues, opportunities and constraints that will need to be addressed in the planning and design processes in following steps. Subjects that will be addressed in the requirements analysis will include, but not be limited to the following:

- Major national and sectorial priorities that can be supported by BNSDI;
- Existing situation with GIS technology use in Belize, general overview;
- Existing framework data infrastructure issues and opportunities (this will also refer to
 existing and planned geospatial data development projects, but the details of this have
 been addressed separately in the Data Inventory and Assessment report;
- Existing technical computing infrastructure issues and opportunities;
- Existing human capacity issues and opportunities;
- Organizational and institutional issues and opportunities;
- Opportunities to tap into Civil Society, private sector, trade cooperatives, NGO's and other potential stakeholder groups external to the government, as well as the general public;
- Policy and regulatory issues and opportunities. This includes an assessment of the existing BNSDI policy in the context of the identified context of related policies, rules, regulations, mandates, and priority requirements and identification of areas of the existing policy that may need change, refinement or extension.
- BNSDI staging and timing issues, opportunities, constraints and interdependencies.

The results of the assessment of the elements listed above are documented here for reference in the remaining tasks. The findings of the requirements and gap analysis will be presented and discussed separately with both the Executive and Technical Committees. Likewise the findings will be presented to the BNSDI Stakeholder Community for review and further comment and input. These activities are important both to keep the Committee members and rest of the Community informed of major findings and directions, and to solicit their input and perspective. Any feedback gained from those exercises will likewise be documented for reference in the next tasks.

1.3 Organization of this document

This document is organized into the following sections:

Section 1: Introduction. This Introductory section outlines the background and purpose of the BNSDI program, the methodology being followed, and other general reference information.

Section 2: Core Business. This Section provides a summary of the government business case foundation to which all other elements of the BNSDI program are intended to respond. This presents a comprehensive view of the business range of business areas that may be supported by the BNSDI in the future based on

international best practice, with further qualification of the existing situation where known through the previous BNSDI Stakeholder Situation Update Survey activity and report.

Section 3: Fundamental Geospatial Data. This section outlines the framework of fundamental data themes that have proven through international experience to most often be needed in common across a range of stakeholders. This section is extended by reference to the BNSDI Data Inventory and Assessment document under separate cover.

Section 4: Community Applications. Certain applications are needed in common across the community of stakeholders, and are thus of special relevance to the BNSDI program. This includes map-centric GIS services as well as the common geoprocessing applications that may be needed to support common requirements across the BNSDI stakeholder community.

Section 5: Computing Infrastructure. Computing infrastructure is the technical foundation for the BNSDI. This section outlines those aspects of the Belize computing infrastructure that are of special significance to the BNSDI.

Section 6: Human Capacity. There are a variety of types and levels of staff skills that are necessary to build, maintain and use GIS and the BNSDI. This section outlines the basic requirements and assesses how fully those requirements are being met under the current situation in Belize.

Section 7: Institutional Environment. The Institutional Environment includes the policies, laws, regulations, operating procedures, forms of institutional organization, management and leadership, and other related issues that have special relevance to the BNSDI.

The current document should be considered a "discussion draft" that will undergo further refinement with the help and advice of the BNSDI stakeholder community, through workshops and provision of further review and comments in regards to the information presented in this document.

2 BUSINESS FRAMEWORK

This section addresses the functional business areas of Belize government and society that can be supported by GIS and the BNSDI. It is commonly stated internationally that over 85% of government functions relate to geographic location in one form or another, and the same could be argued in regards to societal functions as a whole. The purpose of this section of the report is to outline relevant areas of common business sectors, the programs, activities and entities most involved in each and the common GIS/BNSDI functional requirements that are involved in each business area. Clustering current activities according to these generic categories is useful for identifying areas of common functionality and/or business activities that the BNSDI could support directly, as well as help to bridge for better coordination and integration across sectors and administrative jurisdictions.

The section has been organized by major functional areas within which several subcategories of common business activities are outlined. Each section includes a generic summary of each business area based on international sound practice, identification of programs, activities and associated entities is Belize currently involved in these areas (listed in an Appendix due to large table sizes), and a summary of specific GIS and BNSDI functionality that can support each functional area. Appendix B to this document includes a matrix that cross-references the specific business activities of each participating stakeholder organization to the business area groupings overviewed here.

2.1 Land & Sea Use Planning and Development Control

In its broadest sense, the land use & sea use planning and development control sector of local, district and national government includes all policies and plans regulating the use of land and sea areas, estabishing areas for natural resource management and the conservation of natural and cultural heritage. This includes long-range land use planning for land and sea areas, coordination of current development, planning for urban areas and villages, urban design, nature reserves, land and marine protected areas and areas designated for special use. GIS technology is being used extensively around the world to carry out many of these activities, and SDI helps to bring together the broad range of cross-sector information that is needed to do so effectively.

Belize encompasses a total land area of 22,960 km2 of which 5% is distributed over more than 1,060 islands. With a total population of 341,000, Belize is the least densely populated country in Central America. Privately held lands represent 54% (approximately 12,400 km2) of the total national territory with over 10,000 km2 distributed in rural parcels greater than 0.4 km2 (40 ha). Public lands account for 46% (approximately 10,560 km2) of the total land surface of Belize. These public lands are further divided into: (i) protected areas and forest reserves which represent over 30% of the total national territory; and (ii) other 'national lands' (16% of the total national territory) which are either already allocated under

a government lease or unleased public land. It is estimated that there exists between 90,000 and 105,000 land parcels that can eventually form part of the national cadastre and contribute to a dynamic investment market

Belize is undergoing slow but steady development, and over the past two decades has established a significant framework of land use planning and development control measures. This development necessarily requires a high level of coordination among many sectors, and care to avoid irreversible environmental impacts as well as anticipate the potential impacts and implications of climate change. GIS technology, and the sharing of geospatial information through the BNSDI can make a very significant contribution to achieving the overriding goal of sustainable community development. The following summarizes those areas of this sector that can most benefit from the BNSDI, and the requirements that need to be considered.

2.1.1 Urban and Regional Land Use Planning

Long-range comprehensive plans (land use, housing, infrastructure, nature reserves, parks and open space, coastal zone and infrastructure plans) may be formulated over a 10 to 20 year or longer period, possibly "nested" within national and/or district plans. These may be guided by overarching national development strategies that may not be spatial in nature but rather focus on national development aspirations and priorities. Long range land use plans are typically developed initially and then periodically updated to reflect changing conditions. They provide a spatial framework within which area and neighborhood plans may be developed to provide greater detail. Once long range plans are developed, medium term planning and development control can be used to shape compliance, starting with coordination of current development, preparation and adoption of zoning ordinances, review of site development plans, architectural/design, historic preservation, and environmental impacts. With broad stakeholder involvement, these plans also provide a framework for coordination across all sectors. Finally, modern information management tools and methods can shift planning and development coordination from a project oriented process to an ongoing process of continuous, adaptive community management. This is made possible through monitoring community development and related factors in order to identify and assess issues and causative factors, and generally understand the dynamics of community and landscape change over time. This understanding can then be used to calibrate policies, plans, regulations and procedures as needed.

There are a number of policy and planning programs that can have an impact on urban and regional planning in Belize and can be supported through GIS and the BNSDI. Those that surfaced while conducting the BNSDI Stakeholder Situation Survey include:

National Plans

- Horizon 2030 Development Strategy;
- 2009-2013 National Poverty Elimination Strategy and Action Plans (NPESAP);

National Medium-Term Development Strategy (MTDS) (2010-2013).

Sector Specific Plans

- Agriculture Development Management and Operational Strategy (ADMOS);
- Belize Rural Area Development Strategy (BRADS);
- National Sustainable Tourism Master Plan (NSTMP);
- National Land Use Policy and Planning Framework (NLUPP);
- National Environmental Action Plan (NEAP);
- National Environmental Policy and Strategy;
- Sustainable Chemical Management Action Plan;
- National Protected Areas Policy and Systems Plan (NPAPSP);
- National Integrated Coastal Zone Management Plan (CZMP 2014);
- National Protected Area Policy and System Plan (NPAPSP, 2006);
- National Health Plan and Policy;
- National Plan of Action for Children and Adolescents;
- National Plan Toward Eradicating Child Malnutrition in Belize;
- Food and Security National Policy;
- Land Suitability Mapping System for Belize;
- National Energy Policy (NEP);
- National Water Master Plan (pending via NIWRA);
- Comprehensive Climate Change Adaptation Policy;
- Belize Climate Resilience Investment Plan (BCRIP);
- Belize Climate Resilient Infrastructure Project (CRIP).

Municipal Development Plans

Municipal Development Project

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Analyze current and potential future conditions and trends. This involves development of a complete understanding of of the current situation and a historical perspective of how the current situation and land and sea uses have evolved. This may involve a variety of thematic areas, including but not limited to land use and land cover mapping, geomorphology, soils and geology, surface hydrology, building permits, census data, population and household survey information, traffic information, cultural resources, special environmental resources, special hazard areas, community facilities and services, including places of worship, hospitals, schools, community centers, parks, sports centers, and utility networks. This should include projection and analysis of issues that may result from climate change and variability.

Data access, query and exploration, and display visualization. Planners need to be able to discover what information exists and to determine its usefulness for planning purposes. This includes all relevant scientific data, infrastructure, socioeconomic and other topics and including recording of other plans and programs that may have relevance and interdependencies with the plan under development. Basic functional requirments include ad hoc data access, query and thematic mapping and reporting; Spatial query; Multiple media information integration; Thematic mapping and reporting; 3D visualization, and time series visualization and animation.

Data analysis and modeling. Trend analysis; Development opportunity and constraint analysis; Land use and population forecasting; Facility and service modeling; Future development scenario analysis; Traffic modeling; Utility modeling; and Environmental modeling and impact assessment.

Planning Scenario Development and Evaluation. Land use planning scenario development; and scenario impact analysis. Scenario evaluation models can be developed that project potential outcomes relative to sustainable development goals and other measures. These scenarios rely upon underlying scientific and relevant data in regards to existing condition and trends. It also provides an accounting of other plans and programs that concern the same geographic area or proximity that could have an impact on the plan under development.

Plan Implementation and Management. Plan preparation and documentation; Plan execution; and distribute planning information to others. This should include the ability to cross-reference and acknowledge activities related to multiple plans covering the same geographic area that may impact intended outcomes.

Plan Implementation Monitoring, Evaluation and Adaptation. Any long range plan requires monitoring, assessment of progress and periodic calibration and adaptation in response to lessons learned and/or changing context and conditions.

2.1.2 Capital Improvement Planning

Capital Improvement Planning (CIP – alternatively also called Capital Investment Planning) involves shorter term planning to ensure that infrastructure, community facilities and services are planned in time to accommodate urban growth and change over a 3-5 year period or more. Effective CIP requires a clear idea of the type and location of planned development and urban growth and a multi-sector, coordinated effort to ensure that the framework of utility networks and community facilities such as parks, police and fire stations, schools, clinics and other such services that require advance planning are considered. CIP's are aligned with broader community and regional land use plans,

providing an intermediate planning and coordination level between long range and current planning (Area Plans and Urban Design plans).

CIP is not currently a common practice in Belize. The utility companies and others have indicated that most of their planning is reactive in response to specific development proposals and dependent upon annual budget allocations. The current growth rate of Belize (2.39%) is more than two times the rate of global population growth (1.1%), so that if this trend continues, the population of Belize will double in approximately 30 years. Accommodating this growth effectively will require a more proactive approach to CIP, among other issues. Activities that would benefit from proactive CIP supported by the BNSDI include for example:

- Water resource management planning through NIWRA;
- Water distribution system and operations planning by the BWSL;
- Electrical generation and distribution system and operations planning by the BEL;
- Planning for new sewage treatment plants and collection systems by the Town Councils;
- Highways and roads planning by the Ministry of Works and Transport;
- Planning for new or enlarged police stations and staffing by the Belize Police Department;
- Planning for new or enlarged fire stations and staffing by MLLGRD;
- Planning for increased health services and facilities by the Ministry of Health.
- Reservation of land and space for above infrastructure and facilities;
- Coordination of the sequencing of the above, for example to avoid repaving a road only to have it torn up to install new underground utilities, thus requiring repaving a second time.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Provide access to long range land use plans as a reference framework. By providing easy access to long range land use plans and related information can provide an effective means for organizations to understand anticipated change and to produce their own plans in alignment with those assumptions.

Monitoring of community population growth, trends and projections. Provision of online information about projected population growth, assumptions and trends will also support better coordinated planning across all sectors. With public access, this information can also help to support investment decision making by the private sector, including provision for public-private partnership development projects.

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¹ http://www.crwr.utexas.edu/gis/gishydro05/Introduction/TermProjects/robinson.htm

Monitoring of community development area plans. Provision of access to detailed community plans online can provide an effective may to keep all stakeholders informed about land use plans and restrictions, hazard overlays and other information that can aid in their own capital investment planning.

Monitoring of both public and private development project planning and approval processes. Monitoring of actual development activities over time can provide an important basis for either confirming or adjusting growth and related assumptions over time. This is an important requirement for ongoing adaptive planning and management.

Access to CIP and specific infrastructure development plans of other sectors. Once a coordinated CIP framework has been developed it will also be important to keep the stakeholders informed regarding changing conditions and the plans of others. Providing common access to each other's CIP information can provide an important hub for maitaining CIP alignment across all sectors as a continuous process.

Publish own CIP for access and reference by other sectors. Organizations need a convenient and easy to use method to publish their CIP information for access by others. Ensuring that this information can be used by others efficiently requires the establishment of some level of data content standards across the community.

While the BNSDI will provide an effective platform for sharing and referencing information across all the infrastructure, utility and community facility sectors, there will still be a requirement for a facilitated coordination process to address the matter and take full advantage of the system capabilities. Similar coordination is being carried out for other areas such as the review of environmental assessments through the National Environmental Appraisal Committee and the coordination of public sector investment through the Ministry of Finance and Economic Development. The BNSDI as part of the CRIP program is intended to provide the data, tools and facility to support better project planning and formulation for climate resilient infrastructure. Beyond climate resiliency, such a facility could also support CIP planning and coordination both within communities and regionally.

2.1.3 Permitting and Code Enforcement

There are usually a range of building, land use and other permits that are issued locally to ensure that buildings and activities conform to building and land use codes and regulations. Building permits include the review of construction plans for general or master plan and zoning compliance, as well as for building, electrical, plumbing, and fire codes, prior to the issuance of a building permit, followed by field inspections, and concluding with issuance of an occupancy or commissioning permit. Other permits may be required for other issues such as holding of events in public places, temporary road closure, special temporary and

permanent signage, vending machines, ATM's, swimming pools, home businesses, special uses such as child care centers, and other issues.

Planning and building codes and other regulations that define permitting requirements establish the parameters for orderly development and activities across Belize. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Compile and maintain permit activity code information. Capability to tie codes (special historical zone or facility, land use zone, resource utilization, environmental emissions, class of building, etc.) to the appropriate jurisdiction boundaries and/or topical features (e.g. waterbodies, wetlands, coral reefs, etc.).

Review, condition and approve permit. Applications are submitted and must be logged, reviewed and approved or rejected according to code compliance factors.

Case file management. Permit cases require the management of a variety of information related to the case, ranging from the original application material to review notes, field inspection notes, evaluation forms, correspondence and other information. Cases may include documents, photos, database records and other information.

Field inspections and monitoring. Periodic area inspections and targeted inspections may be conducted to verify compliance. Field access to data and forms for recording information may be required. In some cases such as environmental emissions the activities may be monitored automatically and the GIS can provide a way to display and analyze those measurements geographically.

Record code violations. Locate potential violations, plan inspections, and record inspection status.

Code enforcement violation tracking. Notification and tracking of code enforcement violations to ensure compliance within a prescribed timeframe.

Code violation analysis. Topical and spatial analysis of code violations and violation followup.

Thematic mapping and reporting. Types and status of outstanding code enforcement violations, historical enforcement violations.

Historical trend analysis. Trends in code compliance by topic and/or geographic area can be used to support code enforcement resource allocations and operations planning.

Street naming and house numbering. Although not directly part of building permit management, street addresses are often assigned only for completed structures (vacant lots have a plot number under the cadastral system). GIS is used for creating the street centerline data and the definition of an address reference framework (defines addressing points of origin) street beginning and ending, and the assignment of house numbers. The major towns in Belize established a regular system for street naming and house numbering, but this has not been regularly maintained.

2.1.4 Area Plans and Urban Design

Area plans include both designs for new development as well as the renovation of existing neighborhoods or special use areas for tourism or other uses. Urban design standards and plans for retrofit may also affect land use and changes to the built environment that need to be coordinated across multiple sectors and organizations, as well as departments within the Town Councils.

Area plans provide detailed information regarding specific development to be understaken and for which various infrastructure and utilities may be required. Design is a more subjective issue, but GIS and the BNSDI can provide the information and tools to assess a particular context and develop creative urban streetscape, landscape and architectural designs to fit a particular context, and provide visualizations to explain these ideas to others.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Design project identification. Tools to analyze requirements, assess alternative sites when appropriate, and prioritize projects and sites.

Contextual analysis. Investigation of the existing land use character, facilities and infrastructure of a surrounding neighborhood, existing plans and planning criteria, other design projects in the vicinity, architectural character and massing, access to utilities, and transportation access.

Design development. Site design, landscape, streetscape, architecture and other structures in 3D. GIS can also provide tools that will indicate physical, economic

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and visual characteristics of planned development that can be used to assess different area design alternatives.

Plan graphic display and visual communication. 2D and 3D plan graphics, statistical graphs and reports, photos, animated walk-thrus.

Plan execution. Project tracking and periodic review of area plan "build out". Historical information could also be digitally archived for future reference. Trends and contextual changes and proposals may require periodic changes or calibrations to the original area plan.

2.1.5 Environmental Impact Assessment

An Environmental Impact Assessment, otherwise called an EIA, is a planning tool that promotes environmentally sound development practices. It examines both the adverse and beneficial environmental consequences of a project design on human health and the natural and cultural environment, and ensures the development of mitigation measures to address these consequences during project development. An EIA uses the preventative approach versus the reactive approach and also considers alternative project designs; that is why it is so important for project developers to contact the Department of the Environment to begin the process before carrying out any construction activities. The environmental legislation of Belize requires that any project or activity which may have significant impact on the environment may be required to carry out an EIA and following the rules as set out in the Environmental Impact Assessment Regulations and its Amendment of 2007.²

The National Environmental Appraisal Committee (NEAC) was established to review development projects in the context of the national environment. The NEAC membership includes:

- Chief Environmental Officer (Department of the Environment);
- Commissioner of Lands and Surveys (MNRA);
- Director of Health Services (Ministry of Health);
- Chief Forest Officer (Ministry of Forestry, Fisheries and Sustainable Development);
- Fisheries Administrator (Ministry of Forestry, Fisheries and Sustainable Development);
- Chief Meteorologist (National Meteorological Office);
- Director of Geology and Petroleum (MoESTPU);
- Chief Engineer (Ministry of Works and Transport);
- Assigned Subject Matter Expert in Human Development and Social Services;
- Assigned Representative of Tertiary Institution;
- Assigned Representatives of NGO or Private Sector.

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² http://www.doe.gov.bz/index.php/eias

Business requirements for carrying out the EIA review and approval process as identified in the Stakeholder Situation Update Survey report include the following:

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

EIA pre-assessment. Ideally, projects are located and designed from the beginning to avoid or minimize environmental impact. This can be accomplished by providing project planners with access to existing environmental and related information via the BNSDI and through early consultation between the project owner team and the relevant government authorities, backed by up to date and accurate data about the relevant environmental topics. Based on this early feedback and information, project owners can build environmental factors into their project planning and design process, thereby limiting the impacts that will need to be reported and mitigated or conditioned through the EIA process.

EIA logging, tracking and case file management. The logging and tracking of all submitted EIA's requires recording the location and basic characteristics of each submitted Assessment. This also requires the management of case file information for each submittal, inclusive of all the original submission information, site visit notes and photographs, correspondence and any other relevant information involved in the review and approval process.

Review, analysis and confirmation of EIA findings. The BNSDI can provide a wealth of information from all affected sectors to support the review and assessment of submitted EIA's. This includes the ability to access and browse various thematic information in the context of inter-disciplinary EIA review by the NEAC, as well as analysis results that may have been carried out earlier in regards to environmental issues, sensitivities, natural hazards and vulnerabilities and other such interpretive information.

Conduct inspections for compliance with environmental compliance plans. Also listed under "Development Controls and Code Compliance", GIS and the BNSDI can provide the tools and information to be used to track and administer post-EIA environmental compliance conditions.

2.1.6 Utility and Infrastructure Coordination

The planning, design and implementation of utility and other infrastructure development is normally carried out by the individual utilities and other entities individually. Ideally such development is carried out within the framework of an integrated capital improvement plan

and operationally coordinated by an organization or committee structure for both utility coordination as well as site clearance "call before you dig" services. Without such organization and services there is increased chance that utility and infrastructure development will develop inefficiencies and conflicts (e.g. repaving a road only to have it torn up again to replace a water or sewer line), or that inordinate amount of time is spent by customers to secure site clearances for trenching or site alteration from every single entity that may own utility and infrastructure assets in the area.

In Belize at present there is no formal or standardized structure for capital improvement planning. Utility and infrastructure site clearance coordination is supposed to be carried out by the local Town or Village Councils, however many of these are lacking the expertise and information resources needed to carry out this function effectively. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Provide mutual access to integrated Capital Improvement Plan information. If and when an integrated CIP is available, the GIS can support access to this information by all the concerned stakeholders. This is useful for general reference for the preparation and conduct of specific utility and infrastructure projects.

Monitor and coordinate utility and infrastructure project planning and execution. Detailed plans, designs and schedules can be prepared by each individual implementing entity, with reference to each other's project information which can be made available online inclusive of geospatial and other project related information that is needed in common.

Provide site clearance "One Stop Shop". The GIS can provide mutual access to existing utility and infrastructure as-built information that can be used as part of a one-stop function for site clearance "call before you dig" services. This can greatly increase the efficiency of the government and utilities in responding to site clearance applications as well as reduce the burden to the customers of dealing with each entity separately.

2.2 Land Administration

2.2.1 Land Cadastre

This business area involves the determining, recording, and disseminating information about ownership, value and use of immovable property when implementing land management policies including cadastre and registration information. By its very nature it is a complex and highly transactional environment due to the combination of regulatory and administrative requirements, and a large volume of data. The precise location and

measurement of land and control over its uses is critical to this business area, thus the interdependency with an accurate survey control network and various land use regulatory entitlements and restrictions is critical.

The Land Laws of Belize are derived mainly from the Common Law and English Statutes of the 19th century. The Law of Property Act, Chapter 190 is similar to the Real Property Act 1925 of England in many ways. Other relevant statutes include the Registered Land Act, Chp 194 (1977). This statute governs all land transactions of Belize. There are mainly two types of Land in Belize. Which are (a) Undeclared Land & (b) Declared Land. Declared lands are those that have been fully adjudicated and for which permanent land title has been issued. Undeclared lands have not been fully adjudicated but tenure may be supported through other instruments. Transactions related to Undeclared Land in Belize are recorded at the Titles Registry. Transfers carried out for Declared Lands are to be registered at the Land registry. The Law of Property Act also allows for acquisition of property to take place in the instance that one has settled on a land for more than 30 years. The Government is in the process of reregistering all freehold lands under the Registered Land Act of 1987 to achieve an eventual uniform system of nationwide land ownership.

In Belize the Ministry of Natural Resources and Agriculture, Lands and Surveys Department is primarily responsible for the management of the national cadastre program. A Land Management Program (LMP), funded by an IDB loan and counterpart funding from the Government of Belize is working to improve land management in Belize by completing four components — national cadastre and property rights registration, the expansion of land administration, land use planning and development review and land policy reform and ministry-wide strengthening. The MNRA has implemented LandFolio, an electronic system for the management of cadastral boundaries, titles and related instruments and documents. This is being used for the processing and management of cadastral information within Declared areas but the system has not yet been applied to Undeclared areas.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Integrated cadastral data model. Large, continuous, and dynamically linked geographic and tabular databases containing both current and historic data (boundaries, deeds, titles). This cadastral model should accommodate both Declared and Undeclared lands and associated documentation.

Land assessment. The GIS can provide the tools and information to quickly assess the current status, context and suitability of any parcel of land. This can include verification of official declared title, various levels of documentation and instruments associated with undeclared land claims, checking against existing jurisdiction

overlays such as protected areas, Town and Village Council boundaries, required setbacks for public access to waterways and coast and other relevant factors.

Field GIS. Use of GPS and GIS (including both vector basemap data and orthophotos integrated to a palm top device can assist staff in accomplishing field verification for plot set outs and other field checking activities).

Land deed issuance. Automated generation of hardcopy land deeds and other instruments.

Easement information management. Integration of easement information to track the location, characteristics and ownership of various types of easements.

Clearance. Determination of conflicts between a proposed subdivision and any existing utilities, easements, or other utility or infrastructure related issues.

Cadastral workflow management. Management of the land apportionment, deed issuance, land subdivision, parcel splits and joins, cadastral map maintenance and ownership data maintenance. This should include both workflows for Declared as well as Undeclared and National Estate lands.

2.2.2 Property Valuation and Taxation

Property valuation by the government involves determining the monetary value of real property either for taxation or for public land acquisition, disposition and leasing. The property appraisal process often includes consideration of market value of comparable properties at a given point in time, along with other factors. GIS has been used to support computer aided mass appraisal (CAMA) systems for many years, providing the tools to capture and manage property boundaries, improvements, zoning, and other information that may affect the value of a property. It also provides a spatial means for finding recently sold properties with comparable characteristics that are close by or within the same basic neighborhood, thus improving the reliability of the market value calculation.

In Belize, the Ministry of Natural Resources and Agriculture, Lands and Surveys Department, Valuation Section conducts real estate property and lease valuation on behalf of the government. This is carried out for properties in both declared and undeclared areas of the Country, to support taxation, government land purchase, sale, or lease, and expropriation of land and private treaty transactions for public benefit. The Valuation Section uses different methods and sources of information to conduct its activities. Nationwide property tax valuation is generally conducted every three to five years, at the discretion of the Government. There is no set formula for such valuation, but generally includes the types of property improvements that have been made, the character of the context, property condition,

and local comparable sales. Section staffs utilize Landfolio for recent comparable sales and other cadastral reference information.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Provide access to property information. The GIS provides the spatial reference for accessing all manner of data relevant to a property and the characteristics that will influence its appraisal and valuation. This may include specific land record information regarding a particular property as well as contextual and overlay information that may impact its use and value.

Manage and track property sale information. Market value of property is an important factor, especially when calculating the equitable value of property to be acquired for public purpose. The tracking of property sales linked with information describing the characteristics of each property can be used as a powerful and defensible mechanism for assessing market value based on comparable sales.

Conduct computer assisted mass appraisal. The GIS can provide important information and analysis tools to support computer assisted mass appraisal (CAMA) analysis across all properties in Belize or for selected areas. This functionality is useful both as a starting point for periodic reappraisal as well as a fiscal planning tool to assess and project government revenue based on market trends, projections and scenarios.

Track property tax assessments and payments. GIS can provide the capability to display and track property tax assessments, payments and follow-up geographically.

2.2.3 Property Acquisition and Disposition for Public Purpose

Government is sometimes required to acquire private property for achieving a public purpose, such as building a highway or public facility. In these cases, a statutory process is applied to ensure that the property owner is fairly compensated for the taking of the land.

The MNRA Lands and Surveys Department is responsible for land acquisitions for public purpose. The Valuation section developed a Land Acquisition Management System (LAMS) to record all relevant information such as payments and outstanding balances by the Government of Belize, for Land Acquisition for public purposes according to the Land Acquisition (Public Purposes) Act, Chapter 184 of the Laws of Belize, and Land Acquisition (Promoters) Act Chapter 183 of the Laws of Belize, Revised Edition 2000, secondly;

revising the Land Acquisition Index for ease of information and thirdly, updating other records.

A related activity is the leasing of National Estate Lands, also administered by the MNRA.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Conduct property acquisition analysis. The mandatory acquisition of privately owned land for public purpose is a legally mandated process. The identification of lands to be appropriated may be designated in a land use or public infrastructure plan indicating the location of a proposed use and the identification of properties that would need to be acquired.

Conduct property valuation. The acquisition of land for public purpose requires fair compensation to the current land owner, by monetary payment or trade for a property of equivalent value. In the case of monetary payment the property valuation function described previously can provide a detailed and defensible property value as the basis for owner compensation.

Comparable site selection. In some cases it may be preferable to acquire a private property for public purpose via a trade for another property of equivalent value in another location. GIS and the BNSDI can provide the tools and information to identify and locate equivalent properties for consideration.

Prepare property acquisition and disposition documentation. The GIS and BNSDI tools and data can be used to prepare the map exhibits and other supporting documentation that is needed to support the processing of a land acquisition or disposition transaction.

Track historical property transactions. GIS can support the tracking of historical property transactions that have been carried out for public purpose utilizing government funding. This is important to for transparency and future reference.

Manage leasing of government owned properties. The leasing of government owned properties is a related business area because it involves a land related financial arrangement between the government and private party within which the rights of both parties must be equitable and transparent. GIS functionality can support the processing of land lease applications, calculation of fair land lease value, and the tracking of land leases, payments and associated information spatially.

2.3 Utilities & Infrastructure

The utilities and infrastructure core business area covers the planning, design, implementation, and ongoing operation and administration of a wide variety of utility infrastructure. This includes, but is not limited to, electricity, water, telecommunication, gas, sewer, storm drainage, and irrigation. While each of these utilities has its unique characteristics and specific requirements, the basic "business" areas can be generalized to several basic categories, including long range planning, capital improvement planning, project design, construction, operations and maintenance, administration and finance. GIS technology supports each of these business areas, and provides mechanisms for systems integration around common geographic and asset references. The BNSDI can provide the bridge between and among utilities, and provide access to planning, land use, census and other information maintained by other agencies that are needed to support the utility business. The generic "business" areas are described in the following paragraphs.

Long Range Planning. This is ideally integrated to long range comprehensive community development planning, which should incorporate infrastructure expansion considerations, including the allocation of corridors and areas of land to accommodate future networks and related facilities.

Short Term Planning. Involves the identification and further scoping of specific facility development or refurbishing over a 1-5 year time span. This includes the assessment of near term needs and priorities, and identifies what specific projects can be carried out to improve or extend service or to maximize the useful life of existing infrastructure. Once developed, the short term or "capital improvement" plan provides a well studied framework for the identification of specific projects to be undertaken in any given fiscal year.

Design. The development of detailed drawings and specifications that permit the preparation of work orders for construction. Several design scenarios may be prepared before selecting the best solution.

Tendering. The process of determining a tendering and contracting mechanism, prequalification and selection criteria, reviewing submitted bids, and selection.

Construction. Once construction responsibilities are assigned, there is a process for managing and overseeing that project through completion, including keeping track of both the technical and financial performance of the work as specified in the contract and associated contract documents. Next, a final approval is issued and the work is commissioned for operation, with a defects liability period.

Asset Registry Management. Traditionally, the recording and use of utility asset information has been handled separately in the facility mapping, operations and

maintenance, and financial management systems. In a modern integrated enterprise utility management platform a centralized, common asset register database is used to support each area while streamlining the process of asset registry capture and providing integration and interoperability across various enterprise applications.

Operations and Maintenance. This is usually initiated after commissioning, and includes all the activities required to keep the networks operational to a certain level of service and to maximize the useful life of the assets. This should include preventive and emergency maintenance, system monitoring, managing stores, administering a customer call center, and updating available system information to reflect changes.

Administration and Finance. This refers to a variety of activities that support the core business, and include procurement or contract management, legal issues, regulatory monitoring and control, financial management, human resource management, public relations, and quality management.

Public Utility Oversight and Regulation. A Public Utilities Commission is often in place to provide oversight of utility companies to ensure their services are efficient, equitable and provided in a manner that serves the best interest of the public, including the regulation of fair rates to be charged to customers.

While each utility has completely different technical, financial, and operating considerations, there are similarities in the way GIS improve service delivery. A broad list of general applications that are used to support utility management follows:

- Long range and capital improvement planning;
- Facility design;
- City plan review and comment;
- Subdivision review and comment;
- Facility mapping;
- Redline management;
- Field data access;
- Map series production;
- Project management;
- Maintenance management;
- Utility system modeling and simulation;
- Financial management;
- Warehouse management;
- General data access, query, mapping and reporting;
- Library and electronic document management;
- Standard reporting;
- Outage management;
- Incident management and reporting;

- Routing and logistics;
- Emergency contingency planning and response;
- Historical trend analysis;
- System Control and Data Acquisition (SCADA) integration;
- Permit tracking;
- Incident management and reporting.
- Access to time series data and relevant current indicators for projecting future capacity needs;
- Ability to provide service information to customers;
- Information sharing between utility authorities that may overlap varying levels of administrative units of government;
- Access to capital improvement plans;
- Exchange of and access to various types of data relating to underground and aboveground utilities and other information that will be needed;
- Access to high resolution imagery;
- Common reference system to ensure that data from all agencies is interoperable.

2.3.1 Long Range Utility Planning.

This is ideally integrated to long range comprehensive community development planning and capital investment planing that should both incorporate infrastructure expansion considerations, including the allocation of corridors and areas of land to accommodate future networks and related utility facilities and activities.

Long range planning for each utility in Belize is variable and conducted by each organization independently.

Belize Electric Ltd (BEL). For long-range planning, BEL monitors trends that will impact future demand, such as population growth, commercial and industrial growth, changes in land use distribution, changes in electrical consumption over time and other such factors. Key to this planning is understanding how growth is happening, where and how electrical production and consumption is changing over time. BEL requirements within this business area include:

- Monitor urban development plans and changes in land ownership;
- Monitor population growth, densification and expansion geographically;
- Monitor power consumption rates and trends geographically;
- Monitor socioeconomic trends;
- Monitor long term climate trends and assess impacts on hydroelectric power generation;
- Monitor the adoption of local power generation from renewable sources (solar, wind, etc.);
- Track new highway and road development;

- Model all of the above to assess potential future demand and load growth scenarios geographically over time;
- Assess feasibility of supplying powers to more remote communities;
- Assess emerging technologies and methods for smart power management;
- Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities;
- Conduct spatial analysis to determine optimum routing for distribution networks:
- Plan for land acquisition to accommodate power facilities;
- Environmental impact assessment for planned facilities;
- Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public;
- Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up);
- Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends.

Belize Water Supply Ltd (BWSL). The BWSL carries out most of its water and sewer system planning on a reactive basis, depending on annual budgets and priorities. Requests for new system development are submitted by private developers and the government (for example the Social Investment Fund). Budgetary estimates covering all legitimate requests are submitted for review by the PUC and ultimately to the Ministry of Finance and Economic Development. Final plans for system renovations and expansion are then based upon the approved budgets each year. BWSL requirements within this business area include:

- Monitor urban development plans and changes in land ownership;
- Monitor population growth, densification and expansion geographically;
- Monitor water consumption rates and trends geographically;
- Monitor socioeconomic trends and their impacts on water consumption;
- Monitor long term climate trends and assess impacts on water resources;
- Track new highway and road development;
- Model all of the above to assess potential future demand and demand growth scenarios geographically over time;
- Assess feasibility of supplying water and sewer services to more communities;
- Assess emerging technologies and methods for smart water and sewer system management;
- Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works;
- Automate design and as-built record management;

- Conduct spatial analysis to determine optimum routing for distribution networks;
- Plan for land acquisition to accommodate water production and sewer treatment facilities;
- Environmental impact assessment for major planned facilities;
- Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public;
- Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends.

Belize Solid Waste Management Authority (BSWaMA). The BSWaMA, in conjunction with Local Government bodies and other stakeholders, is responsible for the safe and environmentally sound management of solid waste in Belize. A key role of BSWaMA has been to facilitate, plan and oversee the construction and operations of solid waste management facilities (Transfer Stations and Sanitary Landfill) constructed under the Solid Waste Management Project (SWMP). It is expected that there will be a need to conduct long range planning for other regional landfills and collection systems over time.

Other utilities that are related to this functional area and will likely be future GIS and BNSDI stakeholders but have not been directly investigated for the current project include:

■ Belize Telemedia Ltd. (BTL – telephone, internet, cable television)

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Capture and manipulation of current and historic data. This involves development of a complete understanding of of the current situation of the utility and its customers and a historical perspective of how the current situation has changed over time. This may involve compiling and monitoring a variety of thematic information, including but not limited to land use plans and land use change over time, land subdivisions and building permit issuance, census data, population and household survey information, including statistics concerning population characteristics and trends, community facilities and services, and business licenses. It also includes monitoring of utility consumption rates and trends generally and by communities or neighborhoods, socioeconomic trends and their impacts on utility demand, and the introduction and adoption of various technologies that may impact utility service supply and demand.

Conduct future demand forecasting. Long range utility planning involves understanding likely future demand to establish future targets. GIS provides tools that can be used to project various possible alternative futures and the utility demand implications of each.

Data access, query and exploration, and display visualization. Utility planners need to be able to discover what information exists and to determine its usefulness for planning purposes. Basic functional requirments include ad hoc data access, query and thematic mapping and reporting; Spatial query; Multiple media information integration; Thematic mapping and reporting; 3D visualization; and Animation and time series. These capabilities are used to both provide utility planners with the analysis results and insights needed for plan preparation, but also the tools and products that are needed to explain resulting plans to decision makers and the public.

Data analysis and modeling. Trend analysis, including both monitoring of development and growth as well as place-specific changes in consumption patterns over time; Land use and population forecasting; Facility and service modeling; Future development scenario analysis; Utility modeling; and Environmental modeling and impact assessment.

Planning Scenario Development and Evaluation. GIS also provides the tools for analyzing utility network performance based on both existing conditions and various future demand and system configuration scenarios. Among other areas, this may include the siting and/or coridoor analysis for major system facilities and transmission or distribution routes, environmental impact assessment, financial feasibility analysis, engineering feasibility analysis and other such evaluations.

Plan Implementation and Management. The implementation of long term utility plans is normally carried out through more detailed levels of capital improvement planning (CIP), specific projects and the monitoring and adoption of new and better "smart utility" technologies and methods as these become available and financially feasible. Ongoing system performance monitoring and evaluation can provide the insights and metrics that can then be used to periodically recalibrate long term plans in response to changing context. These can include tracking the location and characteristics of unplanned maintenance issues, system outage, customer complaints, operations and maintenance costs and other such trends.

Plan Implementation Monitoring, Evaluation and Adaptation. Any long range utility plan requires monitoring, assessment of progress and periodic calibration and adaptation through short term capital improvement planning in response to changing context and conditions. This may include evaluation of evolving utility service demand and associated customer needs and expectations, supply conditions (source,

quantity, quality), emerging technologies, full lifecycle costs, utility service rates, and other factors.

2.3.2 Short Term Utility Planning.

Short term, or capital improvement/investment planning (CIP), involves the identification and further scoping of specific facility development or refurbishing over a 1-5 year time span. This includes the assessment of near term needs and priorities, and identifies what specific projects can be carried out to improve or extend service to meet near term demand, or to maximize the useful life of existing infrastructure. Once developed, the short term or "capital improvement" plan provides a well studied framework for the identification of specific projects to be undertaken in any given fiscal year.

Short term utility plans are intended to support near term development requirements and to ensure that adequate utilities services can be in place in advance of specific development and building permits.

Short term utility planning is variable and conducted by each organization separately.

Belize Electric Ltd (BEL). Plans for shorter term CIP planning for BEL are mixed. At present there is a lack of an integrated capital improvement planning approach across all sectors to ensure that land use, utility, and other community facility and service matters are coordinated within the 3-5 year, medium term timeframe. BEL has started working more closely with sister utility providers to address this matter. Developers approach the utility to determine or request access to electrical services, often after they have already invested significant time and effort in processing plans through the government only to find that service cannot be cost-effectively provided. In addition, the government will often conduct land use planning without consulting with BEL which can result in areas that have been approved for development even though there are no plans in place to provide electrical service. In regards to government expansion plan, BEL often learns of these through information provided by the Ministry of Finance and Economic Development MoFED) Public Sector Investment Programme Reports.

Belize Water Supply Ltd (BWSL). As mentioned in the previous section, the BWSL carries out most of its system planning on a reactive basis, depending on proposed development projects, service requests, annual budgets and priorities. Final plans for system renovations and expansion are based upon the approved budgets each year, which are set in part in response to requested services.

Other utilities that are related to this functional area and will likely be future GIS and BNSDI stakeholers but have not been directly investigated for the current project include:

Belize Telemedia Ltd. (BTL – telephone, internet, cable television)

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Monitor and assess system conditions and demand. CIP's are developed in response to both system renovation requirements as well as increasing demand which may drive the need for more system capacity or the extension of services to new areas. BNSDI will provide access to a variety of information that can assist utility organizations in anticipating the location and characteristics of land use and population changes that will affect utility service demand in the near future. This includes but is not limited to land use plans, proposed development projects, existing and projected population statistics and trends at the neighborhood level, and the CIP's of other entities, including other utilities. Likewise, by monitoring and analyzing system maintenance and inspection activities the CIP can respond to correct chronic maintenance issues and need for preventive system renovations. The development and communiction of a common consensus regarding near term renovtions, development plans and projections would help greatly for the utility companies and other providers of community infrastructure, facilities and services to more effectively develop their own CIP's, and result in more coordinated and efficient utility coordination and community development collectively.

Provide access to common land base information. Utility CIP planning often requires the development of general designs for system expansion or retrofit, at a level that can be used to determine project feasibility and planning for more detailed engineering design in the future. This requires access to basic land base information that includes representation of the current built environment, administrative juridictions, physical characteristics of the landscape such as topography, soils, hydrology and other factors, land ownership, land use plans and restrictions, locations and characteristics of other utilities, and existing and potential natural hazards.

Analyze utility development issues, opportunities and constraints. GIS technology provides a variety of spatial overlay and analysis tools that can be used to identify location of future system needs and the individual and cumulative issues, opportunities and constraints that need to be considered in defining utility CIP's. The resulting supply/demand, opportunity/constraint and utility coridoor routing analysis maps can provide invaluable information to support the formulation of well considered CIP's by concerned utilities.

Support development and recording of utility capital improvement plan. GIS provides geospatial tools that can be linked to computer aided system modeling, design

and drafting applications that exist for each type of utility. These can be used to prepare general utility system configurations, identify properties that might be affected and any environmental issues that might be created, as well as provide engineering and financial feasibility information. Once developed, the digital CIP for each utility could be published for access by authorized BNSDI users for their reference and to aid in community development and utility coordination efforts.

2.3.3 System Design.

CIP's provide a near term planning framework within which specific projects are carried out. System renovation and extension projects require their own specific and detailed treatment for the preparation of detailed system designs and all other engineering and administrative considerations that need to be addressed in planning for project execution.

The utility companies in Belize each administer their own detailed system renovation or extension engineering designs, as follows:

Belize Electric Ltd (BEL). The BEL is involved facilitating and managing network design and construction for electrical transmission and distribution networks. Minor system design work is carried out in-house by BEL staff. A majority of the major design and construction works are carried out by private sector firms based on competitive tenders, but these are carried out according to BEL standards and under the supervision of the Utility. Each of these requires a field survey to document current conditions. For larger projects this is carried out by a licensed surveyor. GIS and BNSDI requirements within for this activity include:

- Base mapping providing up to date and accurate information concerning existing roads, buildings, and other infrastructure;
- Land ownership and land use;
- Demand load forecasting and system modeling;
- Facility siting analysis;
- Alternative network design analysis;
- Construction drawings in real world coordinates, usable with other information in GIS;
- Construction management and status tracking;
- As-built data consolidation;
- Transfer of as-built inventory to fixed asset inventory.

Belize Water Supply Ltd (BWSL). The BWSL carries out detailed system design works for water and sewer system renovation projects and new construction. Smaller projects are conducted in-house and larger projects are contracted to qualified engineering consultants through a competitive bidding process. GIS and BNSDI requirements within for this activity include:

- Base mapping providing up to date and accurate information concerning existing roads, buildings, and other infrastructure;
- Land ownership and land use;
- Water demand and sewer contribution forecasting and system modeling;
- Facility siting analysis;
- Alternative network design analysis;
- Construction drawings in real world coordinates, usable with other information in GIS;

Other utilities that are related to this functional area and will likely be future GIS and BNSDI stakeholers but have not been directly investigated for the current project include:

■ Belize Telemedia Ltd. (BTL – telephone, internet, cable television)

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Assess project requirements. This involves the use of GIS data and network analysis to assess the requirements for renovation of existing utility facilities and networks or the design of new additions. Demand information can be compiled from statistical coefficients based on land use, household and facility data as well as metered information where available. Renovation and demand requirements can be used to define system condition and capacity targets.

Conduct engineering assessment. Basemap and other layers of information can be used to identify physical engineering characteristics, land ownership, utility easements and other factors that need to be considered in preparing the actual design for the system.

Conduct system engineering design. Computer aided design tools can be used with GIS information to prepare the detailed system design, inclusive of network routing and system components. Draft designs can be modeled for system performance and cost effectiveness, with final information ready for structuring to engineering documents suitable to support bidding and construction.

Prepare construction documentation. Digital system design information can be used to generated engineering documents and associated information that can help to streamline the project tender and bidding process. If structured correctly, the system design information can be used to automatically generate material bills of quantity listing all components to be refurbished, replaced or installed.

2.3.4 Construction Management

Once construction responsibilities are assigned, there is a process for managing and overseeing that project through completion, including keeping track of both the technical and financial performance of the work as specified in the contract and associated contract documents. Next, a final approval is issued and the work is commissioned for operation, with a defects liability period.

Requirements for construction management are relatively similar between the participating utilities and entities involved in other infrastructure development. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Track project locations. The location and extent of planning, in-progress and past projects can be tracked location. Using a project number or name as a unique identifier, the location information can be linked to all other information about the project that is in digital form (schedules, construction drawings, case files, etc.), thus allowing project information to be monitored spatially and retrieved through a map.

Monitor project installation progress. Project status information can be linked to the spatial location of the project, and displayed thematically. This can allow a "dashboard" view of project status across a geographic area of interest.

Manage project construction drawings and case files. Digital construction drawings and case file information including field notes, photographs, correspondence and other pertinent information can be linked to the project location on a map. This allows this information to be retrieved through a map interface individually or through a spatial and/or tabular query (e.g. give me access to all the projects within the past three years within 100' of Front Street).

Record and manage project as-built drawing. As a project is installed and prior to burying any underground components, the final location and characteristics of the installed system should be recorded as the digital "as-built" information. This information can then be added to the GIS database to provide the most accurate location of the installed system for future reference. As-built information including explanations for any deviations from original design drawings can likewise be stored in a digital format linked to the project location and other information and retrievable for future reference.

2.3.5 Asset Registry Management.

Traditionally, the recording and use of utility asset information has been handled separately in the facility mapping, operations and maintenance, and financial management systems. Likewise, the management of a parts warehouse inventory might typically be handled yet another disconnected information database, In a modern integrated enterprise utility management platform a centralized, common asset register database is used to support each area while streamlining the process of asset registry capture and providing integration and interoperability across various enterprise applications. With well structured standards and process covering the previous steps, a common fixed asset register that can be used for all the other areas mentioned.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Develop integrated enterprise system model through facility mapping. When modeled correctly, the system design and as-built map information for a utility project can be used to automatically create an integrated enterprise system model that can support multiple applications and link other systems.

Integrate GIS with other enterprise systems. GIS data can be modeled as one component of an integrated utility enterprise information management approach:

- Common asset register used by financial system for system valuation and depreciation;
- Common asset register used by maintenance management system to link preventive and reactive maintenance to specific locations and appurtenances;
- Link customer care system to account locations;
- Link GIS network to System Control and Data Acquisition (SCADA) systems;
- Utilize spatial analysis tools to cluster, analyze and report maintenance, system performance issues and customer complaints by geographic locations and areas;
- Place-aware social media and messaging used for public to report observed problems or issues;
- Common facility map also structured to accommodate system modeling;
- Common facility map also structured to accommodate outage analysis and response.

2.3.6 Operations and Maintenance.

This is usually initiated after commissioning, and includes all the activities required to keep the networks operational to a certain level of service and to maximize the useful life of the assets. This should include preventive and emergency maintenance, system monitoring, managing stores, administering a customer call center, and updating available system information to reflect changes.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Link maintenance workorders to system locations and appurtenances. Facility map identifiers can be used as the asset tag to tie preventive or reactive work orders to specific system locations and appurtenances.

Assess system fault and dispatch response crew. GIS linked to other operational systems can be used to model the probably location of a system fault, to generate a work order and dispatch the appropriate crew to the location of the probable fault within all the system information needed to carry out their work.

Route inspectors and maintenance crews. Whether preventive or reactive maintenance, the GIS with linkage to other operational systems can be used to visualize workload and assign crews on a geographic basis.

Customer notifications. When system maintenance activities will involve temporary service outage or other impacts to customers, the GIS linked to customer care can be used to notify the customers of such disruptions in advance.

Monitor and assess recurring maintenance issues. Recurring complaints and maintenance activities can be visualized and analyzed geographically to identify hot spots and issues that may require longer term resolution.

2.3.7 Administration and Finance.

This refers to a variety of activities that support the core business, and include procurement or contract management, legal issues, regulatory monitoring and control, financial management, human resource management, public relations, and quality management.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Maintain up to date asset inventory. Integration with GIS based facility mapping can ensure that the common asset registry is up to date and accurate according to as-built records and conditions. Information such as project identifiers will be present in the

raw information, thus allowing the information to be aggregated as needed to support financial analysis purposes.

Conduct location-aware customer relations management. Linkage of customer care, accounts and billing information to the account location in the GIS provides a variety new ways of analyzing and visualizing customer information, including but not limited to consumption rates and trends, complaints, bill payment status, meter shutoff work orders, and other such activities.

Route meter readers. The GIS can be used to establish the most effective routes for meter readers. These can also illustrate accounts with pending approximations that are past due for physical reading, meter location information, and recording of any constraints to reading (gate access, dog, etc.). Such information can be accessible online or downloaded to meter reader mobile device. Alternatively, meters can be converted for remote sensing and real-time reading.

Prepare analysis and reports for PUC. The Public Utilities Commission (PUC) requires certain financial and operational information to ensure that each utility is being run in an efficient manner that is in the best interest of the public and that utility rates charged are appropriate, fair and equitable. System performance statistics (service outages, complaints, etc.) can be tracked and reported spatially. An integrated approach to enterprise management enhanced and supported by appropriate modern technology can ensure that the public is receiving the best service at the best price.

2.3.8 Public Utility Oversight and Regulation.

A Public Utilities Commission is often in place to provide oversight of utility companies to ensure their services are efficient, equitable and provided in a manner that serves the best interest of the public, including the regulation of fair rates to be charged to customers. The requirements for the effective utilization of GIS and the BNSDI have been listed in the previous sections. Implementation of GIS as an integral component of an integrated enterprise information management approach can help to ensure that utility operations are integrated, coordinated and streamlined to the extent possible for maximum efficiency and quality of service delivery to the customers. It can also be used to effectively monitor and assess the quality of service delivery based on measurable factors such as maintenance activities, service disruption events, customer complaints, service quality or issues (e.g water quality), and other such factors.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Monitor utility performance. The monitoring of utility performance in terms of efficiency and quality of services can be supported by the GIS and BNSDI. This includes monitoring the full range of business activities and associated costs from long range planning down to operations and maintenance and administrative management. Monitoring these issues spatially can provide better insight to specific problem areas that need addressing and the customers that are most affected. It can also provide information and insights into ways that the utilities can keep capital investment and operating costs in check, thus ensuring that utility rates are fair and equitable and based on an optimized utility business.

Generate statistics and thematic maps. PUC assessment of utility performance, finding and recommendations require communicating this information to leadership and the public. The GIS and BNSDI can provide a rich set of tools for statistical reporting and map-enabled visualizations to understand the issues involved, affected populations and what actions can be taken to resolve these issues and ensure optimum services and service rates to the public.

2.4 Community Facilities and Services

For purposes here, community facilities and services refers to a variety of local service categories that are often needed by neighborhoods or communities and may or may not be provided by government. These include:

- Park and recreation facilities. Local councils are responsible for managing public parks and recreation areas within their jurisdiction. Councils are to ensure that recreation is considered in any local land use planning exercises, maintaining park facilities and grounds, and managing various types of organized activities that are carried out in parks and recreations areas.
- Solid waste management. The MNRA Belize Solid Waste Management Authority is responsible for overseeing the management of the transfer stations and landfill. Local councils are responsible to administer community trash collection services.
- Emergency services. Emergency services include fire and ambulance
- Health services.
- Libraries and archives.
- Museums;
- Cemetaries;
- Places of worship;
- Town halls and community centers;
- Theaters and playhouses;

The presence and adequacy of certain local community facilities and services help to support a certain level of service and quality of life for local community residents. Many of these may be provided by different government, civil or private sector organizations. Urban

planning should establish the land use framework for accommodating community facilities and services, but the actual monitoring and assessment of actual conditions is necessary for local authorities to be able to take actions to implement or lobby for the implementation of government provided services, to provide incentives to attract civic and private sector investments in these areas, and for those providers to assess the viability and feasibility of making such investments in local communities.

The planning, design, development and operations of community facilities and services for the purposes of GIS and the BNSDI related business activities has many structural similarities to utilities and other community infrastructure.

2.4.1 Facility and Service Inventory.

To understand the adequacy of various community facilities and services it is necessary to have a clear picture of the distribution and characteristics of the existing situation. The nature of how geographic locations and service capacities are described varies from theme to theme, but the development of a common integrated repository of such information along with key descriptive information that is common across all (e.g. the "facility name" and "facility type" – the latter according to a standardized classification scheme) can help to provide a common operational picture of the community facility situation across all themes and communities. Beyond these basic descriptors, facility owners can develop additional information that is needed to support their management of those facilities, and some of that information can provide useful reference for other stakeholders.

In the case of GIS and the BNSDI in Belize, requirements of the following community facility types are considered:

Park and recreation facilities. Local councils are responsible for managing public parks and recreation areas within their jurisdiction. Councils are to ensure that recreation is considered in any local land use planning exercises, maintaining park facilities and grounds, and managing various types of organized activities that are carried out in parks and recreations areas. Parks may include both open space to accommodate various general or specific uses (e.g. football field) as well as buildings to support recreation and community activities. Parks may have specific planned recreational programs and spaces that need to be planned and scheduled.

Solid waste management. Local solid waste management, where this is formalized, is handled under the environmental sanitation function of local government. GIS related aspects of local solid waste management include transfer and recycling centers, trash pickup routes and schedules, weed abatement infractions, culvert cleaning, identification and cleaning of illegal dumping and derelict automobiles and other such functions.

Emergency services. Emergency services in this context include fire and ambulance. Public ambulances in Belize are not common but there are a few quality private ambulances such as those operated by the Belize Emergency Response Team (BERT) that offers both ground and air ambulance service and Wings of Hope, another non-profit organization. Fire response service is provided by the Belize National Fire Service, under the Ministry of Labour, Local Government, Rural Development, NEMO and Immigration and Nationality. Emergency service facilities that require mapping include fire and ambulance station locations.

Health services. Health service locations include both government and private clinics, pharmacies, urgent care centers, and hospitals.

Libraries and archives. The Belize National Library Service and Information System (BNLSIS) maintains 16 library and archive facilities that are located in major communities across the country.

Museums. Publicly managed museums in Belize are primarily managed by the National Institute for Culture and History (NICH), Museums of Belize and Houses of Culture (MOB/HOC).

Cemetaries. Publicly managed cemetaries are normally under the jurisdication of the local Town and Village Councils.

Places of worship. Churches and other places of worship in Belize are owned and managed by church organizations. The building of churches is regulated through the Town and Village Councils and the Central Building Authority.

Town halls and community centers. Town halls and community centers are typically managed by the local Town and Village Councils.

Theaters and playhouses. Theaters in Belize are privately owned and operated.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Provide a basis for mapping the location and essential characteristics of facilities. GIS provides the basis for mapping the locations of facilities and the linking to tabular databases that describe the essential characteristics of each, e.g. facility size, number of employees, number of beds, etc. The facility information needed by each entity for its own internal purposes will generally be much more than that needed in common across

the BNSDI community, and these needs will need to be identified through the development of community facility data standards.

Link programs and services to facility locations. The GIS location information can be linked to a full accounting of the facility physical assets and services provided. This information can then be used for facility assessment as described later, as well as provide a basis for customers to find where such services are available, for example through an online application.

2.4.2 Facility and Service Assessment.

Facility and services assessment is conducted to determine how well a community and its various neighborhoods are served within various service categories. From a government perspective, this information is useful for land use planning and economic development purposes. For service providers and investors this assessment can be used to assess existing demand, competitive analysis and to determine the best areas for investment.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Assess community facility supply and demand. Facility and service inventory information described previously includes a record of facility locations and the type and magnitude of services that are offered at each. Other information such as census and other related socioeconomic information can be analyzed to determine the location and likely level of demand for each service. Commercial information providers of "consumer profile" data combine census with other sources of information that describe the different preferences, lifestyle, lifestage, attributes and trait categories of various classes and types of people. When combined with GIS this information is typically used for targetted markeing purposes. Such classifications can also be used to estimate demand for various community facilities and services.

Conduct service area analysis. GIS spatial analysis tools can be used to conduct service area analysis. This can vary from analying the drive time of fire trucks or ambulances from their stations to identify areas outside of target maximum drive time to geocoding customer home and/or business locations to understand their distribution.

Develop thematic maps and statistics. The GIS tools can utilize the service area analysis to generate a variety of thematic maps, statistics and combinations thereof. For example a map showing the target drive times for all fire stations, identification of properties and structures outside the target, calculation of the percent of properties with inadequate service, and their total assessed value.

2.4.3 Facility and Service Siting and Design.

GIS provides tools to support facility siting and design. Stakeholder activities that relate to this business area that were identified during the Stakeholder Assessment are summarized in the following table.

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Siting Analysis. GIS provides the tools to determine the best location for a proposed service. This can be used by government to determine the best locations to fill gaps in existing service areas (for example a new fire station or ambulance dispatch location) or to establish optimum siting for regional facilities, such as a new landfill. This functionality can also be used by the private sector to find optimum sites for a new business. Spatial analysis and weighted decision critera are applied, for example "find a site for my warehouse that requires a vacant plot greater than 5 acres and zoned for industrial, adjacent to an existing main road and with access to water, electricity and sewer and not adjacent to any sensitive environmental feature or land use (hospital, school, aged housing facility, etc.).

Routing. The GIS provides tools to establish the most efficient routes, for example for trash collection.

Facility and Service Programming. BNSDI can provide a variety of information that can be used to evaluate the likely service demand for a particular facility, from which the service programming and facility space planning can be conducted.

Facility Design. GIS can provide information regarding the topography of a site, existing utilitie and infrastructure drainage characteristics, viewsheds, solar access and other factors that may influence the orientation and design of the facility. GIS also provides tools for 3D visualization of the planned facility and tools for adjusting the design that will provide immediate feedback relative to the service and space planning targets.

2.4.4 Facility Construction Management.

GIS can be used to support the facility construction process, including tracking of the location and status of each construction project, linking to project design drawings and associated case file information.

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Link facility design documentation to locations. CAD drawings and other constructoin case file information can be linked to the GIS. This provides the option to retrieve such information through a map interface whenever this is useful.

Link construction schedule and status tracking to locations. A construction schedule in GANTT or other format can be linked to the GIS. Status information can be displayed as a statistical display for each location, for example a nationwide map indicating schools under construction, their target completion dates, and current percent complete.

Maintain a historical record of the construction process and as-built conditions. Changes to design drawings must often be made to accommodate conditions encountered during the construction process. It is important that the final as-built condition of the facility and any related underground or aboveground utilities and other infrastructure are accurately captured and reflected in the GIS.

2.4.5 Facility Operations and Maintenance.

This is usually initiated after commissioning, and includes all the activities required to keep the facilities operational and to maximize the useful life of the facility assets. This includes both routine maintenance as well as unplanned maintenance to address unforeseen issues.

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Link GIS to maintenance management system. A digital maintenance management or work order system can be linked to the GIS to be able to display and track maintenance schedules, activities and history spatially on a map.

Link GIS to space planning system. In-building GIS can be used to plan and allocate spaces in a facility for offices and other activities (including the management of cemetary plots). This same functionality can also be used to program events and other temporary uses.

Link GIS to leasing and fees system. There are a variety of facilities and establishments that pay fees to the local Councils. Any fee tracking system can be

linked to the GIS to be able to track fee schedules and status to the locations of specific facilities

2.4.6 Facility Administration and Finance.

The administration and finance of facilities involves overseeing operations, engaging with facility users, tracking operations and maintenance activities and costs and managing financial matters. With the right data modeling and integrated system development all the operational systems can be interoperable and digital dashboards can be provided that allow managers and administrators to more effectively monitor facility performance.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Administrative dashboard. Provide managers and administrators with the ability to oversee matters related to one or multiple facilities. This sort of dashboard combines the ability link operational information with GIS to summarize, report and display relevant information spatially.

Generate periodic status maps and reports. The GIS and related database statistical tools can be used to generate periodic reports as required by an organization's management or by the government.

2.5 Transport and Transit

For the purposes of the current study, only the Ministry of Works and Transportation was interviewed. This organization is involved in roads and transit and therefore their requirements are reflected here. Although the air and water transportation entities were not interviewed for the study, those modes are significant in Belize and therefore have been included in the report to reflect the likely GIS and BNSDI requirements generally, based on standard practices internationally.

2.5.1 Surface Transportation

Road management includes a full lifecyle of activities from long range planning for future transportation needs, to the management of road paving, signage and roadside weed abatement. The life cycle starts off with development of long range planning, ideally integrated to the long range comprehensive community development planning, in order to develop expansion considerations. This should consist of forecasting, defining planned road locations, routing, and capacities, and their preliminary cost estimates. Following this is short term planning for the building of new roads or the substantial upgrade or repair of

existing ones that will typically involve feasibility analysis, project selection, and cumulative development impact assessment. After approval, a series of activities are undertaken to fully design the project to the extent that it can be used to support bidding and construction. Operations and maintenance involves all the activities required to keep a road network operational to a certain level of service and to maximize the useful life of the road assets. This should include preventive and emergency maintenance, system monitoring, managing stores, administering a customer call center, and updating available system information to reflect changes.

GIS provides the tools and methods for the management and maintenance of local government roadways, inclusive of pavement, traffic markings, street furniture, and other related issues. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Pavement inventory and condition assessment. Comprehensive inventory of streets, street pavement and pavement conditions, and the ability to display and analyze that information geographically. This is often structured as a "linear reference system" that allows the pavement condition and treatment information to be structured, managed and displayed as linear references between established roadway nodes, without the need to break up the topology of the road network.

Street furniture and signage inventory. Street signage and other "furniture" that is owned and maintained by the local government.

Pavement treatment planning. GIS can be used as an effective environment for collecting, managing and analyzing pavement condition data that can be used to plan pavement reconditioning and preventive maintenance activities.

Maintenance management. Work order system to allow supervisors to outline work areas by geographic and/or inventory type (pavement or street furniture), and to route inspectors and field crews in a logical sequence.

Complaint management. Logging and tracking road complaints by street location. Location aware social media can be used to link complaints and supporting photos or notes to the locations the complaint is referring to, for example to report a pothole.

Accident analysis. Traffic accident data can be maintained over time and analyzed to identify trends and explore possible solutions to repeat problem areas.

Historical trend analysis. Trends by street or administrative area.

The BNSDI should eventually be able to support this business area in a variety of ways, including but not limited to the following:

- Provide access to long range land use plans, near-term project plans;
- Provide access to land use, population census, commercial establishments and industrial facilities as input to traffic models;
- Provide a navigable street database that can be used to support routing of inspectors and maintenance crews;
- Publish street closures and barriers so that these are visible and known to others on the network, such as emergency medical, fire and police dispatchers and responders;
- Publish daily and eventually hourly traffic data for major arterials for use by others, including the media and the public;
- Street database can also be used as the basis for a pavement management system;
- Provide access to basemaps to support the development of road facility inventories;
- Provide the ability for call center operators to provide service information to customers;

2.5.2 Transit

Transportation planning is highly related to urban and regional land use planning, ensuring that future land uses can be supported with adequate transportion infrastructure. It should address the multi-modal transportation needs and solutions, given the socio-economic constraints and vision, and given the physical context. Planning should consist of forecasting, defining planned facility locations, routing, capacities, and cost estimates. Based on such plans, specific projects can be developed once a feasibility analysis recommends it. The actual operations and maintenance of transportation will vary depending on the type of mode, but should nevertheless include activities meet or exceed the targeted level of service and to maximize the useful life of the assets. This should include preventive and emergency maintenance, system monitoring, managing stores, administering a customer call center and bus terminals, and updating available system information to reflect changes. Depending on the degree to which some of these services are privatized, regulatory functions may also be necessary.

GIS provides tools for the collection, modeling and visualization of transportation and traffic related information and analysis procedures. This can support the development of regional, structure and local plans, and for both one-time and cumulative analysis of development proposals or changes in the urban fabric over time. It is also used for ongoing assessment of traffic conditions to support the refinement of signalization, traffic markings, signage and other issues. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Data compilation. Capture of various information such as transportation networks, major trip generation and destination sources, traffic measurement data, traffic accident data, signage and signalization, and intersection turning motions.

Scenario development. Development and management of alternative scenarios and options.

Traffic modeling. Simulation of traffic patterns and volumes. Dynamically model realistic network conditions, including turn restrictions, speed limits, height restrictions, and traffic conditions at different times of the day.

Intersection modeling. Traffic analysis at the intersection modeling level to assess signage, signalization patterns, turning motion patterns, and to determine wait-time and other factors under various alternative scenarios.

Bus routing. GIS provides effective tools for determining the most effective routes for buses and any other public transit vehicles that have set schedules and routes. Initial routing can be based on census, establishments and other information that can be used to estimate potential ridership. As routes are operated, ridership information can be monitored and used to calibrate and optimize the routes geographically and/or timings to optimize efficiencies and quality of service to the largest number of public transit users.

The BNSDI should eventually be able to support this business area in a variety of ways, including but not limited to the following:

- Provide access to current and historic land use, population projections and other information from all the relevant sectors to support transportation master planning;
- Ability to link and correlate information such as employment, census, household surveys, commercial licenses, environmentally sensitive areas, and other information, and to summarize that information into traffic analysis zones and transport model nodes that can be used to support traffic modeling;
- Provide a navigable street map that can be used to support traffic and transit modeling;
- Varying levels of administrative units of government across different sectors need transportation plans to coordinate their efforts. BNSDI can eventually provide an environment where all those plans can be accessed, compared, contrasted and coordinated;
- Publish public transit routes and schedules online with other contextual map information;
- Integrated information environment can be used to visualize analysis results and planning scenarios in ways that can be understood by decision makers;
- Provide call center operators the ability to provide service information to customers.

2.5.3 Air Transportation

Air transportation includes commercial, government and private planes, helicopters, landing fields and helipads. The Belize Department of Civil Aviation is the regulatory and oversight body in all civil aviation matters in Belize. The Department is presently under the Ministry of Works and Transport, but was not interviewed directly for the current study. Generic GIS and NSDI business support functions based on international experience includes the following:

Air transportation national planning. National planning for an effective air transportation system requires regional analysis for airport and airfield siting relative to air transportation demand and economic development objectives, land use compatibility, access to surface transportation infrastructure, physical planning characteristics (topography, soils, surficial geology, hydrology, etc.) avoidance of impacts to sensitive environmental and cultural resources, and many other factors. Airport facilities need to be aligned with development plans for surrounding settlement and urban areas to avoid encroachment that could create future issues between the airport and surrounding communities.

Airport facility planning and design. Airports are large and complex facilities that have many characteristics of a small city, including buildings, vehicular circulation, utilities and other features. In addition airports have specialized characteristics for traffic management, runways and all the involved signage and appurtenances for effective air traffic management.

Airport operations and maintenance. Like any facility, airport operations and maintenance can benefit greatly from GIS linked to other maintenance management systems. This applies to both scheduled maintenance as well as as-needed response to unplanned maintenance issues.

Noise monitoring and management. Jet planes landing and taking off create significant noise that can be disruptive to surrounding communities. Monitoring the noise levels of planes coming and going is often conducted to ensure that planes stay within prescribed approach envelopes and that noise limit caps are maintained.

Space planning and management. GIS provides the ability to map and manage spaces and uses across the airport, including the development and management of office assets.

Security management. Airports today have special security requirements to ensure the safety and security of the facility, its employees and customers. GIS-based building and facility plans can include the locations of security cameras that can be accessed via

the map. Likewise the GIS can be used to prepare security vulnerability analysis and contingency planning and management.

Develop and maintain aeronautical charts. Aeronautical charts for Belize and surrounds are prepared by the U.S. Federal Aviation Authority (FAA) and the Mexican National Mapping Organization, INEGI. These are highly specialized cartographic products with their own special geographic and navigation symbology that can benefit from access to certain data that will be available through the BNSDI. Likewise some of the digital chart data can be of benefit to other applications outside of aviation.

2.5.4 Water Transportation

Water transportation in Belize is run by private companies, connecting major coastal towns on the mainland and the Cayes. These companies were not interviewed for the current study, but because the water taxi system plays a significant role in the tourism this has been included here to reflect likely GIS requirements, based on international practice. Likewise, there is no official hydrographic mapping agency in Belize for the preparation and maintenance of nautical charts, and this too is reflected here to acknowledge how the GIS and BNSDI can support these functions in the country. This latter issue is also summarized within the section of this report covering National Mapping.

Maintain inventory of all docks, marinas and boat ramps. GIS can be used to develop and maintain a digital database of the locations and characteristics of all docks, marinas and boat ramps.

Maintain water transport route maps. The approximate location of water taxi routes is known and mapped. While the boats do not follow these as you would a road, knowing the locations and place to place connections is useful and can be maintained in GIS.

Maintain nautical charts and notice to mariners bulletins. Nautical charts for the Belize coast are maintained by the U.S. National Geo-intelligence Agency (NGA) and the British Hydrographic Survey. These maps are variable scales depending on the level of detail required for navigation purposes. Notice to mariners are periodic bulletins that announce changes to nautical charts and navigation aids. Maintaining this information in the BNSDI can support many types of marine applications.

2.6 Public Safety and Security

These activities cover a number of different components: Crime and investigative analysis; Community policing; Criminal justice and intelligence; Corrections, parole and probation; Law enforcement resource tracking and management; Event management; Emergency response; Disaster response; and Disaster contingency planning. Also within public safety is

the court function, including local court administration, and case filing and tracking. In cases where the public safety function is not located administratively within the local government, it is then important that there are strong linkages and communications and information sharing channels open between the organizations to ensure effective coordination. GIS applications in this area range from risk assessment and emergency response contingency planning, to crime analysis and tracking, emergency dispatch and police resource planning. SDI ensures that the broad range of information that security and law enforcement professionals need to do their job is readily available.

2.6.1 Community Law Enforcement

Community law enforcement in Belize is carried out by the Police Department. However there are others with law enforcement and "police powers" related to traffic control on highways, littering, recording crime incidents in special use areas such as touristic destinations and national parks, illegal hunting and fishing, non-compliance with environmental permit and other related activities.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Conduct computer aided dispatch. Connected to a call and dispatch center, GIS can assist in rapidly locating an incident and mobilizing a response. Location aware social media can provide pubic callers with a convenient way to communicate the location of incidents, in addition to addresses and other points of interest.

Record and track violations. The location of violation incidents can be captured on a gps, gps-enabled mobile device or smart phone or reference to points of interest and street addresses. The location information can be linked to the violation record for spatial tracking, analysis and thematic mapping purposes.

Monitor and assess violation patterns. The analysis of violations over time can provide insights to the source, causes and possible solutions to avoid future incidents. Crime analysis is well established to support police work, and the same principles are applicable to other incident analysis areas.

Record and track fire code inspections. Fire code inspections are recorded and citations issued for correction. Re-inspection may be carried out to ensure that the corrections are carried out.

Thematic mapping and reporting. Generation of a variety of thematic maps and reports.

2.6.2 Emergency Response

Fire and ambulance emergency response services are life and property saving activities that are very time sensitive and can mean the difference between life and death. These services are provided by the Belize National Fire Service and various private ambulance service entities such as the Belize Emergency Response Team (BERT), respectively. These entities were not interviewed for the current report, but given the importance of these functions they are mentioned here to ensure they are acknowledged as potential beneficiaries of the BNSDI. Common functions include the following:

Conduct computer aided dispatch. Connected to a call and dispatch center, GIS can assist in rapidly locating an emergency and mobilizing a response. Location aware social media can provide pubic callers with a convenient way to communicate the location of emergency incidents, in addition to addresses and other points of interest.

Record and track emergency incidents. The location of emergency incidents can be captured on a gps, gps-enabled mobile device or smart phone or reference to points of interest and street addresses. The location information can be linked to the violation record for spatial tracking, analysis and thematic mapping purposes.

Monitor and assess emergency response patterns. The analysis of violations over time can provide insights to the source, causes and possible solutions to avoid future emergencies.

2.6.3 Disaster Management

Belize is prone to hurricane-related natural disasters including flooding, wind damage, storm surge and others. This business area is especially important to the community and infrastructure resiliency issue related to increased storm activities, sea level rise and other issues related to climate change. While primary responsibility for this is consolidated within the NEMO mandate, in actuality involvement in this area crosses nearly all sectors in Belize and is central to the Climate Resilient Infrastructure Program (CRIP) of which this project is a part.

Effective disaster management involves a full lifecycle of several stages of activities that can be supported by GIS and the BNSDI and that will provide a rich repository of information that can be used together to accomplish this important business area. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Hazard analysis. GIS can be used to determine where natural hazards are present, for example modeling what part of a river or drainage is likely to flood or where storm surge and wind exposure could present danger during a major storm.

Vulnerability assessment. The location and characteristics of a hazard can be overlayed to other resources at risk such as people, buildings, infrastructure, facilities, and anything else that may be damaged from a given hazard. Vulnerability assessment can also consider the cumulative risk of multiple hazards, and include systemic hazards such as access roads that may be cut off or a hospital that may be put out of commission during a disaster event. Such assessment can also be used to adjust disaster insurance policies to best reflect the most likely scenarios and needs for response and recovery.

Contingency planning. Once the hazards and vulnerabilities have been identified, then various pre-planned scenarios for how to respond to them most effectively can be devised. Contingency planning involves a significant multi-stakeholder, multi-sector effort to address all facets of an effective response plan so that the roles and responsibilities and chain of command among all concerned is well defined and understood and that all critical resource and logistical staging and procedures are established well in advance of a disaster event. Contingency plans may also be used as the basis for joint drill exercises in advance of an event.

Response support. During an event the GIS and BNSDI can support the mobilization of the contingency plan for an effective response effort. The movement of personnel and materiel can be monitored and the BNSDI used to provide a common operational picture so that all parties understand what others are doing and what resources are available.

Recovery support. Following a major disaster, GIS and the BNSDI can provide important information to assist in carrying out recovery efforts. The movement of recovery aid food, water, medical supplies and other material can be tracked. Internally displaced persons can be registered to help friends and family to locate one another and temporary shelter assigned, among other functions.

Disaster resistant community planning and design. The best way to avoid catastrophic impacts of major disasters is to plan communities and landscapes to avoid problem areas and build sustainability and resilience into planning and development processes across all sectors. This consideration with special consideration to climate change issues is being incorporated into most of the major planning efforts underway in Belize today.

The best practice experience in this core business area suggests that the following additional benefits can in principle be gained from BNSDI in this business area:

- Access to navigable street data to support vehicle routing;
- Detailed survey information provides important information that can be used when responding to emergency events especially in Belize island and similar urban contexts:
- Providing 3D displays for better event management and visualization;
- Integration of current public health capacity information with emergency response services;
- Access to location and capacity data for certain facilities such as schools that require special evacuation response;
- Access to location and hazardous material data for certain facilities such as factories that require special emergency response;
- Access to real time information on water storage locations and capacities for fire engine refilling;
- Common reference system to ensure that shared data can be integrated spatially, especially during disaster response;
- Access to demographic time series data and relevant current indicators for crime analysis;
- Ability to provide service information to the public;
- Access to frequently updated high resolution imagery;
- Varying levels of administrative units of government across different sectors need comprehensive plans to coordinate their efforts. SDI provides an environment where all those plans can be accessed, compared, contrasted and coordinated.

2.6.4 National Security

National security in today's unsettled world is dependent on strong military and intelligence functions. GIS is used extensively in this field to support defense mapping, base operations, intelligence and surveillance, military engineering, force protection and security, incident planning and response, mission planning and many other areas. The role of NSDI in this area is to ensure that information accessible to the civilian agencies is likewise accessible to the national defense community. The NSDI function may be further extended within the defense community to integrate information among military and intelligence branches, but this information is generally segregated from the civilian NSDI.

National security entities were not interviewed for the current study. However, given the importance of this topic the international sound practice requirements in this area have been incorporated so that these can be acknowledged in the overall conception of the BNSDI.

GIS aligns well with the concepts of Network-Centric Operations (NCO)—using a network to connect decision making across multiple defense domains and is able to seamlessly integrate homeland defense with other internal security activities. Specific examples include:

Military operations. Network Centric Operations (NCO) represent the future for defense in which modern information technology transforms the military into a smaller, smarter, and more agile force, covering intelligence, surveillance, and reconnaissance (ISR), command, control, communications, computers, and intelligence (C4I), and Precision engagement (PE).

Base and facilities management. Flexible technology to balance the management of real property, assets, and facilities with resources and mission requirements.

Training area and range management. GIS provides range managers with decision support technology to manage increasingly complex weapons systems and environmental and safety concerns.

Environmental security. GIS enables environmental managers to overlay many types of geographic and environmental data to create models and strategies that assist in complying with environmental and cultural resource management regulations.

Force protection and security. Security managers must optimize the use of force protection resources against mission requirements. GIS provides the security management team with a common installation picture and the geospatial tools for effective decision support.

UXO. Unexploded ordnance poses a unique, spatially distributed environmental management and remediation issue for many defense sites. GIS tools support the mission to identify, track, analyze, manage, and remediate UXOs.

The best practice experience in this core business area suggests that the following additional benefits can in principle be gained from BNSDI:

- Access to frequently updated high resolution imagery for various applications;
- Access to updated basemapping and other contextual information for emergency response;
- Integration of military and national security with emergency response services;
- Access to navigable street data for tactical response;
- Access to soil, digital terrain models, road networks, and other data for assessing different route possibilities for different vehicles;
- Common reference system to ensure that accessed data can be integrated spatially.

2.7 Public Health and Welfare

The public health and human service core business is a service sector that addresses a fundamental aspect of society, namely its health and the equitable welfare of its population.

2.7.1 Public Health

The Public Health space includes, but is not limited to, the development and management of hospitals, health centers, clinics, home care, retirement homes, custodial services, others. The health sector covers all aspects of public and private health care, ranging from long range health care policy and facility planning, public health service area analysis, facility siting, design and construction management, facility management, epidemiology and tracking and response to outbreaks of contagious disease, tracking and assessment of chronic health issues, and customer care. GIS provides the tools to track and analyze all these issues geographically, thus allowing us to understand patterns of public health issues, distribution of facilities relative to where the need is, identification of environmental and contextual causes for various health factors, and the outbreak, linkages and spread of communicable disease. SDI provides health professionals with the ability to access and use information about the environment and communities that would not normally be accessible within the sector, but nonetheless provide important input to better understand, plan, and implement public health programs.

While each of the health sector components has its unique characteristics and specific requirements, the basic "business" areas can be generalized to several basic categories, as described following.

Planning and policy. This is ideally integrated to long range comprehensive community development planning, which should incorporate infrastructure expansion considerations, including the allocation areas of land to accommodate future facilities. Policy setting is often a key part of planning as societies deliberate on different health goals and the ways to achieve those goals.

Implementation. This includes the assessment of near term needs and priorities, and identifies what specific projects can be carried out to improve or extend service or to maximize the useful life of existing facilities. This is followed by the development of detailed plans for putting facilities in place, including the human capacity, standards, technologies, and physical structures, which collectively are needed for service delivery. Detailed plans are then implemented through various ways, depending on the nature of the component.

Operations. This includes facility management, emergency response, and monitoring of public health indicators. It comprises all the activities required to keep the facilities and services operational to a certain level and to maximize the performance of the human and physical assets. This should include decision support, system monitoring, maintenance, managing supplies, customer service support, and updating available system information to reflect changes.

Administration and Finance. This refers to a variety of activities that support the core business, and include financial management, human resource management,

procurement or contract management, legal issues, regulatory monitoring and control, public relations, and quality management.

Customer service. Accurate and timely information showing where services are located and how to get there.

Service scheduling. Efficient scheduling of home health care and caseworker visits. Analysis of transportation factors and street patterns to recommend the most efficient route to and between client homes.

Epidemiology. Tools to understand the determinants of disease and its spread from person to person and community to community, and present spatial information (individual occurrences) and conduct predictive modeling.

Site selection. Ability to access the geo-demographic dynamics of an organization's existing service area in contrast to the likely demand for services at a new location.

Service location tracking. Collection and maintenance of geographical locations of service providers, customers, employers, payers, and health plans.

Resource management. Linking the physical location with the condition of the equipment or supplies. A visual link to other enterprise applications that track resources and their consumption or deployment.

Multimedia functionality. Linking reports, forms, or photos with geographic data stored in the database and help in paper reduction efforts.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to geocoding engines for locating point information (incidents, patients);
- Provide a means for supplying georeferenced public health statistics for use by others:
- Access to time series data and relevant current indicators on demographics and health cases for projecting future capacity needs;
- Provide access to environmental data for epidemiological analysis;
- Provide access to capital improvement plans for utilities and infrastructure and other contextual information for siting analysis;
- Integration of location and capacity information with emergency response services;
- Provide transportation data that can be used for patient transport routing;
- Common reference system to ensure that data from all agencies is interoperable;
- Ability to provide service information to customers.

2.7.2 Social Welfare

For the purposes of this report, social welfare refers to the host of social support facilities and programs that are implemented to ensure equitable support and opportunities for all segments of society.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Social welfare program requirements analysis. Different segments of society need different sorts of support for social and economic development. The GIS linked to population census, household surveys and other such information can provide the tools needed to analyze and visualize the location and character of social program needs at the neighborhood level. New techniques utilizing location-aware social media are also opening new ways to establish two-way engagement with communities and to use this to better understand and respond to local issues and needs.

Program planning and design. Once local requirements are better understood, it is then possible to develop plans for facilities and services to respond to those requirements. Community needs typically span multiple sectors, and the GIS and BNSDI provides an opportunity to better understand and respond to these needs in a more holistic and coordinated manner.

Program development and management. As new social welfare facilities and programs are developed these can be added to the compiled archive of all programs that can be made available through the BNSDI.

Customer relations management. Ideally the eGovernment portal can provide an integrated "customer relations management" (CRM) call center capability that any citizens, residents or visitors can use to report issues or establish contact with government. Spatially enabled CRM can provide a means of understanding the locational implications of complaints, reports and service requests. Combined with location-aware social media this can provide an effective channel for two-way community engagement that can streamline government service provision and greatly improve the public perception of government responsiveness and effectiveness.

Service scheduling. Efficient scheduling of home health care and caseworker visits. Analysis of transportation factors and street patterns to recommend the most efficient route to and between client homes

2.8 Natural and Cultural Resource Management

The natural resource sector includes resource utilization and extraction, as well as environmental protection and preservation. The sustainable management of precious natural resources and preservation of natural heritage is fundamental to the health and quality of life for people in Belize Country. Understanding baseline conditions, monitoring trends, developing and enforcing environmental laws, monitoring and assessing resource utilization and extraction activities like mining, dredging, fishing, hunting, determining and managing special environmental areas to be protected and regulating the emissions from industry are all activities within this sector for which GIS is being used around the world. The BNSDI will eventually need to support a framework where comprehensive environmental data can be used with information from all other sectors to gain a better and more holistic understanding of the environment, its unique assets, the pressures that are affecting those assets, and the intervention activities that are needed to avoid or mitigate impacts or establish sustainable resource management.

2.8.1 Agriculture, Forestry and Aquaculture

Agriculture (encompassing farming, grazing, and the tending of orchards, vineyards and timberland) is the production of food, feed, fiber and other goods by the systematic raising of plants and animals. For the purposes of this study, agriculture includes covered greenhouse cultivation.

Forestry is the science, art, and craft of creating, managing, using, conserving, and repairing forests and associated resources, in a sustainable manner, to meet desired goals, needs, and values for human benefit. Forestry is practiced in plantations and natural stands. The challenge of forestry is to create systems that are socially accepted while sustaining the resource and any other resources that might be affected. The forest science has elements that belong to the biological, physical, social, political and managerial sciences. Modern forestry generally embraces a broad range of concerns, in what is known as multiple-use management, including the provision of timber, fuel wood, wildlife habitat, natural water quality management, recreation, landscape and community protection, employment, aesthetically appealing landscapes, biodiversity management, watershed management, erosion control, and preserving forests as 'sinks' for atmospheric carbon dioxide.³

Aquaculture involves cultivating freshwater and saltwater populations of organisms such as fish, crustaceans, mollusks and aquatic plants under controlled conditions, and can be contrasted with commercial fishing, which is the harvesting of wild fish. Agriculture is a huge and varied sector across the world, and GIS has come to play an integral role across the spectrum, from analysis of yield information to assisting government with commodity subsidies.

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³ http://en.wikipedia.org/wiki/Forestry

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Develop and manage cultivated areas inventories. GIS provides the ability to capture the location, extent and characteristics of farms, forestry areas and aquaculture sites. Each of these types of cultivated areas has its own set of essential information that is needed to understand the distribution, productive capacity, and service requirements of these areas and the associated communities that rely on them for jobs and subsistence. Managing this information over time provides a historical record that is useful for understanding development and trends in the sector.

Land capability and suitability modeling. The BNSDI will provide access to a broad range of information that can be used to understand the capability and suitability of the land to support various farming and forestry productions. This can include physical characteristics such as topography, soils, geomorphology, and climate. This analysis can also include accessibility to transportation and local markets, processing centers, export channels and other parts of the supply and demand chain that will affect the financial feasibility of production in specific areas.

Farm and forestry production monitoring. Satellite remote sensing and direct reporting by extension officers and farmers or foresters themselves can be used to monitor agricultural and forestry productive outputs each season and year. Other factors such as weather, market price fluctuations, disease spread and others can also be analyzed and the production and economic impacts projected so that farmers and the government can plan accordingly.

Provide extension services. The government provides expert extension and related services for farming, forestry and aquaculture. Having a complete and accurate inventory of all these activities provides extension officers with a mechanism to ensure they services are being provided equitably across the community. Extension officers can also have access to projected weather conditions or other factors that may impact farmers that can help to increase the breadth and value proposition of extension services.

Market inventory and monitoring. The MNRA monitors and publishes market prices for various agriculture commodities. The formal statistics require some time for publishing. Developing a location aware basis for a more interactive exchange of market price and related information can provide a more timely mechanism for monitoring prices and supply/demand topics that may be beneficial to the farming community.

Field data collection. Handheld mobile devices and smart phones allow for field-based creation, visualization, and querying of data, and integration to real time data such as weather conditions. Farmers can map various crop growing stresses found within a field such as pest infestations, nutrient deficiencies, and water shortages.

Disease and pest outbreak monitoring and tracking. GIS and field data collection can help in the early identification of disease and pest outbreaks and the mobilization of interventions needed to stop the spread.

Farm management. Accessing and integrating different data types to estimate crop yields, estimation of areas within a field that are suffering a form of stress perhaps caused by a specific pest, or the identification of areas of land suffering from soil erosion can be of assistance to farmers and foresters.

Precision agriculture. Incorporating GPS into standard farming practices to improve the precision of existing agronomic management activities and supports the use of precision farming (PF) and variable rate technologies (VRT).

Agricultural risk assessment. Incorporating historical climatic data, previous claims, and previous management practices in order to assess insurance risk.

Insurance claim assessment. Use of satellite or aerial imagery for damage delineation of crops caused by such events as flooding or gales.

Supply chain analysis. Acquiring knowledge related to the whereabouts of agricultural assets and demands, analyzing this information, and using it to provide an optimized strategy to deliver where existing and future needs and business opportunities are located.

Raw material procurement and delivery. Understanding the processes and movements along the transportation network from the point of production in the field to the processing facility. GPS receivers and transmitters located on vehicles allow transport managers to better coordinate supplies to processing facilities and, consequently, enhance profitability.

Identity preserve of agricultural crops. Tracking agricultural products from the farm field to the grocery store shelf to indicate what these food products contain in relation to GMOs. Geo-accounting applications record crop input operations spatially and warehouse in a database for future reference.

Crop input permitting. Use of streamlined applications for the use of restricted chemical inputs such as fertilizers or pesticides can be integrated with location information in order to assess the geographically-specific environmental constraints.

Government and the agricultural land parcel. Reallocation of land use classification, or variance as it is known, is often a protracted procedure involving many agencies and individuals. This deals with land taxation, agricultural water rights, and land ownership.

2.8.2 Historical and Archeological Resources

Belize has a rich historical and archeological heritage that is important culturally and which is an important part of the growing tourism sector in the country. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Develop and maintain inventory of historical and archeological sites and facilities. GIS provides the ability to develop an inventory of the location, extent and characteristics of all historical and archeological sites. Each type of resource requires its own specialized information and levels of detail. In the case of undeveloped archeological sites the detailed information is sensitive and must be accessible only to qualified officials and researchers to avoid the looting of artifacts and other impacts. There are methods for generalizing this information to keep specific site information protected while alerting other stakeholders that important archeological resources may exist in an area and requires followup with the NICH and any other appropriate authorities. An example of this is the overlaying of a multi-kilometer grid and the characterization of the number or character of archeological resources falling inside each grid cell, thus allowing the generalized information to be provided to the broader NSDI community without compromising the confidentiality of the site-specific information that would only be accessible on a "need-to-know" basis.

Detailed site mapping, inventory and analysis. GIS is often used by archeologist and historical archivists to develop a mapped record of an archeological or historic sites. This includes among other matters the mapping of structure locations, where artifacts are found, and samples are taken. Photographs, field notes, sound files and other information can also be linked to specific site locations when relevant to the research activity. GIS is also used to conduct various spatial analyses for settlement patterns, agricultural and natural resource utilization, cultural landscape alteration and a host of other issues.

Manage historical and archeological parks. Some historical and archeological areas are managed as parks for public access and education. GIS can be used by park managers to inventory and manage park assets. It can also be used to monitor activities of surrounding communities and land uses and to ensure that adequate outreach, communications and coordination is conducted to protect the park resources and avoid conflict.

Provide historical and archeological online interpretive information. GIS can be linked to site information and documentation as an online interpretive experience to support research, tourism and other such activities.

2.8.3 Water Resources

Water resources, inclusive of both subsurface and surface water, are critical to all sectors in Belize. The National Integrated Water Resources Authority (NIWRA) is being established to enforce the policy of the Government for the orderly and coordinated development and use of Belize's water resources, to conserve and protect such resources for the benefit of present and future generations of Belizeans, and to provide the Belizean public with a safe, adequate and reliable supply of water.

While related, the production and delivery of potable domestic water to urban areas is treated as a utility and described in that component of this report.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Water resource inventory. To manage water resources effectively it is necessary to have an accurate accounting of the location, quantity and quality of available surface and subsurface water resources. While there is significant interplay between weather, surface and subsurface water, the methods and tools used to map and model these resources are very different. GIS provides the tools to inventory and assess all components of the hydrologic cycle that are involved in water resource management.

Weather monitoring and analysis. Understanding rainfall and related weather patterns is a critical component of an integrated water resource management approach. The location, extent and characteristics of rainfall events is important to modeling how that that input will behave within the surface and subsurface hydrology regimes. GIS can be linked to meteorological systems to measure rainfall and to model its behavior on the landscape below. That behaviour will be affected by land use and land cover, topography, soils, surficial geology and the permeability and current saturation of surfaces where it falls. Some of that water will be absorbed by vegetation or runoff into streams and rivers. Other water will be absorbed through the surface to become part of the groundwater cycle. Inbetween there may be significant exchange between surface and groundwater systems through infiltration and exfiltration, erosion and sedimentation and other factors.

Surficial hydrology monitoring and modeling. Belize is rich in surface water resources with many rivers and streams lacing most of the country. River gauges

provide a measurement of surface water levels and flow. GIS provides the ability to integrate river monitoring with rainfall and other information to better understand and project implications for water resource management.

Flood modeling. Flooding occurs when rainfall or sudden release of stored water (such as a dam break) causes an accumulation of water in areas that are normally dry. This may include flow in low-lying areas, streams and rivers at a rate that cannot be expelled as quickly as the water accumulates. GIS and data accessible through the BNSDI can be used with specialized software tools to calculate the likely location and extent of flooding that can be expected in any given storm event or scenario.

Groundwater resource inventory and modeling. Measuring and monitoring groundwater requires information derived from wells. Borehole records compiled when a well is dug can be used to understand the geologic strata below. Combined with other geologic data and interpretations this can be used to model the structure of the subsurface aquifers. Ongoing well readings regarding depth to groundwater, water quality and flow can then be used to model the flow of groundwater through those aquifers to determine the quantity and quality of the availabe groundwater resources.

Integrated water resource modeling, monitoring and assessment. GIS can be used with other specialized tools to monitor each component of the hydrologic cycle and to model their interactions and location, quantity and quality of water resources that result. Trends can be recognized with time and used as input to policy making and operational considerations to ensure that the available water resources in the country are being used in an efficient and sustainable manner.

Water abstraction permit management. Water resource abstractions in Belize require permitting. GIS can be used to monitor the locations of those permits as well as the production and utilization of water resources involved. Also, each permit provides an opportunity for the collection of additional information that can be used to extend, refine and calibrate various aspects of an integrated water resource assessment system.

2.8.4 Fishing and Fisheries

As is the case with other industries that rely on natural resources, the fishing sector aims for the efficient and cost effective management of fisheries while maintaining ecologically sustainable fish stocks. This is balanced by the desire to maximize economic efficiency while respecting national and international regulations and obligations.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Maintain fish stock inventory. Collection and analysis of existing fish stocks, and development of historical data for trend analysis.

Maintain inventory of fishing and fisheries infrastructure. GIS can provide a foundation for the development of a complete inventory of all the fishing and fisheries infrastructure that is in place in the country. This includes

Support policy and regulation formulation. Economic and social conditions and objectives, international treaties, and other parameters are considered in the formulation of policies and regulation that will apply to the sector. GIS and the BNSDI can provide tools and supporting data to support policy formulation and communication.

Monitor fishing activities. Capture of data on all fishing activities, including illegal fishing, to determine compliance with regulations.

Manage fishing licenses and permits. Management of coastal, inshore, and inland commercial fishing, aquaculture, and recreational fishing. This includes licensing and permitting.

Conduct fish stock management. Spatial modeling to support license administration and fiscal accounting generated by fishing activities and tracking of stock replenishment campaigns.

Conduct fish stock planning. Modeling to test solutions that incorporate temporal and spatial contexts, as a basis for monitoring regulatory requirements.

Protect fish spawning areas. Identify and track threats and design options for prevention, intervention, and recovery.

Prevent or mitigate fisheries impacts from hazardous material spills. Risk assessment, pre-attack planning (resource positioning) and management of prevention activities. During a spill, modeling the progress and using mobile technology to map the perimeter can help to ensure that important fisheries and spawning areas can be protected as a matter of priority.

Conduct ecology and habitat management. Modeling the relationship between fishing, other coastal/marine activities, and environmental impacts.

Manage fish habitat. Linking information to habitat needs or suitability in order to determine species viability.

2.8.5 Mining and Quarrying

This business area covers the exploration and exploitation of geologic and mineral resources. Application of GIS in this field ranges from broad area geologic exploration to actual mine facility management and environmental assessment. With most significant mines there is a need to run the mine operation, with tools to compile, process, display, analyze, and archive massive volumes of data. GIS provides significant functionality for managing and operating the enterprise, exploration, extraction, distribution, asset management, safety, and reclamation.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Conduct mineral exploration and assessment. Mineral assessments are provided to the MNRA and these and the supporting documentation and information can be integrated with GIS indicating the location and extent of these studies. When considered together and with other information a broader national assessment can be conducted to product an inventory of known mineral resources. Multiple geophysical images can be displayed simultaneously and overlaid by other datasets to evaluate their qualitative spatial relationships, using either qualitative or quantitative methods.

Mineral and quarry licensing and permit tracking. GIS can be linked with the location of permitted mineral and quarrying locations and production statistics. Reserve estimates, annual planned production, and cost-per ton statistics can be linked to prospective sites or existing mine locations.

Mine planning. Siting of ore passes, draw points, ramps, and other components of the mining operation. Determining areas to dispose of waste rock and mine tailings. Planning road networks and determining the optimal route for vehicles. Gauging the impact of mining operations on nearby communities by calculating the slope angle and direction of surfaces to determine visibility between points on a map. Use data on population density, socioeconomic distribution, labor resources, housing, and recreational infrastructure, to prepare environmental impact assessments.

Asset management. GIS combined with GPS helps track the status and location of mining equipment.

Field work. Integration of field devices with survey analysis tools to provide a fast and accurate solution for replacing and maintaining control points and calculating the volume of material moved.

Mine safety. Proximity analysis capabilities to site refuge chambers within a safe distance from production stops. Planning distribution of refuge chambers and exits for shortest route from production areas.

Mine closure and reclamation. Monitoring and reclamation by analyzing and mapping soils, vegetation, surface hydrology, and groundwater.

2.8.6 Petroleum

The hydrocarbon sector covers a range of activities, starting with the exploration for oil and gas reserves, developing and extracting crude oil and gas products from on-shore and offshore oil fields, transporting the products to storage and shipping facilities, processing and storage, exporting crude or refined products, and distribution of refined products to resellers or customers.

GIS supports the full lifecycle and management of the petroleum business from exploration through to downstream operations such as retail gas station supplies and logistics. Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Conduct petroleum exploration. Through spatial integration, analysis of different types of data for finding new or extending existing resources. Data includes satellite imagery, digital aerial photo mosaics, seismic surveys, surface geology studies, subsurface and cross section interpretations and images, well locations, borehole data and existing infrastructure information. The GIS can be used to compile and integrate all the exploration information that has been produced by multiple

Concession oversight and management. Oil exploration and production in Belize is carried out under concession agreements between the government and private companies. The GIS can be used to track concession boundaries and the required documentation and reporting associated with each.

Support and monitor petroleum production. Overlay analysis integrated with other business risk or economic business planning enables the understanding of certain geographic, infrastructure, business conditions, and environmental factors about the area in question.

Conduct petroleum facilities management. Tracking and modeling drilling platforms to pipeline networks to refineries, and integration of such data and systems to more traditional "in plant" infrastructure management systems, such as CAD, attribute records, and scanned documents.

Retail planning. Analysis of demographic and transportation information to site retail outlets in a way that matches market demographics. Once an outlet is operational, sales figures can be monitored to adjust the store profile and stock.

Petroleum exploration and production is critical to the economy of Belize. Much of the geographic information maintained by the government and concession holders is proprietary to their business or is subject to national security considerations and other restrictions that will constrain the use and distribution of this information to others. The petroleum community will thus be a major user of information from others, but will only be able to provide a limited amount of information for access by others.

2.8.7 Biodiversity and Conservation

The environment of Belize and the great biodiversity it supports is a national treasure and the main attraction for a majority of the tourism industry that is so important to the country's economic and future development potential. Extensive cave systems and other special environments and landforms are also subject to conservation attention.

The environmental resource management and protection government business area covers the inventory, assessment, management and protection of the natural environment and natural heritage resources. These resources included terrestrial flora and fauna, marine resources, coral reefs, cave systems and unique waterfalls and springs.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Environmental data inventory and assessment. GIS provides an effective environment for collecting and compiling environmental resource information at various levels. Once in a GIS environment it can be used with other information to model environmental systems, to assess conditions, identify pressures, and design protection plans.

Environmental decision support. Effective environmental management and protection involves careful consideration of a broad range of complex and interrelated factors and issues. A strategic assessment and planning function includes methods, GIS-based tools and information for understanding the present environmental situation, analyzing trends, conceptualizing alternative intervention scenarios and their future implications, weighing these alternatives, and supporting final decisions. These can apply to environmental policy, resource management, or environmental science issues and the many interactions among them. It can also include the assessment and analysis of institutional relationships, linkages, and communications and coordination channels.

Environmental education and outreach. Education and outreach functions are critical to ensure that all levels of society are both aware and appreciative of the environment and their interactions with it. Many issues in the environment are complex and interrelated, and the implications of poor policies and practices may not be directly felt for many years, and sometimes not before conditions become critical and even irreversible. Building awareness of these issues from executive bodies to the general public is critical to support informed dialog and decision making. GIS provides the means for people of all ages to access and explore information, visualize environmental issues and causative factors, and understand the various components of environmental systems and the complex interactions involved.

Environmental policy setting. Environmental policy setting involves the consideration of key issues, assessment of these issues relative to various value systems, determination of possible policy scenarios and their implications, and the codification of final determinations into policies, laws, regulations, and guidelines. GIS is used to identify environmental policy issues and to analyze various policy strategies and refinements.

Resource management. Resource management is carried out where human intervention may be required to ensure the protection, enhancement or sustainable use of an environmental resource. This can involve the protection of endangered plant or animal species through the preservation of known habitat, the designation and protection of special resource areas, or the implementation and enforcement of sustainable resource extraction or consumption practices (e.g. commercial and recreational fishing or hunting licensing, restrictions on well production, etc.). GIS is used extensively to assess resource extent and wellbeing, pressures, levels of existing protection and other issues.

Scientific research. Scientific research involves a wide range of systematic investigative activities that are carried out by various disciplines of environmental scientists. Research might be applied, that is related to a specific issue or concern, or it may be basic research intended to extending or enhancing general or specific areas of knowledge, or the identification of new issues that require a policy and/or management response. GIS is used extensively for both basic and applied environmental scientific research purposes.

Environmental monitoring. Monitoring involves the collection of baseline information concerning environmental assets, and the periodic collection and assessment of information about these assets to understand the character, location, extent and intensity of change over time. Various sorts of thresholds and indicators may be developed to provide a systematic means for measuring and comparing issues over

time, or to trigger legal or administrative actions. Much baseline and related information can be stored in a GIS format to support modeling and trend analysis.

Planning coordination and support. Good basic or interpretive information concerning environmental resources and sensitivities can be used to influence land use planning, capital improvement planning, and other planning activities. Strategic environmental assessment can be used to make other organizations aware of sensitive areas as input to the preparation of an environmental element in a land use plan, or as a constraint to be avoided or mitigated during project design. Through this means, plans and designs can be responsive to these issues from the start, thus minimizing the issues that might otherwise surface only during the environmental impact assessment stage which might in turn create project delays or require expensive mitigation. GIS can be used as a foundation system to support this activity.

Development review and permitting. Development review and permitting involves a combination of review, advisory and permitting activities related to environmental matters. This environmental business area includes environmental impact assessment (EIA) and building permit review and conditioning (i.e. identification of mitigation measures to be incorporated by project engineers and planners). Some EIA may require environmental monitoring and reporting as one of the mitigation measures. GIS can be used both to prepare as well as evaluate EIA findings and suggested mitigations.

Operations permitting and monitoring. This business area includes the provision of operating permits for various sorts of regulated or monitored facilities. Both EIA and operating permits may require ongoing monitoring and reporting. GIS provides a geographic framework for tracking the location and characteristics of regulated facilities, including analysis of trends and enforcement actions over time.

Environmental infraction monitoring and enforcement. Environmental policies and regulations can only be effective if there is some means of enforcement to address non-compliance. In many cases, environmental impacts can be avoided through increased awareness and best practices. However, in some cases there can be deliberate infractions that cause real harm to the environment or that result in increased risk to human health and safety that have to be rigidly enforced. In this context, monitoring may include periodic inspections, area patrols, periodic measurements of pollutants, public complaints, and other means of identifying actions or activities that are not compliant with environmental policies and regulations. Enforcement then includes the process of following up on such infractions to cause voluntary or involuntary compliance. There also must be a means of applying legal and physical restraint where compliance is not accomplished. GIS provides the tools for tracking environmental infractions and enforcement actions, including assessing issues and patterns over time.

Environmental crisis management. Environmental agencies become involved in crisis management to help identify potential natural or technical hazards, the transport of hazardous emissions through water, soil, or air, identification of resources and populations at risk from various crisis scenarios, advisory and direct support to crisis response teams, and support in post-crisis environmental cleanup and recovery efforts. GIS provides a foundation system for development of contingency plans as well as operations support during environmental crisis response.

2.9 Education and Research

An educated and aware population is key to the advancement of any society. The development and delivery of learning opportunities in society today can take many forms, supported by information and communications technologies. Planning for schools requires understanding population growth and change, locating candidate school sites for convenient access to the most students, managing school construction and following construction the ongoing operation and maintenance are all activities that can be supported with GIS technology. In addition to the facility planning and management, GIS can be incorporated to curricula to bring new life to the teaching of geography, and beyond this to introduce spatial thinking and problem solving to students of all ages. The technology can also support advances in basic and applied research in all fields. SDI can support access to the broadest range of geographic information that can be used to enhance curricula, increase geographic awareness, promote cultural diversity appreciation, provide marketable job skills, and catalyze new research horizons.

Like other service sectors, public awareness and education has a typical development cycle that goes through planning, design, implementation, and ongoing operation and administration. This can include, but is not limited to, nurseries, primary through secondary education, vocational colleges, universities, research centers, and libraries. While each of these has its unique characteristics and specific requirements, the basic "business" areas can be generalized to several basic categories, as described in the following paragraphs.

Planning and policy. This is ideally integrated to long range comprehensive community development planning, which should incorporate infrastructure expansion considerations, including the allocation areas of land to accommodate future facilities. Policy setting is often a key part of planning as societies deliberate on different education goals and the ways to achieve those goals.

Implementation. This includes the assessment of near term needs and priorities, and identifies what specific projects can be carried out to improve or extend service or to maximize the useful life of existing facilities. This is followed by the development of detailed plans for putting facilities in place, including the human capacity, standards, technologies, and physical structures, which collectively are needed for service

delivery. Detailed plans are then implemented through various ways, depending on the nature of the component.

Operations. This includes facility management, service provision, and monitoring of education indicators. It comprises all the activities required to keep the facilities and services operational to a certain level and to maximize the performance of the human and physical assets. This should include decision support, system monitoring, maintenance, managing supplies, customer service support, and updating available system information to reflect changes.

Administration and finance. This refers to a variety of activities that support the core business, and include financial management, human resource management, procurement or contract management, legal issues, regulatory monitoring and control, public relations, and quality management.

Facility management. Integration of CAD-based maps with GIS to add intelligence such as room capacity, available times, technology infrastructure, overall facilities and infrastructure, real estate management, hazardous waste tracking, and student housing.

Service area mapping. Analysis of existing facilities in conjunction with demographic information to determine underserved communities and plan new branch locations.

Transport scheduling. Analysis of transportation factors and street patterns to recommend the most efficient route to and between students' homes.

Demographic analysis and collection development. Analysis of demographic distribution in relation to location of facilities. Demographic analysis can take into account different variables such as languages.

Customer service. Accurate and timely information showing where services are located and how to get there.

It was evident during interviews and discussions that there is a significant lack of qualified staff in the area of geospatial information systems and science. There has also been little opportunity for the development of solid professionals through the education system within the country, and many of the trained professionals with significant GIS experience, especially outside of the natural resources sector, have either studied or worked abroad. It is expected therefore that the development of the BNSDI both requires such skill sets to be developed, and as well can contribute to the development of qualified personnel. The following summarizes the basic areas of education and professional development to which the BNSDI can contribute in the coming years.

- Information sharing between utility authorities that may overlap varying levels of administrative units of government;
- Access to time series data and relevant current indicators on demographics and student populations for projecting future capacity needs;
- Provide transportation data that can be used for bus routing;
- Access to capital improvement plans for utilities and infrastructure and other contextual information for siting analysis;
- Integration of location and capacity information with emergency response services;
- Common reference system to ensure that data from all agencies is interoperable;
- Ability to provide service information to customers.

2.9.1 Public Awareness

Essential to the health of a functioning democracy is an informed public. Beyond formal education, there is a need to reach out and make the general public aware of important issues and matters of common interest.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

General access to information. The BNSDI will support access to a wide variety of geospatial and related information on a variety of topics that can be used to support the development of public awareness campaigns and products.

Provide tools for highly compelling geographic visualization. GIS is inherently visual and includes a wide variety of cartographic, statistical and visualization tools that can be used to make complex subjects understandable to the public.

Publish maps and thematic map products. Web-based GIS provides the capacity to produce and publish maps and thematic map products online that can be accessed from PC's, mobile devices and smart phones from anywhere in the world. In addition, similar content can be provided to the local television media for inclusion in their programming.

Produce paper products. For populations that do not have access to digital technology, the GIS can be used to create paper maps and reports containing the content of any of the above. This information can be used to develop pamphlets, public information booklets, wall maps and other types of physical media.

2.9.2 Primary and Secondary

Early education and exposure to GIS has proved effective in attracting the interest of younger citizens in regards to technology, geography, and spatial thinking in a variety of subject areas. Many primary and secondary schools around the world now have GIS in the classroom and this involvement is expanding every year.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Incorporate GIS to primary and secondary school science and technology classes. Today there are a wide variety of tools and curricula development ideas that are available for the incorporation of GIS tools and methods into science and technology classes, among other disciplines.

Identify fora for students to present their work with GIS. An excellent way to encourage students to develop and then continue working with technology is to provide them with acknowledgement of their work and encouragement to go further. Expositions, newspaper articles, television programs, conferences, workshops and exhibitions are all candidates.

Provide online access to data and application services. The BNSDI could provide students and teachers with access to a broad range of existing data resources and online application tools that could be used to support their own projects and programs.

2.9.3 Higher Education

GIS is being incorporated to higher education today either as a dedicated degree subject or integrated within a wide variety of disciplines. It is also being used extensively as a tool to support academic and institutional research and development. Beyond technological skills, GIS can be used to provide students with spatial thinking knowledge and skills that will support them in almost any area of society. This applies not only to geography, but can be applied to nearly every area of academic study, including but not limited to technology, science, mathematics, engineering, urban planning, agriculture, natural resource management and many others.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Incorporate GIS to higher education curricula. GIS can be incorporated as a certificat program for junior colleges and technical schools, a minor degree program

for undergraduates, or as a Masters Degree focus. It can also be integrated to curricula in other academic disciplines.

Provide GIS tools for use in research. University-based research plays in important role in Belize, and the incorporation of these tools and access to the broad range of data resources that can be made available through the GIS can help to strengthen the overall value proposition of this function.

2.10 Economic and Social Development and Finance

Today Belize is a developing country with over 40% of the population living below the poverty line and an unemployment rate hovering around 14%. Figures for those without a job show that there are 3 unemployed women for every two unemployed men with percentages standing at 21.5% for females and males 9.6%.⁴

GIS can support economic and social development and investment in a variety of ways as outlined in the sections following.

2.10.1 Public Sector Investment

Approximately 85% of ongoing public sector investment in Belize is financed externally through multi-lateral banks and other sources. Projects are formulated around the development strategies outlined in the Belize Horizon 2030 plan and aligned with the program priorities and procedures of the individual donors.

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Country strategy. Each international finance institution (IFI) will usually have an investment strategy that has been worked out in collaboration with the host country. This provides the strategic framework within which specific programs and projects are to be defined. GIS and the BNSDI can be used to help analyze the implications of individual and cumulative country strategies to determine what segments of society and communities are likely be affected.

Project identification. Identifies the general parameters for a specific project that aligns with the priorities expressed in the country strategy. Project identification is normally carried out in collaboration between the IFI and the appropriate responsible authority in each sector. Once a project is identified, this may trigger the issue

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⁴ http://www.ctv3belizenews.com/index.php?option=com_content&view=article&id=4223:statistics-show-unemployment-rate-is-down-&catid=39:social&Itemid=110

becoming an element in an IFI's finance "pipeline". The general location and extent of identified projects can be mapped and linked to basis information concerning each for common reference. The status of the project can be updated and reflected on the national map as project pipeline dashboard for common reference by government leaders, donors and planners.

Preparation. The preparation process involves further definition of the project, often in direct consultation with the direct project proponents at the sector level. Ideally this preparation takes advantage of up to date and authoritative data upon which project priorities and assumptions can be based. An important function of the BNSDI coordination is to ensure that projects are reviewed and input provided as to whether the data required is available or not. Also, where new data is to be created by a project, the BNSDI can also assist to make sure that the information is developed in a manner that will most benefit the community beyond the initial project, and that a clear custodian for maintaining the data in the future is identified from the start. The preparation stage may also involve the conduct of a feasibility analysis and other studies ensuring that the proposed project is viable and in compliance with environmental and social safeguards and other such criteria. Where information is not available, some level of data collection may be required to complete the preparation process, thus taking extra time and effort.

Appraisal. Project appraisal involves independent evaluation of the project efficacy and feasibility. This may include an assessment of the need for the project and its feasibility though technical, socioeconomic, financial, legal, and environmental analysis. The BNSDI could be a valuable source of information to strengthen and expedite the project appraisal process.

Approval. The approval process involves final review and commitment on the part of both the country and the IFI. This may require responding to additional inquiries and access to additional information that may be accessible through the BNSDI.

Implementation. Project execution is carried out by a team that may include government staff, contractors and other participants. Contractor support would normally be secured through a competitive bidding process. Project Management Office (PMO) functions within the government will normally oversee the implementation process, often with oversight and support of the IFI. Access to BNSDI resources can support contractors and the government to carry out the project using the best and most authoritative data available, thus reducing time and effort for project execution.

Monitoring and evaluation. Monitoring and evaluation activities may be carried out throughout the project formulation and implementation process, including a final evaluation at project completion. Ideally this activity is extended by the country and or

IFI into the future to evaluate the cumulative impacts of multiple projects based on evidence-based data of target socio-economic and environmental conditions, with calibration of the country strategy based on impact findings over time. Project outcomes can be manifest in a variety of ways and the BNSDI will be helpful in providing access to information that can be used to assess whether original outcome targets are being met.

2.10.2 Private Sector and Other Non-Government Investment

The private sector is expected to play a significant role in the future development of the Belize economy and can benefit from participation in the BNSDI. There are also other non-government sources of development investment that can help to grow and diversify the economy including foreign direct investors, institutional investors and sovereign funds. These investments may be made independently or as public/private partnerships with the government. In all cases the BNSDI can be helpful in providing information that can be used to assess investment project feasibility, locate sites and plan projects.

Private sector and non-government investment entities were not directly involved in conducting this study. However, given the importance of this matter for economic development in Belize the generic requirements of this community based on international experience are represented here for consideration in the overall BNSDI approach. The general requirements for this business area in regards to GIS and BNSDI includes the following:

Conduct market research and analysis. GIS provides the tools and the BNSDI the data to conduct a wide variety of market research and analysis activities. This can include such things as analysis of census information to understand where certain types of consumer profiles are located, assess land and property values and trends, locate certain types of businesses, or assess consumer price trends within markets.

Conduct project feasibility assessment. GIS and BNSDI can support the analysis of feasibility for specific projects. This can include site specific analysis for example to determine whether the supporting infrastructure is available to support a certain type of facility on a particular parcel of land. Other examples include determining how many potential customers and customers may be present in a specific community or the number of people that are likely to see a billboard advertisement on a daily basis.

Conduct project siting analysis. GIS and the BNSDI can be used to find the optimum location for a particular business or facility. An example query might be "find a vacant plot of land greater than 2 acres that is zoned for industrial use, is located adjacent to a major paved road and has access to water and electrical utility service."

Prepare project design. Access to basic information through the BNSDI will allow project owners or their architect/engineer/planner consultants to expedite the process for site design and submittals of proposed development for government review and approval.

2.11 Information Services

Information agencies are those entities that are established primarily to collect, organize, synthesize and publish commonly needed information on behalf of other organizations and the public. These most often include agencies for topographic basemapping, remote sensing, and statistics, including geostatistics. These agencies provide critical information that is needed by others, and the BNSDI can be used as a means for others to access and use that information efficiently. The BNSDI can also provide those agencies with information needed to confirm or supplement their data collection and validation, to support spatial analysis to create new derived information, and to enhance data visualization for publication.

2.11.1 Mapping Agency

Mapping involves the mapping of the surface of the earth and its natural and manmade features at various scales, for use as a common geographic reference. Topographic mapping above 1:20K scale is usually managed by a national mapping organization, whereas basemapping below this level is usually developed for urban purposes and may be maintained by one or more units at the local government level. Basic activities that are carried out within this functional area include calculating and maintaining a national geodetic control network; maintaining geodetic monuments and monument records; maintaining geodetic standards (horizontal and vertical datums); managing a survey support network; conducting aerial photographic surveys; preparing and maintaining orthophotos and topographic basemaps; and publishing and disseminating maps and geographic data.

In Belize the MNRA Land Information Center (LIC) is the de facto national mapping organization, although it does not carry out the classical topographic basemapping role that is typical internationally.

GIS may be used to support all the activities involved in maintaining and managing a topographic base mapping program and all the related data sets, including horizontal and vertical control, planimetric features, aerial photography and remotely sensed data (satellite and/or airborne platform). Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Support GIS-ready data model. Maintenance of essential geometry of the legacy base map data, while creating powerful new data models that will support many

important applications. Direct linkage of the basemap information to related datasets, such as building outlines, cadastral set outs or utility features to the verified field survey points that establish their precise location.

Photogrammetric survey technology support. Capture and maintenance of periodic, comprehensive updates in a form that can be integrated directly to the GIS and directly support feature extraction and structuring according to the new data models.

Remotely sensed data compilation, analysis, and management. Analyze land use and urban features, change analysis, 3D visualization and to support feature identification and extraction to support various levels of base mapping.

Digital aerial photography compilation, analysis, and management. Managing and using both stereo and orthographically corrected aerial photography directly within a seamless GIS environment. Stereo images can be used to derive 3-dimensional perspectives.

Integration with field survey data collection. Direct integration of field collected survey control to the features they define, thus maintaining the highest level of accuracy and synchronization between the GIS and field data collection efforts.

Effective data updating and management environment. Rule-base map editing, version control to support and synchronize multiple editors, quality assurance and quality control (QA/QC), update tracking, and other advanced production support features. Linkage of the editing and version control environments to workflow tracking tools to support both routine and ad hoc map updating programmes.

GIS-integrated survey data model. Direct integration of survey control network data to the GIS database so that survey data can be managed and manipulated (survey computations and adjustments) from within the same environment. Related features in the GIS database can be automatically adjusted as new survey information becomes available. Rule based data modeling assures data quality and consistency in the survey data that are integrated to the GIS database.

Manage geodetic benchmark database. Exact coordinate location, descriptive, condition, status and other information regarding each marker. Types of markers can include primary, secondary and tertiary geodetic control points, as well as any local benchmarks, property corner markers or other types of markers placed in the field.

Field GIS. Integration of GPS-enabled field survey systems allows contextual GIS base data (including vector or orthophoto information) to be taken to the field in digital form for reference. Disconnected editing allows the direct editing of

information such as the survey control network during the field survey process, thus expediting the operational sequence between field data collection and GIS updating.

Field survey activity tracking and recording. Track field survey information back to specific projects, dates and crews.

Effective survey data updating and management environment. Tools for rule-base map editing, version control, quality assurance and quality control (QA/QC), and update tracking.

Survey data dissemination. Tools to extract and provide survey control information.

2.11.2 Statistical Agency

Compilation and synthesis of official vital statistics, population census, sector statistics, multi-sector indicators, and other information at any variety of levels from national to local neighborhoods is often carried out by a central statistical organization. Much of the underlying information is gathered by agencies in the process of conducting their day-to-day transactions. Information that is captured at the most detailed level practical is summarized to higher levels of generalization to support many different types of statistical analysis, trends, and visual communication of the information to others for awareness building or decision support. Other organizations outside of the official national statistical organization may collect and analyze statistical information for their own purposes.

GIS can support in the integration of location with the many forms of statistical data, ranging from population statistics to epidemiological information associated with disease outbreaks, to social welfare cases and others. Once tied to location, data can be summarized, correlated and analyzed in a variety of ways that are not possible otherwise. GIS provides the capability to capture, manage and analyze different sorts of data in many ways.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Link statistical data to geographic locations. Integrating location reference (such as a facility or place name, a street address, a community reference, a building number, etc.) to a wide variety of types of data. This allows aggregation of detailed raw survey data within various geographic delineations as described next.

Conduct spatial aggregation of statistical survey data. By tying surveys and other information to specific locations it is possible to use GIS tools to aggregate the

information to any level or geography for statistical summary and display. For example, detailed census data tied to buildings and/or blocks can be aggregated to various spatial areas such as administrative areas, school district, area likely to be affected by climate change related hazards, or a water utility pressure zone.

Note: detailed census data are highly confidential and must be anonomized at a given level of aggregation prior to publishing. Access to the raw building-specific census data is not usually allowed outside the official national statistics office, and therefore requires that the official agency be prepared conduct specialized analysis as a service to others.

Geostatistical analysis. GIS can provide a variety of tools for conducting geostatistical analysis. This generally involves the analysis of spatial points and associated information to create continuous surfaces representing the spatial extent of a condition or factor. Other tools allow exploring the spatial-statistical relationships among features to better understand the patterns and the nature of the data or the subject being explored.

Thematic mapping and display. GIS provides a variety of tools for displaying statistical information on maps. This can include 3D statistical surfaces, statistical bar and pie charts displayed on maps, thiesen polygon framework and other information.

Trend analysis. Data can be compiled over time, thus providing a historical perspective that can be used to spot trends, evaluate the effectiveness of government programs and interventions, identify unmet need, and other purposes.

Study planning support. GIS data and tools can be used to supporty the design of statistical surveys, for example developing a randomized distribution for representative household surveys.

2.11.3 Weather Agency

The official reporting of weather and weather projections is often carried out by a national weather service. This can include reporting based on a combination of in-situ meteorological monitoring stations, regional weather radar stations, international satellite based weather modeling and global models.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Link weather monitoring station data to locations on a map. Although they are inherently geographic, weather monitoring systems are often not integrated with other GIS. By linking weather monitoring station data to locations on a GIS map it is then possible to utilize GIS tools to further analyze that information and to compare it relative to other mapped information.

Download the output of weather radar and satellite data to an integrated database environment. The variety of meteorological data inputs from different systems is inherently geospatial and bringing all this information together within a common integrated database environment can provide new opportunities to compare, contrast and refine the results to provide better and more accurate weather reporting and forecasting products.

Provide routines and data for the refinement of regional weather models to derive more specific localized results. The available regional weather forecasting models are based on generalized regional and globally available information. These models can be refined locally with the addition of topographic, land cover and land use and other such information

Provide weather condition and forecasting information as online GIS layers for use with other information. The packaging of weather information from various sources for use with other information in the BNSDI will be helpful for many other applications, especially if this information is available online.

2.11.4 eGovernment

eGovernment as a concept leverages computing and internet infrastructure to strengthen and streamline the communications, sharing of information, engagement and processing of transactions between government and the various sectors of society that it interacts with.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The requirements listed in the Appendix as well as international best practices in the application of GIS and NSDI principles to eGovernment can be summarized to the following general requirements:

Public access to BNSDI information. The BNSDI will provide a variety of information that will be of interest to various sectors and the general public, including street maps, buildings and addresses, aerial photography, government office locations, schools, other community facilities and points of interest, among others. Those data that are cleared by government for publishing to the public and useful can be made accessible by linking to the Geonode or other channel through the eGovernment portal.

Spatially enabled eGovernment application services. Many eGovernment services can be spatially enabled with interactive mapping or spatial operators working in the

background. For example the eGovernment portal may provide information about schools, hospitals, government offices and other community facilities that can be displayed on a map and the map can also be used as an interface for accessing information about these locations. Geospatial services can also be offered without a map, for example providing an online tool to determine what school district a particular location is within.

Customer relations management (CRM). GIS is often used to spatially enable incident reporting through a common eGovernment call center. Web-based and smart phone applications can be used to allow the public to report a complaint or incident, capture a photo, and transmit the information to the call center along with the geographic coordinates of the location of the issue. The call center can then display such information on a map and this can be used to expedite government response and dispatch from whatever agency the issue is related to. This also provides an important historical record that can be used to understand the longer term pattern of complaints and incidents so that corrective action can be taken to avoid future issues in these locations.

Access to common data registries. Common registries are single, authoritative listings of such things as street addresses, buildings, plots of land, people, vehicles, businesses and other classes of objects that can be accessed and used in common to ensure consistency and interoperability of information across government. For example, if all government online systems are referencing a single, authoritative registry of street addresses in Belize as part of the process of entering an address to any database, then the ability to be able to link those databases later on is then present in the system. The establishment of such registries is an important function of eGovernment practice internationally and has significant implications for the use of GIS and the effectiveness of the BNSDI.

2.12 Political and Government Affairs

There are a variety of political, governance and civil society matters that are not specific to any particular sector or Ministry that can also be supported by GIS and the BNSDI. This area has not been fully explored for Belize within the current study, however it is possible to reflect on relevant international experience and practice in this area that can be included in the listing of potential requirements to ensure that this area is acknowledged in the conceptualization of the BNSDI policies and plans moving forward.

2.12.1 Political Affairs

For the purposes of the current study, political affairs refers to the range of political activities that can be supported in some manner by GIS and the BNSDI. Political bodies were not interviewed as part of the current study but are an important activity that can be well

supported by the BNSDI and should be considered in its development. The activities and respective requirements are summarized in the following, based on international experience:

Public opinion polling. Polling of public opinion is carried out to understand issues that are important to the public and how people think about these issues. Location-aware mobile media and smart phones provide the ability to tie the responses to random public polls and household opinion surveys to places. The distribution of these samples and the results can be visualized spatially and with access to a wide variety of other information through the BNSDI can provide important insights to issues that are of political significance.

Election management. GIS has traditionally been used for managing elections, including identification and communication of polling places, voter registration, and confirmation of voter district affiliation. GIS along with census and voter registration information has also been used for re-districting analysis to estimate the consequences of voter district boundary changes.

Campaign management. Running a political campaign involves a significant amount of promotion, communications, resource management and logistical activities. GIS and the BNSDI can be used to prepare communications strategies, mobilization of promoters and canvassers, movement of campaign resources and other applications.

Public communications. The GIS and data from the BNSDI can be used to analyze and communicate issues that are important to voters, in ways are inherently understandable and compelling. Community specific census and other data can be used to target certain messages to specific communities that are most interested in or affected by particular issues.

2.12.2 Governance and Public Administration

The political and executive leadership in the government is responsible for setting strategic directions for the development of the country and ensuring that these directions are used to focus and align government policies, investments and the operational priorities of the ministries and local government bodies. This requires not only consideration of the issues and possible interventions within specific sectors, but also consideration of the interactions and possible outcomes and consequences of alternative policy or operational decisions.

Those involved in determining governance and public administration in Belize were not directly interviewed for the current study. However this is an important activity that can be well supported by the BNSDI and should be considered in its development, therefore the activities and respective requirements are summarized in the following, based on international experience:

Decision support. GIS provides a wide variety of tools and methods for analyzing and visualizing issues that are important to government covering economic development, poverty alleviation, security, environmental resource management, education, health, food security, water security and most other national development issues. The BNSDI

can provide the data that can be accessed and analyzed to better understand the underlying issues, understand current conditions and trends, and project the potential results of alternative decisions. GIS-based executive dashboards allow information to be presented in a consolidated and easily understood manner that can support the evidence-based decision making process.

Policy assessment. Ongoing monitoring and feedback regarding policy impacts and effectiveness is important to a healthy functioning government. GIS and the BNSDI can provide the tools and data to analyze conditions and trends over time. When combined with web-based channels for public input and communications, location-aware social media, results of stakeholder or household opinion polls, and other such emerging public engagement techniques this can provide a powerful two-way environment for monitoring policy effectiveness and impacts.

Government transparency. Policies supporting open access to government data are important for ensuring transparency and maintaining public and investor confidence in government and the democratic process. Providing access to as much government information as possible and useful without compromising privacy, intellectual property rights, national security and other policy matters is of paramount importance.

2.12.3 Civil Society

Civil society is the combination of non-government, non-commercial organizations and institutions that represent the interests and will of citizens. Civil society organizations may be focused on specific special topical or geographic area interests. When actively and productively engaged, civil society can help to ensure representation of a diversity of societal views as well as effective checks and balances in influencing how government operates and makes decisions.

Appendix B provides a comprehensive identification of all the organizations and their functions that relate most directly to this business application area. The GIS/SDI requirements of those functions can be summarized to generic common requirements for this business area as follows:

Special interest issue monitoring and assessment. When provided with access to a wide variety of information as allowed through the BNSDI, civil society is better able to monitor and assess issues and trends that are important to them. Experience suggests that open data helps to ensure that debate among differing interests can be most effectively conducted when all parties have access to the same accurate and authoritative, evidence-based information.

Promote government transparency. Open access to information is key to the effective functioning of civil society. An open data policy allows civil society to conduct its own analysis of conditions and trends, and by so doing helps to establish a level of trust

and confidence that supports an effective and mutually beneficial partnership environment between government and civil society.

2.13 Business & Industry

The private business and industry sector includes a wide range of business types, each with its own requirements for spatial information and tools. For the past several years, the business sector has been one of the fastest growing segments within the more mature GIS markets in Europe, North America, Australia and elsewhere, with applications ranging from long range projections and business planning, demographic commercial profiling and other retail market analysis, service area assessment, product and service delivery planning and logistics support, competitor analysis, and many other areas. In many cases, these private sector applications have been stimulated by open access to information that has been created by government for government purposes. In this way private sector ingenuity and resources can be leveraged to create new services, diversify the economy and provide jobs.

Evaluation of private sector interests in GIS and the BNSDI could not be fully explored in the current study due to time and resource constraints. The description of potential requirements expressed here are based on international experience and discussions with one GIS vendor company and several GIS consultants who presently serve the market. This was done to ensure that there is some acknowledgement of potential private sector interests in the formulation of the BNSDI recommendations for moving forward.

The majority of private sector GIS activities in Belize at present are mostly being carried out in support of government projects, but it can be expected that the demand for value-add products and services, and the use of GIS to support private sector operations will grow in the coming years. This can be accelerated with the establishment of private sector access to appropriate data through the BNSDI and reasonable terms for its use.

The application of GIS to Business & Industry sector activities, and the implications of this for the future of BNSDI in Belize are far ranging. General requirements for GIS that are common across most business areas include the following, based on international experience:

Business strategic planning. Population projections, including the total number and characteristics of future populations and their likely socioeconomic profiles is important in positioning business topically and locationally. In GIS form such projections help to determine what types of products and services will be needed, and land use masterplanning can provide an early indication of how that population may be spread, where land and infrastructure will be available, identification of available land parcels, and other issues.

Business operations. Many businesses need to know the locations of their customers to support delivery logistics, locating branch offices where they can be most accessible to target markets, to analyze service area effectiveness over time and other issues. They can also benefit from analyzing the locations and service areas of existing or future competitors. Location based services are growing in the marketplace, for example allowing a person to use their location-aware phone or PDA to locate an ATM, restaurant or specific type of store within their proximity.

Marketing and business development. This business area involves gaining and sustaining optimum positive exposure of one's products and services to those target markets that most need them. Business development includes enlarging existing markets and expanding into new markets. GIS technology is used in this area for consumer and customer profiling and target marketing, web-based location mapping, billboard advertising management, and other applications.

2.13.1 Manufacturing

The manufacturing sector involves a range of activities from the processing of raw material to the production and assembly of products. The uses of GIS in this sector include, but are not limited to:

- identify optimal geographic locations for manufacturing plants based on:
- access to raw materials or components;
- proximity to markets, transportation and distribution channels;
- labor market availability and characteristics;
- infrastructure availability;
- avoid environmentally sensitive areas and other constraints;
- planned land use and regulations.
- monitor and comply with environmental regulations for emissions into air and water;
- facility inventory, operations and maintenance;
- record and track storage of hazardous materials;
- emergency contingency planning and response support.

The BNSDI can provide a significant source of information for business owners to work together with community planners, Chamber of Commerce and others to identify optimum locations for various types of manufacturing plants. It can also provide access to the various data needed to help monitor and assess pollution emissions and effects over time, provide valuable information concerning the locations of hazardous materials that can be accessed by fire, police and other responders in time of emergency, analyze demands and pressures on local infrastructure including transportation, water, electricity, gas, sewage (including pretreated effluent) and others.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to basemapping showing cadastre, infrastructure, and other contextual information for siting analysis, to ensure avoiding environmentally sensitive areas and any impact to residential populations;
- Ability to link and correlate manufacturing sites with information such as flood zones, environmentally sensitive zones, and others for regulatory compliance;
- Provide transportation data that can be used for logistical routing and scheduling;
- Integration of hazardous material storage locations with emergency response services:
- Access to information from all the relevant sectors for disaster response;
- Access to basemapping showing infrastructure and other contextual information for facility management.

2.13.2 Construction

The construction sector is responsible for the development of buildings and associated structures and facilities. This normally includes a process from initial project siting, land acquisition, urban and architectural design review, permitting and utility signoffs, site preparation, construction management and oversight, through final approvals, commissioning certification, and preparation and filing of as-built drawings. GIS is used most often in the site selection, planning and design phases. New advances in CAD and Building Information Model (BIM) approach to CAD data modeling, and the integration of such modeling with urban scale GIS is opening new avenues for urban data management including 3D architectural and urban design modeling, analysis and visualization.

The relevance of the BNSDI to the construction sector can include, but is not limited to:

- Access to cadastral, land use masterplans, available infrastructure, traffic and other information that can be analyzed to determine optimum locations for a building project;
- Provide basic site information as the basis for more detailed site surveys that are needed for actual construction design and documentation;
- Provide integrated CAD and GIS data-rich environment that can be used to comprehensively analyze proposed projects and help to streamline the review and approval process;
- Interact with municipal government and traffic police for temporary road closures, barricades and other operational issues;
- Submit final as-built drawings to the municipality in digital form that can be used to update the basemap, building and other layers.

2.13.3 Wholesale and retail trade

Wholesale and retail trade includes all businesses that carry out the distribution, warehousing, sales and after sale support of consumer products. GIS technology is often used in this sector for a variety of applications, ranging from providing consumers with tools to find the nearest retail store, to optimizing logistics for goods distribution (from warehouse

to store and delivery to customer). In addition, GIS is helping retailers prioritize their location selection by market and to maximize the stores they can put into each market or territory. Predictive models that analyze the demographics can help determine exactly how many stores the market can absorb. When demographic data is applied to geospatial analysis of a retail site, it becomes possible to predict or analyze market opportunity in terms not just of the consumer base, but of the transportation infrastructure, accessibility, and even brand desirability. This helps improve sales performance by simulating the merchandising strategies of individual stores based on the demographics of each store's market. Retailers can also use GIS to determine match their strategy (moving, closing, expanding) in light of a stratification of their market

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to time series demographic data and relevant current indicators to compare with sales data to identify possible reasons for strong/weak performance of specific brands;
- Access to navigable street data to support distribution logistics;
- Access to data on infrastructure, zoning, other commercial establishments, crime patterns, and other relevant information for siting new stores or relocating poor performing existing ones;
- Ability to provide service information to customers, especially for finding the closest store;
- Common reference system to ensure that shared data can be integrated spatially, especially for siting analysis;
- Competitor analysis.

2.13.4 Tourism

Tourism is travel for predominantly recreational or leisure purposes or the provision of services to support this leisure travel. These service industries include transportation services such as cruise ships and taxis, accommodation such as hotels and restaurants, and entertainment venues, and other hospitality industry services such as spas and resorts. Tourism, as other sectors, includes siting, design review, permitting, construction and commissioning, operations and maintenance, and finance and administration.

GIS is often used in tourism to integrate many relevant types of data, such as of roads, buildings, landmarks, restaurants, hotels and routes, with critical contextual information such prices, availability, and activities. This is important, as the tourist sector is so large and diverse that even with detailed research, unique and interesting places may be overlooked.

Some specific examples of how GIS is being used in tourism are:

- Show location, type, and timing of events for use by tourists and service suppliers;
- Produce cartographically compelling maps for use in hard copy maps, web-based maps, and mobile mapping applications;

- Combining different types of data for more complex search capabilities;
- 3D representation with roads and buildings to highlight attractions;
- Visualizing the location of a destination in comparison to recognizable features.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Providing customers with visually compelling (3D) displays of the area surrounding a particular property;
- Access to information on transportation infrastructure, commercial establishments, residential areas, crime, and other relevant sectors for siting purposes;
- Access to navigable street data to find shortest/quickest route;
- Ability to provide service information to customers;
- Common reference system to spatially integrate basemap layers, touristic information, environmental features, and other relevant types of data;

2.13.5 Transport and storage

Transport or transportation is the movement of people and goods from one place to another. Transport involves long term planning, identification of routes, services, and facilities, design review, permitting, construction and commissioning, operations and maintenance, and finance and administration.

GIS has found its way into many aspects of the transportation sector, including monitoring the location of all sorts of assets, tracking flight paths and noise levels, or planning for highway maintenance. As such, transportation professionals increasingly rely on geographic information systems to manage equipment and infrastructure. Transit networks can be analyzed in terms of their fares and other factors, including multiple travel modes. This can be extended to transit assignment to produce link level and aggregate ridership statistics. GIS can also be used to predict changes in travel patterns and the utilization of the transportation system in response to changes in regional development, demographics, and transportation supply (trip generation, trip distribution, mode split modeling, and traffic assignment). In the operational mode, increasing the efficiency of routing and logistics is one area where GIS has become a standard tool for solving various types of pickup and delivery routing problems, and for arc routing which supports street sweeping, solid waste collection, and other door-to-door operations.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to very detailed navigable street data for routing applications;
- Access to demographic data for development of multi-modal transportation models;
- Common reference system to ensure that shared data can be integrated spatially;
- Ability to provide service information to customers;
- Access to zoning plans.

2.13.6 Media and press

This core business involves collecting, researching, compiling, producing, and publishing various types of information, news, entertainment, advertising and other material for consumption by the public at large, focus groups, and other segmented markets. Dissemination is primarily via printed media, television, radio, and increasingly the Internet. The media and press are constantly concerned with the location context of the news, advertising, entertainment, and other material they work with and promote.

GIS provides many tools to put this material into context, analyze it, make it more understandable through visualization, and also can help managers reduce costs and diversify their business. Some specific examples include the following:

- Economic patterns, environmental changes, political changes, and other complex data can be accessed, analyzed, and presented using GIS to help see the relationships between physical features and the events;
- Create customized maps to be used for printed media, TV, and online;
- Face the challenge Internet poses to traditional outlets by identifying new markets, increasing advertising revenue, and reducing logistics expenses;
- Mapping business, demographic, and consumer household data to see trends in customers habits and to locate customers with similar characteristics;
- Map circulation as well as the penetration level to determine market potential in the circulation areas;
- Identifying where competition is located and where it is advertising;
- Conduct integrated marketing, by using geographic information to profile potential customers through demographics and population distribution reports;
- Managing the logistics of delivering publications to customers or resellers to reduce costs.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to navigable street data to support distribution logistics;
- Access to frequently updated high resolution imagery for use as background to maps;
- Access to highly current and historic demographic information to identify new markets for printed media readership, and to target advertising;
- Access to basemaps for such features as building footprints, landmarks, built up areas, roads, and other contextual information for creating context maps.

2.13.7 Financial services

Financial services is a term used to refer to the services provided by the finance industry. Financial services is also the term used to describe organizations that deal with the management of money and includes merchant banks, credit card companies, consumer finance companies, government sponsored enterprises, and stock brokerages. Financial services have to be planned, located, set up, and operated, including monitoring service provision performance, reassessing the range of services and markets.

GIS can help banks handle regulatory compliance by adding a spatial dimension to the statistical, operational, and monetary data. At an operational level, GIS can enable better service planning and optimization, extending customer management profitability, and improving customer retention. It can be used to analyze large potential or under-exploited submarkets. Some of the specific examples include:

- Identifying new influence areas;
- Stratifying customer markets;
- Analyzing the change in market and demographic forces;
- Link customer locations to transaction location;
- Model travel patterns;
- Map and analyze penetration by territory and branch/ATM location.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to time series demographic data and relevant current indicators to compare with revenue data to identify possible reasons for strong/weak performance of specific branches;
- Access to environmental data such as flood plains, fire zones, and other data for insurance risk calculations;
- Access to data on infrastructure, zoning, other commercial establishments, crime patterns, and other relevant information for siting new branches or relocating underperforming existing ones;
- Provide transportation data that customers can use to identify closest branch and directions;
- Ability to provide service information to customers;
- Access to navigable street data to support distribution logistics;
- Common reference system to ensure that shared data can be integrated spatially, especially for siting analysis.

2.13.8 Real estate, renting, and business activities

The real estate sector and related activities revolve around developing and marketing real estate properties for all types of usage. This encompasses the whole development process, marketing, sales, and management. GIS offers a variety of tools related to real estate such as map—based content management and sophisticated investment analysis. 3D modeling combined with photo rendering software can produce realistic imagery for marketing purposes. At a simpler level, potential customers use maps and imagery to get a sense of general orientation, landmarks, and local services, as a way of making decisions. It is also possible to map recent property transfers to analyze prices, and this can be facilitated by geocoding properties on their address. Planners and local government officials will often use GIS to map changing patterns of urban development, which are in many cases driven by the real estate sector. At a regulatory level, insurance companies can use GIS to assess site selection to ensure compliance with various regulations. This type of analysis can be

extended to assessing the availability of utilities and other services. GIS also supports siting analysis, in terms of proximity to target customers, competitor location, crime rates, infrastructure, labor pools, and environmental risk factors.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to sales transactions to compare a particular property offering to neighboring market values;
- Access to data on infrastructure, zoning, school districts, crime patterns, and other relevant information to decide on purchasing or renting a property;
- Provide transportation data that prospective buyers can use to get directions;
- Access to frequently updated high resolution imagery to create 3D and other visually compelling scenes of neighborhoods and properties;
- Common reference system to ensure that shared data can be integrated spatially.

2.13.9 Health and social work

The health and social work sector involves developing human and physical facilities, medical standards, and other resources to provide medical and social services to a wide variety of people. GIS assists researchers, public health professionals, policy makers, and others to better understand geographic relationships that affect health outcomes, public health risks, disease transmission, access to health care, and other public health concerns. GIS achieves this by integrating and sharing data, in order to leverage an organization's investment in data by spatially enabling the data and making it an agency- or organization-wide data resource. Some of the uses of GIS in public health are:

- Determining geographic distribution of diseases;
- Analyzing spatial and temporal trends;
- Mapping populations at risk;
- Stratifying risk factors;
- Assessing resource allocation;
- Planning and targeting interventions;
- Monitoring diseases and interventions over time;
- Providing information for customer services;
- Scheduling home health care services from a transportation perspective;
- Selecting sites based on geodemographic dynamics of an organization's existing service area in contrast to the likely demand for services at a new location.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to time series data and relevant current indicators on demographics and health cases for projecting future capacity needs;
- Access to environmental data related to epidemiological analysis;
- Access to capital improvement plans for utilities and infrastructure and other contextual information for siting analysis;

- Integration of location and capacity information with emergency response services.
- Provide transportation data that can be used for patient transport routing;
- Common reference system to ensure that data from all agencies is interoperable;
- Ability to provide service information to customers.

2.13.10 Education

The educational sector involves developing human and physical facilities, curricula, and other resources to provide educational services to a wide variety of people. GIS provides decision-makers in universities, government, and industry with spatial data sets and tools for using and analyzing such data. In colleges and universities, courses in methods and theory of GIS are taught in geography, engineering, business, environmental studies, geology, and in other disciplines. In schools, teaching with GIS covers concepts and skills in many different fields. GIS is also used as an essential research tool in higher education and research.

In addition, GIS is an important tool for the business of education. There are several examples of this, such as in facility management through integration of maps with information about resources and scheduling, service area mapping to analyze existing facilities in conjunction with demographic information, developing schedules for transporting students, and general customer service.

The best practice experience in this core business area suggests that the following benefits can in principle be gained from BNSDI:

- Access to time series data and relevant current indicators on demographics and student populations for projecting future capacity needs;
- Provide transportation data that can be used for bus routing;
- Access to capital improvement plans for utilities and infrastructure and other contextual information for siting analysis;
- Integration of location and capacity information with emergency response services;
- Common reference system to ensure that data from all agencies is interoperable;
- Ability to provide service information to customers.

2.13.11 Geospatial products and services

Although the market in Belize is relatively small, there is still a significant need for specialized technical products and services and this can be expected to grow in the future. GIS software in use today is either commercially sourced or open-source. In either case there is a need for the provision, distribution, customization and support for GIS and related software and equipment. Most GIS consulting and technical support services are being carried out on behalf of government, although there is growing demand from business and trade associations and larger landowners. The establishment of the BNSDI can be expected to make GIS feasible for a much broader range of organizations than the present, and the demand for private sector specialized consulting and technical services is expected to grow considerably.

3 GEOSPATIAL DATA

Fundamental data are those data types that are most commonly needed across the BNSDI community. Fundamental Geospatial Data Sets (FGDS) include among other issues topographic information, cadastral information, orthoimagery, elevation data, transportation, hydrography, governmental administrative units, land cover/land use, demographics, soils, climatology, air and water quality, all at various geographic scales and levels of resolution as needed to support stakeholder applications.

The development of the BNSDI data framework requirements requires the careful consideration of the current and future needs of stakeholder agencies, the extent of current and future business requirements, data sharing relationships, and a host of other issues. The definition and nature of BNSDI fundamental data includes consideration of several key factors that are discussed in brief in this section. However given that data represents the key SDI component, and analysis of the data situation represents a very large and complex undertaking in and of itself, a separate companion report, the Data Inventory and Analysis has been developed under separate cover to deal exclusively with this issue. This section therefore only summarizes the data assessment and requirements characteristics that are addressed in detail in that companion volume, and calls out those aspects that are related to the other components of the BNSDI reference architecture.

3.1 FGDS Identification

Whether or not a particular dataset is of interest across the stakeholder community and should therefore be subjected to the overhead associated with filling this need is an important consideration. The BNSDI will need to establish criteria and procedures for making such identification. On the long term, this is not so much a question of inclusion or exclusion, but rather a question of prioritizing certain data sets over others, and establishing the appropriate level of technical and institutional mechanisms needed to support the maintenance and dissemination of the information among the stakeholder who most need it. It is also recognized that the goal of any FGDS program is a reference framework that is flexible and scalable, against which the community can continuously adapt and innovate as strategic and tactical requirements arise.

Among fundamental datasets it is also important to distinguish those that provide a "framework" for other information. While the terminology is used inconsistently in the international SDI community at large, for the purposes of the BNSDI, fundamental data sets are those topics that are needed in common by many organizations. They may be geospatial 'primitives' (i.e. basic spatial information upon which other information can be linked or derived), or they may be derived. Framework data sets are those fundamental topics to which many other topical data sets and statistics can be linked. Utility network information for example may be a fundamental dataset because many organizations need to understand the

location and characteristics of the network, whereas "buildings" or "land parcels" are features that other organizations may use as a way to tie tabular information such as building permits, census surveys, and commercial license records to a specific geospatial feature.

In considering whether data is essential to the stakeholder community, several factors need to be considered. One is the degree to which data supports carrying out essential business activities of the stakeholder organizations, and within that considering the products or decisions that must be supported as well the process and workflow implications. Another factor is to differentiate between community, enterprise and subject data. At one end of the spectrum, subject data are highly specific and specialized to the needs of a particular unit or function within an agency, while at the other end community data is by definition data that is of use to a wider audience. It should be noted that these are not mutually exclusive groups, but rather loose characterizations of data.

Finally, a common reference schema is a useful mechanism when considering an integrated information management environment. There are at a minimum three essential dimensions of data that if structured along common standards can greatly increase the broad usage and interoperability of framework data, including:

Topic. This refers to the domain aspects of the information, and the relational keys that can be used to relate datasets to one another. For example, the use of common taxonomies and classification schemes and other methods of describing geographic features and their characteristics can help to ensure that information that is topically related can be compared. Similarly, the use explicit relational keys (like a common address or parcel number), key words, taxonomies, common phrases, and other topical references can be built into the data content to maximize the ways in which data can be linked and otherwise correlated. This same principle is now also being applied to visual, sound and other sorts of information and media.

Place. Many information resources reference things that exist in the real world. These things may exist in a fixed place, or may be transitory. Maintaining geospatial reference for those information objects for which it matters is a powerful way to correlate information that might not otherwise be recognized.

Time. A timeframe reference is important for many types of information resources, and can be used to correlate, compare and contrast data in ways that are not possible with the other two dimensions mentioned previously. For example, in assessing the currency of a dataset or using a date range to isolate certain historical or time series information for direct comparison.

The dimensions of this schema can be used to interrelate and correlate seemingly disparate pieces of information, thus creating a much richer and more integrated information management environment. Some of this information can be built into the structure and content of the data files, while others can be captured through systematic cataloguing, and

others through the various indexing and clustering techniques that are now being applied within search engine technologies.

3.2 Fundamental Registries

Fundamental registries are centralized, authoritative databases that are used as a common reference to verify the validity of information before it is recorded to another database. Those registries that have geospatial relevance include such things as personal identification, street addressing, parcels of land, development project identification (including both private development, public sector investment projects, and others), government fixed asset registry, legally registered companies and others. By establishing a single reference and responsible custodian for each fundamental registry it then becomes possible to provide access to the data to confirm that a reference exists and is officially recognized prior to accepting it as a valid entry to any other database. This common verification then establishes a latent interoperability across government and other databases to ensure that they can be cross-referenced through relational database linkages. This principle is equally important within the broader framework of the eGovernment program and should be addressed through a coordinated effort.

3.3 Thematic Content

It is useful to group FGDS data according to certain classes and themes of data to as one method to help identify commonalities among datasets from disparate organizations, as well as interrelationships and potential interdependencies among data topics within a theme. The BNSDI FGDS framework is organized as a taxonomic description of the fundamental classes, related data themes, and the principal topics that make up a data theme. Classes, themes, and topics are defined as follows:

Class. A data class is a grouping of related data objects that have topical and structural commonalities. Relationships between objects in a class can be both spatial and topical (i.e. domain specific). A class contains data themes.

Theme. Data themes are sub-types of a data class. A data theme is made up of one or more related data topics.

Topic. Data topics are sub-types of a data theme. They have geospatial properties and generally speaking, strong spatial relationships at the data theme level. Data topics may describe multiple types of a single geographic phenomenon or data products. Representation of data topics will vary by spatial scale. Requirements for data collection and management will also vary within a single data topic.

A set of data classes and themes based on international NSDI experience has been adapted to fit the needs of the BNSDI. The six (6) basic classes of geospatial information are Basemap, Areas, Environmental, Transportation, and Utilities. These comprise over 50 themes,

representing over 200 data topics. In consideration of the business requirements, these are then consolidated to approximately 100 FGDS that represent clusters of related topics to be addressed programmatically in the BNSDI program design and implementation plan.

Each class is summarized below, along with a listing of its related themes. Further details, including the listing of specific data topics within each theme are described under separate cover in the Data Inventory and Analysis Report.

Basemap. Information in this class provides the spatial frame of reference for all other geographic data. These include horizontal and vertical geodetic control, topographic and bathymetric contours, spot elevations, planimetric features (such as landmarks), coordinate grids, and similar information. The Basemap class includes the following data themes:

- Survey Control
- Places (Gazetteer)
- Elevation
- Imagery
- Remotely Sensed Data
- Planimetric Features
- Structures
- Scanned Basemaps
- Grids and Indexes

Areas. This class refers to subdivisions of land or water areas according to some jurisdictional or other purpose. Areas, such as administrative areas, can follow topographic features, or be used to delineate socioeconomic or management zones. Areas delineate jurisdictional areas, land ownership, statistical reporting and management zones and are used for a variety of planning, administrative and other purposes. The Areas class includes the following data themes:

- Activity Areas
- Cadastral
- Planning Areas
- Political/Administrative
- Service Areas
- Special Management Areas
- Statistical Areas

Environment. Environmental data typically include features of the natural environment such as hydrology, vegetation, soils, geology, archaeological sites, sensitive flora or fauna locations, and other information concerning the natural and cultural environment. There is a great deal of interest within certain organizations involved with rational physical planning, resource management and environmental protection, to enhance the development of more extensive environmental databases. The Environment class includes the following data themes:

- Air & Climate
- Waste
- Cultural Resources
- Land and Aquatic Use/Cover
- Biodiversity
- Surficial Hydrology
- Subsurface Hydrology
- Soils
- Geology
- Seismology
- Geomorphology
- Marine Abiotic

Utilities. The definition of utilities in the present context addresses the various types of asset-intensive and capital-intensive infrastructure services such as electricity, water, sewage, gas, and telecommunications. The Utilities class includes the following data themes:

- Electrical Facilities
- Potable Water Facilities
- Sanitary Sewer Facilities
- Stormwater Sewer Facilities
- Telecommunication Facilities
- Waste Management Facilities

Transportation. This class include roadways, highways, rail lines, bridges, airports and any other information related to transportation networks and facilities. This information can be used in a variety of spatial analyses and for general reference. For example, the street network can be used to route delivery trucks, school buses, public transport vehicles, emergency medical or police response, and other routing applications. It can also be used for allocation applications, by correlating the street network with other information, such as population adjacent to the streets to be served by public transportation, and other factors. The Transportation class includes the following data themes:

- Air Transportation
- Water Transportation
- Land Transportation

All of the data themes listed above have been addressed at one level or another by other government agencies or private companies, professional organizations, and standards bodies. International and industry data model standards that address content and format standards for each theme can be referenced and used as a starting point for the adaptations that are most often required to make these models fit each unique situation.

The classification scheme above is being used as a starting point for the development of a customized geospatial data reference architecture for the BNSDI. This will be subjected to further refinement in collaboration with various groups of BNSDI stakeholders as each specific data area is addressed in later stages of the program. This process will include referencing of available international data content standards from around the world that can be used as a starting point for the development of content standards for Belize.

The following table provides a summary of the data class, theme, topic and FGDS that were defined within the Data Inventory and Assessment report.

Table 1 - BNSDI FGDS Classification

CLASS	THEME	TOPIC	FGDS
Basemap	Survey Control		Geodetic and Survey
		Geodetic Control Network	Control Network
Basemap	Survey Control	CORS/RTK Station Locations	CORS/RTK station
			locations
Basemap	Survey Control	Ground Control Points	Ground Control Points
Basemap	Places	Gazetteer	Gazetteer
Basemap	Places	Points of Interest	Points of Interest
Basemap	Elevation	LIDAR Elevation Data	LIDAR Elevation Data
Basemap	Elevation	Topographic/Bathymetric Contours	Topographic/Bathymetric Contours
Basemap	Elevation	Digital Terrain Model (DTM)	Digital Terrain Model (DTM)
Basemap	Elevation	Digital Elevation Model (DEM)	Digital Elevation Model (DEM)
Basemap	Elevation	Triangular Irregular Network (TIN)	Triangular Irregular Network (TIN)
Basemap	Elevation	Coastline	Coastline
Basemap	Imagery	High Resolution Satellite Imagery	High Resolution Satellite Imagery
Basemap	Imagery	Aerial Photography	Aerial Photography
Basemap	Imagery	Orthophotography	Orthophotography
Basemap	Remote Sensing Data	MSS, SAR, Other	High/Medium Resolution Satellite Data
Basemap	Remote Sensing Data	MSS, SAR, Other	Low Resolution Satellite Data
Basemap	Planimetric Features	Utility Structure, Fences, Walls, Landscape Vegetation, Pavement Edge, Landscape Structures, Parking	Planimetric Features
Basemap	Structures	Building Footprint, Building Points, Street Address, 3D Buildings, Facilities, Accommodation, Eating and Drinking, Attractions, Commercial Services, Education and Health, Public Infrastructure, Retail, Sports and Entertainment, Manufacturing and Production, Accommodations, Restaurants and Bars, Botanical and Zoological, Museums and Art galleries, Recreational Landscapes, Tourism Facilities, Financial Services, Health Practitioners and Establishments, Animal	Building Footprints Building Points

		Health, Primary, Second and Tertiary,	
		Education, Recreational and Vocational,	
		Education, Burial Sites and Cemeteries,	
		Government Agencies and Offices,	
		Organizations, Places of Worship, Postal	
		Services, Public Safety, Recycling Facilities,	
		Utilities Companies, Fuel Stations, Parking	
		Lots and Structures, Food, Drink and Multi- Item Retail, Outdoor Pursuits, Venues, Stage,	
		and Screen, Farming Products Facility, Forestry	
		Products Facility, Industrial Products Facility	
Basemap	Scanned Basemaps	Scanned Topographic Basemaps	Scanned Topographic
Визетир	Seamled Busemaps	Sommer Topograpine Buseniups	Basemaps
Basemap	Scanned Basemaps	Scanned Historical Maps	Scanned Historical Maps
Basemap	Grids and Indexes	Coordinate Grids	Coordinate Grids
Basemap	Grids and Indexes	Non-Coordinate Indexes	Non-Coordinate Indexes
Areas	Activity Areas	PSIP, Research Plots, Other	Activity Areas
Areas	Cadastral	Plot Boundaries	Plot Boundaries
Areas	Cadastral	Block Boundaries	Block Boundaries
Areas	Cadastral	Easements	Easements
Areas	Cadastral	Right of Way	Right of Way
Areas	Planning Areas	National Spatial Plan, Area Plans, Regional	Planning Areas
		Plans, Urban Design Areas, Special	
		Development Areas, Natural Resource	
		Management Plans	
Areas	Political/Administrative	National and Sub-National Boundaries	National and Sub-
	Areas		National Boundaries
Areas	Political/Administrative	Electoral Divisions	Electoral Divisions
	Areas		
Areas	Political/Administrative	Municipal Boundaries	Municipal Boundaries
Areas	Areas Political/Administrative	Exclusive Economic Zone	Exclusive Economic
Aicas	Areas	Exclusive Economic Zone	Zone
Areas	Service Areas	Utility Service Areas,	Utility Service Areas,
Areas	Service Areas	Government Service Areas	Government Service
Meas	Service rueas	Government Service Areas	Areas
Areas	Special Management	Marine Protected Areas, Protected Areas	Protected Areas
	Areas	, , , , , , , , , , , , , , , , , , , ,	
Areas	Special Management	Designated Cultural Heritage, Designated	Designated Heritage
	Areas	Natural Heritage, Private Protected Areas,	Areas
		Designated Sensitive Habitat	
Areas	Special Management	Mineral Concession, Petroleum Concession	Concession Areas
	Areas		
Areas	Statistical Areas	Awaiting information from SIB	Awaiting information
English and 1	Aim Pa Climanta	Matagralagical Citation I and	from SIB
Environmental	Air & Climate	Meteorological Station Locations	Meteorological Station Locations
Environmental	Air & Climate	Air temperature, wind speed and direction,	Climate Summary Data
Divironnichtal	7 in & Climate	relative humidity, pressure, precipitation,	Cimac Summary Data
		evaporation, and sunshine duration	
Environmental	Air & Climate	Air temperature, wind speed and direction,	Derived Climate Isohyets
		relative humidity, pressure, precipitation,	1111 22 900
		evaporation, and sunshine duration	
Environmental	Air & Climate	Green House Gas Emissions	Green House Gas (GHG)
			Emissions
·	· · · · · · · · · · · · · · · · · · ·	·	

Environmental	Waste	Municipal Solid Waste, Construction and Demolition Waste Sources, Landscape Waste Sources, Hazardous Waste, Medical Waste, Industrial Emissions	Waste and Emissions
Environmental	Cultural Resources	Historical Sites	Historical Sites
Environmental	Cultural Resources	Archeological Sites	Archeological Sites
Environmental	Cultural Resources	Paleontological Sites	Paleontological Sites
Environmental	Land & Aquatic	Land Use, Land Cover, Vegetation, Benthic	Land and Aquatic
Environmental	Use/Cover	Type,	Use/Cover
Environmental	Land & Aquatic Use/Cover	Urban Land Use	Urban Land Use
Environmental	Land & Aquatic	Agriculture Land Use	Agriculture Land Use
	Use/Cover	XX 1 to a m	
Environmental	Biodiversity	Habitat Type	Habitat Type
Environmental	Biodiversity	Biological Survey Boundaries, Species Observation Points, Biological Plot Surveys, Animal Tracking Data, Species Range Data, Population Assessments;	Biodiversity Study Data
Environmental	Biodiversity	Biodiversity value, Habitat of species of special concern	Biodiversity Value
Environmental	Biodiversity	Protection status and gap analysis	Biodiversity Protection Gap Analysis
Environmental	Surficial Hydrology	Rivers and Streams	Rivers and Streams
Environmental	Surficial Hydrology	Waterbodies	Waterbodies
Environmental	Surficial Hydrology	Watersheds	Watersheds
Environmental	Surficial Hydrology	Flood Zones	Flood Zones
Environmental	Surficial Hydrology	Coastal Storm Surge	Coastal Storm Surge
Environmental	Subsurface Hydrology	Groundwater Monitoring Locations	Groundwater Monitoring Locations
Environmental	Subsurface Hydrology	Groundwater Basins	Groundwater Basins
Environmental	Subsurface Hydrology	Groundwater Model Outputs, depth to	Groundwater Model
		groundwater, salinity, ph, other	Outputs
Environmental	Soils	Soils boundaries, soil sample points and data	Soil Type Areas
Environmental	Soils	Geotechnical study locations and data	Geotechnical Studies
Environmental	Geology	Geologic Sample Sites, Surficial Geology, Subsurface Geology, Mineral Resource Areas	Geology
Environmental	Seismology	Seismic Faults	Seismic Faults
Environmental	Seismology	Seismic Risk Zones	Seismic Risk Zones
Environmental	Seismology	Seismic Events	Seismic Events
Environmental	Geomorphology	Geomorphology	Geomorphology
Environmental	Geomorphology	Topographic Slope	Topographic Slope
Environmental	Geomorphology	Elevation Regimes	Elevation Regimes
Environmental	Geomorphology	Solar Aspect, Hillshade	Solar Aspect
Environmental	Geomorphology	Landform	Landform
Environmental	Marine Abiotic	Marine Monitoring Station Locations	Marine Monitoring Stations
Environmental	Marine Abiotic	Temperature, Pressure, Light intensity, Light wavelengths, Tides, Current strength and direction, Waves, Storm surge, Tsunami run-up zones, Density of the water medium (dependent on temperature and dissolved materials), Salinity, Concentration of other dissolved salts, Concentration of dissolved minerals such as iron, phosphorus, calcium, magnesium,	Marine Monitoring Data

		Concentration of first witness	
		Concentration of fixed nitrogen, pH,	
		Concentration of dissolved carbon dioxide,	
		Concentration of dissolved oxygen,	
		Concentration of other dissolved solutes and	
		nutrients, Marine sediment type and	
		distribution, Magnetic field strength and	
		direction	
Utilities	Electric Facilities	Electrical Generation Facilities	Electrical Generation
			Facilities
Utilities	Electric Facilities	Electrical Transmission Facilities	Electrical Transmission
ļ			Facilities
Utilities	Electric Facilities	Electrical Distribution Facilities	Electrical Distribution
			Facilities
Utilities	Electric Facilities	Electrical Utility Communications Facilities	Electrical Utility
0.1111100			Communications
			Facilities
Utilities	Potable Water Facilities	Water Production Facilities	Water Production
Othlities	Totable water Facilities	water Froduction Facilities	Facilities
TRUE	Potable Water Facilities	Water Distriction Parillian	
Utilities	Potable Water Facilities	Water Distribution Facilities	Water Distribution
.**	g :- g		Facilities
Utilities	Sanitary Sewer	Sewer Collection Facilities	Sewer Collection
	Facilities		Facilities
Utilities	Sanitary Sewer	Sewer Treatment Facilities	Sewer Treatment
	Facilities		Facilities
Utilities	Stormwater Sewer	Stormwater Sewer Collection Facilities	Stormwater Sewer
	Facilities		Collection Facilities
Utilities	Stormwater Sewer	Stormwater Sewer Catchment Areas	Stormwater Sewer
	Facilities		Catchment Areas
Utilities	Telecommunications	Telephone Cable Network Facilities	Telephone Cable
	Facilities	1	Network Facilities
Utilities	Telecommunications	Wireless Towers	Wireless Towers
	Facilities	101000	,, n eless 10 // els
Utilities	Waste Management	Landfill Facilities	Landfill Facilities
Othlics	Facilities	Landini i acintics	Landini i acinties
Utilities	Waste Management	Solid Waste Management Facilities	Solid Waste Management
Othlities	~	Solid Waste Management Facilities	Facilities
TRUE	Facilities	Call I Waste Calle dies Dante	
Utilities	Waste Management	Solid Waste Collection Routes	Solid Waste Collection
	Facilities	***	Routes
Transportation	Land Transportation	Highways, roads, tracks, trails	Road Network
Transportation	Land Transportation	Roads Linear Referencing Scheme	Roads Linear
			Referencing Scheme
Transportation	Land Transportation	Transit Routes, Bus Routes	Transit Routes
Transportation	Water Transportation	Water Transport Facilities	Water Transport
•	1	•	Facilities
Transportation	Water Transportation	Water Transport Routes, Water Taxi Routes,	Water Transport Routes
	- Santa - Sant	Ferry Routes	port reduces
Transportation	Water Transportation	Water Transport Aids to Navigation	Water Transport Aids to
11ansportation	Tracer Transportation	The sport rids to Havigation	Navigation
Transportation	Air Transpartation	Air Transportation Facility I agations Aircraft	_
Transportation	Air Transportation	Air Transportation Facility Locations, Airports,	Air Transportation
TD	A: T	Airstrips, Helipads	Facility Locations
Transportation	Air Transportation	Air Transportation Routes,	Air Transportation
			Routes

4 GEOSPATIAL APPLICATION GROUPINGS

BNSDI application grouping are those areas of related functional requirements that are needed either to support the management and operation of a central or network node metadata server and data clearinghouse, as well as those geospatial processing components that are needed in common to support other common business requirements of the stakeholder community. The most commonly needed BNSDI applications include the following, each of which is described in more detail in sections following:

- Data Publishing and Dissemination;
- General Data Viewing, Query and Reporting
- Spatially Enabled eGovernment Services;
- Geostatistical Analysis and Visualization;
- Sustainable Development Management;
- Environmental Sensitivity Assessment;
- Hazard, Risk and Vulnerability Assessment;
- Development Project Management;
- Asset Management;
- Navigation, Routing and Tracking;
- Spatially Enabled Document Management;
- Executive Dashboard;
- Volunteered Geographic Information;
- Field GIS;
- Geocoding;
- Online Virtual Education and Training;
- BNSDI Community Engagement.

The correlation between each of the above application groupings and the associated stakeholder activities that are related to each are indicated in Appendix D.

4.1 Data Publishing and Dissemination

The BNSDI will eventually accommodate data publishing from a central repository and/or map services made available from decentralized nodes on an interconnected and interoperable network. In all cases it is important that users are able to publish their information, browse or perform simple and advanced searches to find information, and once found to be able to view and use it according to data access authority and security rights.

Functional requirements related to this application grouping are summarized in the following:

Metadata Catalog. The BNSDI solution shall provide the users with the capability to catalogue common fundamental GIS data. The cataloguing shall be based on metadata international best practices and standards. It should be noted that the data cataloguing

services can be offered in the individual enterprise nodes i.e. in the agencies. The metadata could be harvested also to a central location where the user can browse for information that is updated almost on real time basis by the agencies. The Distributed Catalogue environment is more than just a catalogue of locator records. The Distributed Catalogue includes reference and/or access to data, ordering mechanisms, map graphics for data browsing, and other detailed use information that are provided through the metadata entries. This metadata acts in three roles: 1) documenting the location of the information, 2) documenting the content and structures of the information, and 3) providing the end-user with detailed information on its appropriate use.

Data publishing management. Data publishing is one of the more critical and effort consuming transactions in the BNSDI environment. In essence, it refers to how the fundamental GIS data is rolled up from the agency enterprise system where it is being maintained as part of their business activity and made available for use by the BNSDI community. BNSDI stakeholders could have the choice of publishing their own web services, or to pass a digital copy to a central BNSDI data repository for publishing on their behalf. In either case, the maintenance and publishing of regular updates should be carried out by the official custodian according to agreed policies and agreements. Agreements should address data content and format standards and updating frequency. Tools and procedures will need to be established to accept, check and transform data to a standardized form for use by others. This application area will need to include functionality to codify data updating and publishing agreements to a periodic workflow that can be implemented and monitored on a regular basis to ensure that there is reliable compliance with the terms of such agreements.

Data access. There are several means for viewing and sharing fundamental GIS information that could be required. Implementations of data access services may include one or a combination of the following:

- Web Map Service. A Web Map Service (WMS) is a standard protocol for serving geo-referenced map images over the Internet that are generated by a map server using data from a GIS database.
- Web Feature Service. Web Feature Service (WFS) standard provides an interface allowing requests for geographical features across the web using platform-independent calls.
- Offline (e.g. packaging and physical delivery of data sets in either hardcopy or softcopy);
- Direct to data store (e.g. soft goods delivery via ftp, specified via e-commerce order request);
- Brokered (e.g. provide specification of data access request to secondary access service online or offline);

 Online data service (e.g. state-full request/response access protocol to data warehouse) supporting online operations such as: Drill down, Aggregation and Generalization and Transformation.

Data access security management. Ideally the BNSDI will provide maximum access to the broadest range of geospatial data resources across the stakeholder community. However it is also recognized that some information is sensitive or proprietary and will need to be restricted to those with the specific need to know and access authority. The BNSDI security framework will need to accommodate methods for data access management and auditing controls in a multiuser database environment. This should include the ability to manage users' digital identities, credentials and groupings throughout the lifecycle of their membership in the BNSDI, as well as identify synchronization, certificate management, user password resets and user provisioning.

Catalogue of Services. There are a variety of geoprocessing services that can be developed by the BNSDI stakeholders or other entities that can be offered for use to others. Cataloging of these services allows others to know what is available, and whether or not it will be useful to the person who is accessing the catalog. This can include background services such things as an address geocoding service, vehicle tracking system, field mapping platform and others. The cataloging of geospatial services represents an extension to the application services metadata that would ideally be provided by the eGovernment portal.

This area of application functionality is ubiquitous across every stakeholder sector and has direct impact on many of their business areas. The specific functions that relate to this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area.

- Open Data Policies. In line with international experience, the government should ensure the free and open access to as much information as possible that does not compromise privacy, intellectual property rights and national security;
- Mobile access. With the growing number of mobile devices and ubiquitous connectivity it will be important that BNSDI published data be accessible from a variety of devices;
- There is increasingly a wide variety of open source and commercial GIS platforms available. Online data publishing should be based on commonly accepted web mapping service standards;
- Equitable access. There are segments of society in Belize that are not connected to the internet and do not have easy access to computing resources. Provision for access to BNSDI published data may require other channels, for example by providing access through village ICT centers, government public service counters or kiosks in public places;

- VGI. The BNSDI may consider the potential contribution of volunteered geographic information (VGI) from groups like OpenStreetMap and other social media and crowd-sourced channels. This may also include having the ability for these groups to consume web services or download data in a standard data format that can be accommodated by the group's platform;
- Some BNSDI users will need hardcopy outputs and may not have the equipment to support. The government may wish to establish a printing service at ICT Center locations, as well as provide a channel for users to route their map request to a commercial printing operation for output.
- The BNSDI may want to provide smartphone app developers in Belize with access to map data for incorporation to their work.

4.2 General Data Viewing, Query, Mapping and Reporting

Nearly every organization within the BNSDI stakeholder community is in need of the capability to access available data, view the contents, submit spatial or logical queries to isolate the specific features of interest, and to generate thematic maps and tabular reports.

Functional requirements related to this application grouping are summarized in the following:

Data access and navigation. The GIS should support broad data access and usage by non-GIS professionals. A common, standard user interface should provide predesigned and customizable user views to all the BNSDI GIS and related data sources, including vector data, aerial photography, and other media. This interface should be easy to use by non-GIS staff with minimal training, and should provide all the geographic data navigation tools (pan, zoom, identify, find, etc.) needed to browse and explore the available databases, develop custom maps, database queries, and document views. Scale dependent display capability may be provided to control what information and level of detail is displayed as a user zooms in or out. The interface should also be customizable by the users to suit their purpose.

Tabular query. The common GIS interface should support tabular query using standard structured query language (SQL) and Boolean (if, and, or, etc.) expressions. Easy to use query building functionality should support the user in querying any BNSDI database. The application will need to accommodate combined spatial and tabular query functionality to derive a selected set of information. The results of tabular queries should be simultaneously displayable in both tabular and mapped form. Users should have the ability to save and manage their own custom queries

Spatial query. The common GIS interface should support spatial query using standard geospatial selection routines including but not limited to overlay of existing or user defined boundaries, proximity, buffer, and others. Easy to use query building

functionality should support the user in querying the database. The results of spatial queries should be simultaneously displayable in both tabular and mapped form. The application will need to accommodate combined spatial and tabular query functionality to derive a selected set of information. Users should have the ability to save and manage their own custom queries.

Standard Reporting. With the intention of greater integration of information across the BNSDI community, the need to have reporting tools which can address the both the range of systems and user needs arises. Frequently, software applications with their own proprietary reporting tools do not integrate well with external systems. Also a diversity of reporting tools complicates user training, and ultimately limits usefulness. An integrated approach provides a common framework for developing reports that summarize information across multiple databases or application platforms.

Standard Mapping. A Map Series system provides the ability to generate and maintain standardized maps. While the map frame, look and feel remain the same, the information contained in each map reflects the current status of the underlying GIS database each time the map sheet is produced. The basic functional requirements for this application are outlined below. For maps series production, a spatial index or grid is used to delineate the boundaries of map pages. Set content, including specific features and symbology, is then displayed within a selected index map sheet for printing or generation of a digital map product for dissemination and viewing. Another type of map series that can be accommodated involves a set map frame, within which the geographic area, scale and content can change depending on the needs of a specific business process or user.

This area of application functionality is ubiquitous across every stakeholder sector and has direct impact on many of their business areas. The specific functions that relate to this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- A Discover Belize application that is specifically designed for smartphone use could be beneficial for mobile users. This could be developed by government, by a private company under licensing arrangement with the government or through a public/private partnership arrangement. This should include "suggestion box" functionality to channel feedback to the application developers;
- Use of the general map viewer could be monitored to discover patterns that may suggest areas for extension and refinement;
- The BNSDI may want to provide selected up to date information to the major providers of virtual globe information such as Google, Bing and Esri;

4.3 Spatially Enabled e-Government Services

The services described herein are general purpose geoprocessing functions that can be used to support e-Government applications. These capabilities may be offered through a central portal and embedded or adapted to meet the special needs of each specific e-Government service.

General Map View. The general map view services offer the same type of functionalities described under the General Data Viewing section, however, applied in the specific context of spatially enabling the general map view capabilities at the level of an individual node or sector. This will serve in this case as a ready-made tool box that can be tapped into any time in order to spatially enable the basic viewing capabilities of the concerned entity. This functional module could be added to any eGovernment service that can be enhanced by providing the ability to access and navigate custom map information.

Spatial Query Services. Spatial Query Services is the type of services that can be offered to the users on top of the basic viewing services. For example, the user may be looking for information about hospitals that fall within a certain perimeter buffer. This tool will provide the capability to perform a spatial query on the BNSDI data clearinghouse/ nodes in order to extract and portray the needed information in both spatial and tabular representation.

Geographic Locator. A Geographic Locator capability provides the ability for an eGovernment application user to quickly locate and zoom to a specific geographic area of interest. This is a relatively simple functional capability that can greatly streamline the user navigation of a large, seamless geographic database and to quickly find the area or location that they are looking for. Such capability requires extensive base map, place names, landmarks and other common reference information to support it. The basic requirements for this functionality are outlined below.

<u>Street addressing</u>. Street addressing requires both a consistent street numbering system and a robust engine to geo-locate addresses. Where street numbering is not available, street intersections can also be used. There is no systematic street addressing system in place for most of the Country. The effective utilization of this capability will require the development of the appropriate databases, including but not limited to:

- Street network, including street names and intersections;
- Place name gazetteer, including landmarks and common place names;
- Building addresses;
- Specialized location references (landmarks, points of interest, business names, etc.)

<u>Place name gazetteer</u>. Where street addressing is not available or appropriate, locating features by place name is possible. Place names may include village name, cultural landmark name, a historical place, a neighborhood or other such references that are generally known to the user community.

<u>Landmarks</u>. Landmarks are names of reference facilities whether they are churches, commercial centers, banks, restaurants, etc...that can be referred to easily (because they are known by the majority of people) in order to locate the specific geographic area of interest.

<u>Coordinates.</u> Coordinates information, where available, can be used to locate a specific geographic area of interest. This information can be mostly captured using GPS equipment or smart phone. Coordinates may be fed directly to the service by a user's device.

<u>National Grid Reference</u>. Many nations have applied the concept of a national grid reference system for locational reference. These systems are typically based on real world coordinates that have been systematically simplified to accommodate a smaller number of digits to reference geographic places within a single country than those that are required for comparable positional accuracy for the entire world.

<u>Intersections</u>. Street intersections can be used also to indicate the location of a specific geographic area of interest. For example, the office is located at the north-west corner of Smith Drive and Cohune Street.

<u>Pan & zoom.</u> The simplest tool for locating a geographic area of interest is the pan and zoom tool. The user will zoom from the small scale to the large scale until he reaches finally the sought location, supported by street names, place names and other contextual reference features.

<u>Telephone numbers</u>. Land line telephone numbers can be used where arrangements are made with the telephone company to match a phone number to a customer location. People and businesses may move taking their phone number with them, thus requiring close coordination of this information with the telephone company's customer records database.

<u>Crowd-sourced places</u>. The e-Merging Technology Report outlines the use of crowd-sourced information from cell phone users as a method to add to the breadth and depth of the database concerning commonly referenced places.

Customer Relation Management. A spatially enabled Customer Relation Management (CRM) system provides added value in being able to record and track complaints, incident reports and other public engagement over time. For example, the

system can be set up to accommodate user input from an address or geographic location through a smart phone, providing the ability for the user to enter information about an incident or complaint, to take a photo of the issue if relevant, and to submit this information to the CRM call center. Such entries can then be displayed and visualized by type of report, timeframe or any other relevant category information to more effectively respond and over time to understand the location and potential sources of repeat complaints.

This area of application functionality is ubiquitous across every stakeholder sector and has direct impact on many of their business areas. The specific functions that relate to this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Integrated Place Database and GeoSMS Translator. This would allow non-smartphone users to submit a place name to a server and have it return likely alternatives from which the user would pick. The coordinates for the returned choice would then be sent back to the user in GeoSMS for their use as a geographic location reference in other applications.
- The eGovernment platform should incorporate BNSDI mapping and geospatial analysis and visualization capabilities to support a variety of government and public engagements.

4.4 Geostatistical Analysis and Visualization

Modern GIS provides tools for geostatistical analysis and visualization that can bring new insights and understanding to complex information. A key functional capability of this application area is the generation of probabilistic surfaces based on distributed sample points. The results of various types of geospatial analyses can also be output to traditional statistical analysis packages that can be used to derive analysis results and to display the results in a spatial map. Basic functions within this application grouping include the following:

Surface analysis. This includes the application of various algorithms for the generation of probabilistic surfaces based on a set of distributed data points. This technique is used where there is the probability that the values between sampled points can be logically and reasonably interpolated, for example for topography, rainfall, temperature, depth to groundwater, and other such measurements in the natural environment. This can also be used for other types of data such as epidemiology, income, real estate values, and any other such measures. Such analysis is useful to explore the characteristics of a dataset, data variability, relationships among spatial features, and the identification of atypical data values. It can also be used to identify the probably errors in an interpreted surface that can also be used as one input to the refinement of a monitoring network.

Integration with statistical analysis routines. The results of spatial and tabular queries can be used in traditional alphanumeric statistical analysis packages and algorithms, and the results used to generate reports and graphs that can then be displayed with the mapped information.

Geostatistical visualization. GIS can support the display of geostatistical information in a variety of forms. This can include 3D visualization of an interpolated surface or the display of statistical graphs and charts on a map.

The Statistical Institute Belize (SIB) is the only authorized publisher of official government statistics, however there are many others that can benefit from geostatistical capabilities. The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

Crowd-sourced information and social media. Interaction with information from the public through online information capture, social media traffic and others can provide information that could be geostatistically analyzed to gain new and interesting insights.

4.5 Sustainable Development Management

The forecasting of population growth and land use change over time is needed to support more effective and coordinated planning across nearly every sector in Belize. The development of a common platform for refining and consolidating such projections would be useful to ensure that all affected stakeholders have input to the forecasting assumptions and visibility to the results. Such forecasting provides a useful platform for considering what policies and actions are needed to achieve certain targets and to measure whether the actual outcomes are evolving in alignment with these targets over time. This can result in better projections and more coordinated capital investment and operational planning over time. Basic functions within this application grouping include the following:

Population trend analysis and projections. A key parameter for effective growth management the rate of growth in real numbers and change in the socio-economic characteristics of the human population. The regular periodic population census can be augmented with household survey information to approximate change between census taking. Over time this information can be used to identify and project trends forward in time, qualified with various planning assumptions, scenarios and targets. This information can then be used with various planning coefficients to project community needs for various infrastructure, facilities and services. The projections and coefficients can also be compared to actual measured change over time as the basis for calibrating and improving projections with time.

Land use and cover change detection and trend analysis. The GIS should support the analysis of historical land use and land cover information to identify and analyze change in the urban, rural and natural landscapes. It should be able to correlate this information with other historical information regarding building permits and

development projects, to analyze trends and project the location and extent of potential future change.

Traffic data capture. The GIS should support the capture and management of traffic information from available sources and provide the analysis tools to understand the growth and change in transportation characteristics over time. These results can be used along with population and land use change projections to understand potential future transportation needs and the infrastructure that will be needed to support those future conditions.

Community facilities and services. The GIS should support the identification and characterization of various community facilities and services, including places of worship, hospitals, schools, community centers, parks, sports centers, and others. Coefficients can be defined that indicate what level of facilities and services are required to support a community and to predict what future development may be required to meet the needs of projected populations.

Utility networks. Utility network information should include sufficient information to support high level capacity analysis and modeling. The population and land use projections can be used to also project the level of utility infrastructure improvements, capacity and service area coverage will be needed in the future.

Sustainable development goals and objectives. The above components can be used to monitor and measure the attainment of the country's development goals and objectives over time. Developing and maintaining a framework that associates national policy and planning sustainability and resiliency targets against measurable change over time can provide an important basis for adaptive management. This analysis also provides important information for use in the Executive Dashboard described later.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- SketchMap capabilities. Applications such as "SketchMap" described in the e-Merging Technology report provide a means for planners to most effectively engage with stakeholders and the general public, to inform the dialog with evidence based information and to record and organize that information for later reference;
- Social Media. Providing linkages with all the most prominent social media networks could be leveraged to increase opportunities for two-way exchange with stakeholders and the public. This should allow use of SMS for non-smartphone users.

4.6 Environmental Sensitivity Assessment

The integrated analysis of environmental sensitivity is needed to support more effective and coordinated resource management, conservation and environmental impact assessment in Belize. The development of a common platform for refining and consolidating such analysis would be useful to ensure that all affected stakeholders have input to the determination of environmental sensitivity and visibility to the results for use in their own planning activities.

Such analysis provides a useful platform for considering what policies and actions are needed to achieve integrated environmental planning targets and to design new projects and programs to specifically avid or mitigate potential impacts. This also provides a basis to measure whether the actual outcomes are evolving in alignment with environmental targets over time. Basic functions within this application grouping include the following:

Integrated environmental assessment. The development of an integrated environmental assessment provides an important forum for broad and multi-sector consideration of the drivers, pressures and impacts of human activities on the environment both in terms of current context as well as future conditions that are likely to be the result of development growth and/or climate change in the future. By analyzing and recording the location, extent and characteristics of such sensitivities it is possible for the community to develop better mutual understanding of the most pressing environmental issues and the human activities that contribute to the vulnerability of these environments.

Environmental sensitivity flagging. The results of an integrated environmental assessment can be used on a site-specific basis to highlight environmental issues that need to be addressed for specific development projects. This type of flagging can be used as a proactive mechanism to inform project proponents about such issues so that they can be considered when considering investment decisions and project design that avoids or mitigates potential impacts. In some cases the actual locations of some sensitive features (e.g. archeological sites, endangered bird nesting sites, etc.) may need to be kept confidential, but listed as a potential area of sensitivity when proximal to a proposed project area.

Environmental impact assessment repository. Past and present environmental impact assessments (EIA's) can provide much information that is useful reference information when considering new projects and programs. This application grouping could include access to the archives of past EIA's, linking the project location on a map to the supporting documentation and data.

Cumulative environmental impact monitoring and reporting. EIA's typically address the anticipated impacts of a specific project in a specific location. The monitoring of the cumulative impacts of multiple development projects over time can provide additional information that is useful for the evaluation and refinement of future policies and planning methods and considerations.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Sensitive area monitoring. Development of working relationship with major satellite imagery companies might be worked out to identify areas of landscape change within environmentally sensitive areas that could be used to correlate with other information to determine if the activities are legal or not;
- Social media reporting. Use of the public to report suspicious activities in sensitive areas.

4.7 Hazard, Risk and Vulnerability Assessment and Planning Support

The integrated analysis of natural hazards and the associated risks and vulnerabilities is needed to support more disaster resistant urban and regional planning in Belize and in the development of well-informed disaster contingency and response plans for future events. This is even more urgent in consideration of the additional variability and risks that may be introduced by climate change.

The development of a common platform for refining and consolidating such analysis would be useful to ensure that all affected stakeholders have input to the determination of hazards, risks and vulnerabilities and visibility to the results for use in their own planning activities. Such analysis provides a useful platform for considering what policies and actions are needed to achieve risk management targets and to prepare effective disaster contingency planning and response in advance of actual events. Such analysis will also be useful as a reality check against national disaster insurance portfolio and rates.

Basic functions within this application grouping include the following:

Hazard assessment. GIS can be used effectively to identify and analyze hazards and determine vulnerability and risk. This can include the identification of both natural and manmade hazards, and facility and personnel vulnerabilities, including but not limited to:

- Flood;
- Wind;
- Storm surge;
- Fire;
- Earthquake;
- Subsidence:
- Marine spill;
- Toxic chemical transportation and storage;
- Medical waste transportation and disposal;

Vulnerability assessment. Once potential hazardous areas and conditions have been determined, this can be compared against land use, population, environmental, facilities, and other information to determine what human or natural resources may be at risk from those hazards. The location and characteristics of these vulnerable populations or resources can then be compared against various disaster scenarios to assess overall likelihood and degree of impact from each scenario as a way of determining overall vulnerability.

Contingency planning. Contingency plans consider both the hazard and vulnerability assessment information, and use this as a basis for helping to define conditional actions to be followed in the case of certain emergency scenarios. GIS has been used as a basis for developing and maintaining contingency plans and instructions.

Response and recovery support. Once a disaster event has happened, there is a great deal of communications and logistical coordination that needs to be carried out quickly and effectively. GIS has been used to support damage assessment and the tracking of emergency response resources during and immediately following an event. It has also been used effectively to support post-disaster recovery and re-building, to track the distribution of recovery materials and resources.

Disaster resistant planning and design. All the previous functional requirements described in this application grouping are largely reactive based on existing conditions. Disaster resistance can also be incorporated into community and infrastructure planning and design such that such hazards and vulnerability are avoided in the first place. This consideration should be built into the processes by which communities developed on an ongoing basis, including consideration of new or heightened risks due to climate change.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Provide AIS capability for monitoring the movement of ships, especially those carrying potentially hazardous materials;
- Require installation of tracking devices to all public and private vehicles and equipment that may need to be mobilized in an emergency;
- Crowd-sourcing and social media. Utilize information from the public in the identification of areas being impacted during an emergency;
- Investigate use of low-cost drones for reconnaissance during disaster response, damage assessment and recovery;
- Establish relationships with major satellite imagery providers to acquire the most accurate and timely post-disaster imagery following a major event. In advance, establish a "friends of Belize disaster relief" network of volunteers who can perform imagery interpretation and damage assessment for immediate use by responders;

4.8 Development project management

A majority of the financial support for public sector development investment in Belize today is sourced from a variety of international finance and donor organizations. At present these projects are formulated by various entities and then a process of review and qualification is facilitated by the Ministry of Finance and Economic Development. The formulation, design and implementation of the capital expenditure projects require access to quality information about the places they are to be located, the infrastructure or facilities they relate to, the populations they are intended to serve, and the benefits to be provided. They must also be

defined in a manner that avoids or mitigates adverse environmental and social impacts. The following summarizes the functionality to address this application area.

Project formulation. The formulation, assessment and refinement of project proposals requires consideration and analysis of a variety of issues, including a characterization of the beneficiaries and associated needs, definition of issues, opportunities and constraints that the project will need to consider, definition of project feasibility analysis (possibly addressing multiple alternative scenarios), appraisal and identification of any social and environmental impacts, and related information. There is also a need to compile and package project formulation information in the specific manner required by each donor institution.

Project implementation. Once a project has been approved for financing and implementation GIS functionality can be used to manage the implementation process. This can include many aspects of the implementation, from providing the contextual and detailed design, finance and scheduling information for an infrastructure or other physical development project to the general monitoring of project completion status of multiple projects by district or nationally. The system will also need the capability to output project status information in the reporting formats required by the different donors.

Project tracking. GIS can support the tracking of historical projects, inclusive of both those that have been proposed as well as those that were ultimately financed and implemented. Maintaining a geographic map illustrating the locations of all planned and implemented projects with linkages to the information about each can provide a very valuable perspective into what was considered and what was committed and developed over time.

Project monitoring and evaluation. The GIS and BNSDI can provide a solid foundation for the monitoring and evaluation of both individual projects as well as the assessment of the cumulative impacts and outcomes of multiple projects for communities, districts and nationally over time.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

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<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

 Incorporate crowd-source and social media for project formulation and execution feedback from affected communities

4.9 Asset Management

Asset management is a common requirement across most government entities and utilities. Having an accurate inventory, accounting and valuation of both fixed and movable assets is important to decision making regarding asset preventive maintenance, planning, operations and budgeting. When properly modeled, the same asset register that results from detailed facility mapping can also support financial and maintenance management as well as system network analysis in the case of utilities. Likewise the management of buildings, interior spaces and assets and grounds is a common functional requirement across entities that manage these assets. Each entity will have specialized asset management requirements to meet their own needs, however it is a valid role of the BNSDI to encourage entities to take an integrated approach and to ensure that the information can be generalized in a consistent manner for national asset accounting.

The following basic functional requirements are included within this BNSDI application grouping category:

Common asset registry. An integrated asset registry database provides the bridge between facility mapping, maintenance management, asset financial management, and system modeling. This requires that the elements needed for each of these activities is considered in the development of integrated databases and processes by which this information is modeled, captured and used. This integration is most effectively implemented when such systems are initially developed, thus avoiding the difficulties that can be associated with resolving inconsistent definitions and information across multiple systems that have been developed separately without such coordination.

Building space management. Buildings are important assets that in addition to the inventory information require tracking and allocation of spaces for offices and other uses. GIS can be used to allocate and schedule space allocation within buildings.

Movable asset tracking. Movable assets such as vehicles and heavy equipment can also be tracked spatially. This can be carried out as a static recording of the general location an asset has been moved to or can be live tracking, for example keeping track of a fleet of vehicles (as described in the section following).

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

4.10 Navigation, Routing and Tracking

GIS can be used as an effective way to analyze optimum paths for vehicle routing, work crew routing, meter reader routing, inspection routing, garbage pickup routing, and other optimum route and logistics management uses. It can also be used as a public service, to provide way-finding directions for drivers and pedestrians. The basic GIS requirements for this functionality include the following:

Origination and destination location reference. Routing requires the definition of location for both the origination and destination of a trip. In the case of multiple stop trips this may include a series of locations. The "Locator" function described elsewhere can provide the geographic reference framework for establishing such locations through street address where they exist, geographic coordinates, points of interest and other place reference schemes that would be familiar to the users.

Shortest path. This functionality in GIS can be used to determine the most efficient way for a vehicle to move from one place to another, taking into account the available roads, their characteristics, road closures and other issues. This is most effective for the routing of police, fire, and ambulances or way-finding instructions for drivers or pedestrians.

Logistical route analysis. Logistical route analysis is used to determine the best route for garbage collection trucks, delivery vehicles, conduct inspections and other such activities that require making a series of visits using the optimum routing. This type of analysis considers the capacity of the vehicle, the number, location and characteristics of stops to be carried out, the need to cycle efficiently back to the point of beginning or to an eventual delivery point (like a landfill for garbage to be emptied from a garbage truck at the end of each route).

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Provide a catalog of low-cost location tracking devices for reference by BNSDI users;
- Utilize social media for traffic congestion and traffic incident reporting:
- Make navigable road database, crowd-sourced traffic monitoring, gazetteer and crowd-source points of interest available to those wishing to use those services or to incorporate those into their own service.

4.11 Spatially Enabled Document Management

GIS-linked document management offers managing, integrating and exploring all manner of multiple media information resources, including map data, documents, photographs, aerial photography, books, journals, videos, audio presentations, studies, and websites, among others. This technology can be used as a "knowledge management" foundation for the cataloging, retrieval and management of all manner of information resources as a "knowledge management" system to support the planning, research and operations. Of key relevance is the ability to retrieve a variety of documents that relate to an individual case file, where such documents have been tagged to the case file. This will be especially important

for linking to the various case file repositories that have been scanned and digitally archived in different organizations.

Spatial footprint capture. The spatial footprint capture functionality provides the ability to tie a document or other media to the geographic location or area it refers to. For example, the boundary of a project can be tied to the digital information contained in the project's case file. Likewise the design drawings for a road can be tied to a centerline representing the portion of the road they refer to.

Integrated cataloging and metadata standards. Cross-media management technology should combine and integrate metadata and cataloging standards from the library science (e.g. Machine Readable Cataloguing), geospatial (e.g. Federal Geographic Data Committee/Open Geospatial Consortium/International Standards Organization) and multimedia (e.g. Dublin Core) communities and provide data exploration tools that allow a researcher to navigate and correlate information resources by topic, location and time. This catalog could also provide cross-references to the case file, property, transaction, and other operational activities that may have a linkage to documents and other library resources.

Document access, exploration, and retrieval tools. The end user community for the digital library should have the ability to navigate the information through catalog browsing or searching, through tabular queries, spatial selections, calendar selections and other techniques. Once the appropriate information has been located through the metadata catalog, the user should have the ability to retrieve the electronic version of that information directly, and to view and further manipulate or analyze that information in the appropriate environment. Selected information can also be exposed to the public through the Portal, if desired.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

• Link government documents to the places they refer to. A place name recognition tool could be used to automatically identify names in the text and connect them to geographic locations through the gazetteer and points of interest datasets;

4.12 Executive Dashboard

An executive dashboard, targeted at executives and other high-level decision makers, is often a combination of automated tools for standard reporting of key indicators, as well as an analyst-supported function. Whereas many day-to-day decision support needs might be met by standardized reporting tools or simple applications, many of the decision making needs of executives require synthesis of complex variables, understanding of key business questions, as well as compelling graphic communication to make complex information and issues understandable to a lay audience. These various skills often are best served by support staff, using a set of tools specifically designed to support the decision-making environment.

Metrics monitoring. There are a number of key metrics that executives in Belize may be interested to monitor, relating to sustainable development goals, public sector investment, government performance, revenues and expenditures, public opinion trends, economic development indicators and other relevant information. An executive dashboard will often draw information from a multitude of sources across the BNSDI community, and apply statistical and geostatistical routines to summarize the information by topic and/or geographic area.

Visualization and display. Often, images can best communicate complex factors in more compelling manner and at summary levels. A key element of most decision support systems is graphic display of results. This might be as simple as statistical graphs and charts, but should also include mapping and 3D data visualization.

Scenario Analysis. Scenario analysis involves examining the predicted outcomes of different decisions and/or policies. For example, a scenario analysis might look at the different social and economic impacts of a change to property values. There are typically two different types of Scenario Analysis:

<u>Condition Scenarios</u>. Condition Scenarios can also be referred to as 'If-Then' analysis. Condition Scenarios model potential outcomes based on specific inputs by the user. For example, staff could model impacts to tourism revenue based on anticipated damage to touristic facilities by a major hurricane scenario. Condition Scenarios also allow users to test the likely outcomes of various mitigation scenarios and measures.

<u>Projected/Proposed Scenarios</u>. Projected/Proposed Scenarios address predicted changes based on existing data trends. A typical model might examine projected revenues from a property value reappraisal initiative.

Sensitivity Analysis. Sensitivity Analysis involves looking at the sensitivity of criteria used to evaluate a decision. For instance, what is the likely price sensitivity of different types of tenants to possible changes in National Estate property rental rates? Sensitivity analysis would examine how the results change based on which criteria are weighted heaviest. Sensitivity analysis is useful for identifying solutions to problems wherein there is significant input from multiple stakeholders with conflicting value systems.

Uncertainty Analysis. This function uses metrics for accounting for missing knowledge or data and the influence or risks in decision-making. Decision makers can evaluate how missing data or knowledge influences their confidence level in the predicted outcomes of the decision.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Utilize BNSDI and eGovernment network as sources for Big Data access and analysis applications to identify issues and patterns that might not otherwise be discernable. When tied geographically to communities and neighborhoods this can help to reveal emerging issues before they become civic problems;
- Incorporate social media feeds and analysis to better understand what the public in general is interested in or concerned about.

4.13 Volunteered Geographic Information

The ubiquitous adoption of spatially-aware smart phone technology, other mobile information devices, wiki technologies and the internet has catalyzed public interest in recording and providing information for common use by others. This movement takes advantage of the distributed knowledge, personal time and energy of volunteers who can provide various information such as place names, points of interest, streets, street names, and other such general or specific interest information. Through this process the community members become both producers and users of the information provided. This trend has opened an area of tremendous value in the contribution of useful information for use within an NSDI, however this departs significantly from the traditional notion of "authoritative" data that has been officially recognized by government with both advantages and risks. On the positive side, the collection, use and refinement of information by a broadly-based community can provide a level of checks and balances that verifies information as part of the However depending on the nature of the information topic, publicly sourced information may not be based on the scientific or systematic rigor that may be required to authenticate the information provided. However, crowd sourced information initiatives such as Open Street Map < http://www.openstreetmap.org>, Open Data for Resilience < https://www.gfdrr.org/opendri> and many others (see "Crowdsourcing and Government about governmental projects that incorporate crowdsourced data" https://crowdgov.wordpress.com/>) are proving that the benefits can outweigh the risks for certain applications and are worth further exploration in relation to the BNSDI.

Volunteered and crowdsourced geographic information is a rapidly evolving field. Available relevant case studies suggest that basic functional requirements to support BNSDI-facilitated crowdsourced information include the following:

Community facilitation and support. The development of useful crowd-sourced information often requires some level of community facilitation and support. At a minimum, potential participants need to be made aware of the opportunity to contribute information and the process and tools available to do so. This may be more involved as is the case with OpenStreetMap or more application driven such as smart phone

applications to support citizen reporting of potholes in a roadway or street lights that are not working.

Data access and display. Basic contextual information such as street centerlines with street and community names, building footprints and aerial photography may be needed to provide the contextual information needed to support certain types of volunteered information. Such information should be made available through smart phones and other mobile devices and be sufficiently accurate to support location verification if a gps coordinate is being captured, or the appropriate feature information needed to establish the object or location being referenced.

Incident reporting. The ability to report an incident or observation in a very simplified manner can help to encourage and support public reporting. This can be very useful for noting issues that would otherwise require time consuming and expensive surveys by government staff. Examples include noting of roadway pavement potholes, graffiti, non-operating street lights, illegally dumped garbage, or other such issues.

Data entry and editing. In some cases the capture of a location can be accomplished by capturing a GPS from a specialized receiver or smart phone, or pointing at a feature on a map. Other cases may require more extensive data entry capabilities for example to trace a building footprint or other boundary or linear feature from an aerial photo. In addition to the entry of vector information, the user may also require the ability to enter attributes that relate to the geographic feature entered. Where specific information is being collected (e.g. building structure description or information about an observed animal species) it may be useful to provide an input form with drop-down menus to ensure consistency of the information being captured.

Wiki metadata. As with "official" sources of geospatial information, knowing characteristics of information sourced from volunteers is also useful to understand the nature and possible limitations or advantages of the contributed information. At a minimum the automated capture of date, time and method used to establish location information may be useful. Other more specific information regarding the contributor, the purpose for contribution, contact information and other such data may be useful but more difficult to capture on a consistent basis.

Solicited input. Information from the public can also be solicited by government in a directed manner. This can include conducting polls, asking for public opinion about certain subjects, collecting information about market prices, or soliciting crop status information from farmers. With the wide availability and adoption of mobile telephones and increasing rate of internet accessibility, the technologies are opening new channels and methods for two-way exchange of information with the public.

Unsupervised data capture. Today anybody that carries a cell phone, uses a car navigation system or computer is a potential source of sometimes useful information that does not require a user response. The movement of cell phones can be traced in an anonymous fashion that provides insights to how vehicular and pedestrian traffic is moving on a real time basis. Likewise vehicle fleets and active car navigations systems transmit information that can be used to detect traffic jams and other issues. With the growing number of location-aware sensing devices it is increasingly possible to used and combine this sort of information to gain insights into how a city or nation functions.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Encourage and support crowd-sourced VGI and related social media engagement;
- Utilize VGI to assess areas of authoritative mapping that may require updating.

4.14 Field GIS

A Mobile GIS allowing BNSDI users to access and use GIS and other related data from the field is key to streamlining many field inspection and inventory activities. This application functionality will provide field GIS and data collection and access capabilities that can be configured to each of the relevant business processes. Field personnel could have the ability to access BNSDI GIS, case file documents and tabular databases from site locations anywhere in the country in connected and/or disconnected mode. GPS technology can be used to establish a user's location and collecting coordinates where precision accuracy is not required. This application can also accommodate integration with Continuously Operating Reference Station (CORS), Total Station and other survey technology components in situations where high precision spatial accuracy and measurements are required.

Basic functional requirements for this application area include the following:

Field data access and editing. This application functionality can support access to selected BNSDI data from the field, inclusive of GIS, documents (including text, sound and photograph or video files) and tabular databases, and the capability to add new information or edit existing data. The application would need to accommodate both connected and disconnected modes.

Configurable to multiple mobile platforms. This functionality should be able to be installed and used on a variety of mobile platforms such as Windows mobile devices, tablet PC, laptops, iPad, and others. This would also require remote connectivity via 3G, 4G or other embedded broadband or Wi-Fi solution. It would also need to accommodate digital camera, range finder, GPS, total station and other field measurement technologies.

Support development of custom forms and maps. The functionality should be configurable to meet the needs of individual business processes, including the ability to create custom forms and maps for use by field staff. For example, the SIB should be able to configure forms to support household surveys and population census taking, while the police may traffic accident reports or speeding tickets.

Ability to operate in connected or disconnected modes. In most cases, access to live BNSDI data in connected mode is preferred. However, in cases where internet or network connectivity may not be available or reliable, the application should support an ability to operate in a disconnected mode, providing for download of needed information to be used in the field, and the uploading of any data edits or information once back in the office or the next time network connectivity is available.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Promote and support the use of mobile devices for field mapping, both by professionals and the public;
- Establish forum for all those conducting field surveys to coordinate in regards to latest technologies and methods;
- Establish a service center where equipment for mobile mapping and drone imaging services can be made available for a fee.

4.15 Geocoding

A geocoding service can provide the location information in x and y of a geographic area of interest based on provided input. The input can be the unique ID of several variables including an address, a building or a property. The tool will do calculations where necessary in order to extract and publish the location information as needed. The various inputs to the geocoding tool are described below:

Address. The addressing system may be based on a comprehensive lineage system associated with a street segment. The geocoding tool will calculate the location information either by locating the specific address or where only address ranges are captured by prorating the actual or reserved addressing information at the beginning and end of the street segment, where the address information has been structured in this manner.

Building. In absence of a structured and consistent street naming and addressing system, it is possible to develop and adopt an equivalent unique numbering ID for buildings. This information can be used as a common reference across the BNSDI

stakeholder community that can be used to tie any type of tabular information back to the building that it is referencing.

Property. Property unique ID can be used also to capture the location information similar to buildings.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- Establish universal place reference database that allows a user to use any number of common location references to identify a specific place;
- Allow users to reference a place and receive back the geographic coordinates and/or the GeoSMS for that location through a place name to GeoSMS translator;
- Accommodate the use of non-smartphones for accessing the place name to GeoSMS translator.

4.16 Online Virtual Education and Training

The increasing rate of internet adoption is opening new opportunities for education and training. Beyond the use of virtual online curricula as a part of formal diploma or certificate education the channel can also be used to support individuals in increasing their skillsets and establishing new job opportunities. There are already many international resources available online for learning GIS skills, and it may be desirable to develop courses that are specifically tailored to Belize or the Latin America and Caribbean region. The types of application requirements for supporting online virtual education and training include generally the following:

Access to existing resources. There are many universities, colleges, technical schools and companies that offer online education in GIS. Some are generic and publicly available while others are part of a formal curriculum or require subscription. Several well-established programs can be reviewed through the following URL < http://www.gislounge.com/gis-distance-learning/>

Course building tools. There is today a wide variety of tools available for building custom courses. Some of these are freely available open source tools and others require purchase and/or licensing. A broad range of the better known Learning Management Systems can be reviewed through the following URL < http://www.bestuniversities.com/blog/2009/how-to-create-your-own-online-course-100-tools-guides-and-resources/

Access to data. The most effective GIS training can be carried out using data that the student can relate to directly. Providing access to selected BNSDI data resources could

provide a wealth of information that could be used by students to learn more about the country while building their GIS technical skills.

Access to instructor and technical support. Access to online resources can be a great advantage for students to learn at their own pace and at times that are convenient for their own schedule. However there are times when access to a human instructor, other students of technical support is also needed. Any effective online course should make some provision for this sort of access on an as-needed basis.

Job market access. The purpose for online GIS education is to gain skills that will enhance existing skillsets or develop new skillsets that can be used to gain employment. An online education channel can also provide access to a pool of persons with GIS skillsets and a place for students to find employers that are looking for such skills.

The specific business areas of each of the BNSDI stakeholders that can be supported by this application grouping are indicated in Appendix D.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

- As a national priority, establish internet availability that is more comparable in cost and performance than those available in other countries in the Caribbean;
- Promote increased access to internet resources for remote village and poor neighborhoods;
- Promote the development of locally manufactured inexpensive computers with internet connectivity.

4.17 BNSDI Community Engagement

A functional BNSDI will require active engagement with the stakeholder community. International experience suggests the need for several types of outreach and communication functions that allow the community to communicate, coordinate and exchange information among each other, with the public, and with selected international stakeholders and partners. Besides supporting the needs of the BNSDI initiative, this application area is also considered as an integral part of the Belize information infrastructure program that would ideally include very direct and active collaboration with the SIB, e-Government program, the National Meteorological Office and others.

International experience suggests that an effective web-based BNSDI community engagement channel should support the following requirements at a minimum:

Government BNSDI program identity and descriptions. There is a need to describe the purpose, benefits and process of BNSDI development programs in Belize. This should be written in a form that is easily understood by the public audience, and should make a clear and compelling case for why these programs have been

undertaken, and the benefits that the agency stakeholders and public should gain over time.

Agency directory and links. A master directory to all the Belize government agencies involved in the BNSDI should be provided including a general description of each, location address, contact information, and other basic data. Where there is an agency website available, this directory should also provide a direct link.

Data catalog. A searchable metadata catalog should be provided that allows any user to search for geographic or statistical data regarding any topic or area of interest. This catalog should be consistent with international metadata standards, and would be maintained by the data custodians, either directly or through the "harvesting" of basic metadata information from an agency's server by a central metadata catalog.

Government services catalog. A searchable metadata catalog should be provided that allows any user to identify the source of various government services or facilities. Ideally, this function should also allow the user to indicate a geographic location to help determine what specific government branch office may be responsible for a particular location.

Access to geospatial and statistical data services. One or more agencies may provide the user with the ability to access, manage and use geographic or statistical data according to their user type. For example, some users may be the authorized custodians of information on a portal node, and will have the ability to download, edit and upload information for use by others. Other users will be able to download only, and others may wish to access, view, analyze and display information through server-based online services.

General search function. Standard website indexing and search capabilities should be provided to allow users to perform less structured investigations of available information. Ultimately, such indexing should include all the explicit catalogs as well as data content to allow for the broadest search capabilities.

Registration and partnership. Interested persons and agencies should be provided with a function that allows them to register their interest so that they can be included in community information exchange, events, workshops, conferences, participation opportunities and other issues of mutual interest. Over time a database of such registrants will provide a valuable directory of all those persons included in the extended community of stakeholders with an interest in the BNSDI.

<u>e-Merging Technology Implications</u>. The following e-Merging technology trends may be relevant in the formulation of this Application Grouping area:

 Utilize selected social media channels to maintain two-way exchange of information with the BNSDI community.

5 COMPUTING INFRASTRUCTURE

The computing infrastructure of the BNSDI will be generally compliant with international standards for enterprise service oriented architecture. Areas of this that require specialized treatment in regards to GIS and SDI requirements are outlined below. The computing infrastructure section addresses requirement for the following general components:

- Nodes
- Network
- Enterprise
- Standards & Architecture

5.1 Nodes

Each node on the BNSDI network will need to include specific hardware and software that will connect and interoperate with the rest of the network. These components will include web, data and application servers (currently GeoNode but may need to support heterogeneous platforms using geospatial data publishing standards depending on the scope of each node), and standards-based software for geographic metadata, mapping and basic application services.

Hardware & Software. The hardware and software will be described here in the context of the Central node. However, the same general requirements apply to any distributed node. Two categories are described:

- BNSDI Platform and Portal
- Geospatial Data Clearinghouse
 - o GIS Processing Software
 - Portal Container Architecture and Integration with the Geospatial Portal
 - Service Management Support Infrastructure

There is a need to establish a well-structured, administered and secure central node that will be the main hub of the BNSDI network. While it is theoretically possible to utilize an entirely distributed virtual environment for the BNSDI, experience suggests that not all stakeholders will immediately have the technical capacity to build, maintain and operate their own node. In advance of that capacity it should be anticipated that the publishing of data from some custodians will need to be supported by the BNSDI facilitation group, thus requiring some level of centralized infrastructure to support this function.

The hardware and software for the central node would ideally be hosted in a location that will act as an operational data center for all relevant data centers used to house mission critical computer systems and associated components in government, such as the eGovernment Data Center. Doing so would require some level of assurance that the Center would assure 24/7/365 access with virtually no down time.

BNSDI GIS Platform and Portal

A Geospatial Portal is a single point of access to spatial information, regardless of the location, format, or structure of the data source. An effective portal connects desktop and remote users with disparate data holdings and applications. A Geospatial Portal supports:

Collaboration: A Geospatial portal allows users to publish, share, and disseminate data and GIS web services across the community.

Searching: Access/Search allows a user to discover GIS data and web services for a geographic area in the desired context, whether the search is defined spatially and/or thematically. Metadata stored in the portal catalog contains the knowledge on how to connect and utilize distributed geospatial databases and applications.

Categorization: A portal catalogs GIS data and web services for delivery to the user within the context needed

Geospatial portals are built on top of underlying web technology and standards-based GIS software. Network communication between clients and web servers uses the Hypertext Transmission Protocol (HTTP). A portal is essentially a master website, connected to a web server, which contains a database of metadata information about geographic data and services. The services are built and exposed as web services, that is, self-contained, self-describing web applications that can be invoked over the web using messages encoded in Extensible Markup Language (XML) and transmitted over an HTTP connection.

A GIS network has three key building blocks:

- Metadata portal catalogs where users can search for and find GIS information relevant to their needs;
- GIS nodes where users compile and publish GIS information sets;
- GIS users who search for, find, and then connect to and use published GIS data and services.

As a compatible adjunct to the Belize e-Government program, the GIS network should further support spatial enabling of e-Government services through a centrally coordinated Portal environment.

A key component in a geospatial portal is a portal catalog, a registry of all significant data holdings and information sets, regardless of whether that information is accessible to all users or not. This portal catalog is searchable through the search function. The search function provides easy-to-use methods to the portal user to discover geospatial data by keyword, navigate through data categories, visualize live geospatial data, or connect to related applications. A portal catalog is a GIS database that stores indexed geospatial

metadata. A number of GIS users act as data stewards who compile and publish their data sets for shared use by other organizations. They register their information sets at a portal catalog.

Content for a portal catalog can be published and maintained using various harvesting methods. This can allow users to connect to the portal metadata service and publish metadata directly from the geospatial data or from separate collections of metadata files. Users can also upload XML files or automatically harvest from different kinds of metadata repositories including ArcIMS® metadata services, Z39.50 clearinghouse nodes, web-accessible folders, or Open Archive Initiative (OAI) metadata services. The XML upload function is a web-based interface that allows users to publish metadata into a portal catalog by submitting metadata content in XML format. Metadata harvesting is an automated scheduled process for collecting new and updated metadata from a wide variety of GIS metadata sources. The process of harvesting allows a portal to synchronize its metadata with publishers' metadata.

The Geospatial Portal, currently GeoNode established at the MNRA LIC is a centralized hub that can facilitate and support access to both central and distributed repositories. Other remote services can also be established by other agencies and linked to the BNSDI central portal.

The BNSDI Portal software components will need to support the following requirements:

RDBMS Software: This software will manage metadata and spatial data components. For high availability environments as is required by the portal, RDBMS software should be used that provides a proven, industry standards based platform. The RDBMS will need to interoperate well with other geospatial software components and support databases that may reach many terabytes in size. When deciding on an RDBMS platform, high availability, cost, and ease-of-use will be important considerations. For example, Oracle is a high-quality, high-reliability product that provides a large amount of tuning capabilities to meet almost any RDBMS need, however specialized. SQL Server, by contrast, may not be as sophisticated as Oracle but is less costly and also much easier to use.

Application Server Software: This software will support most of the Internet based operations that will occur on the portal as well as on agency nodes. The software comprises the middle-tier or server side of the implementation and will typically provide search, query, downloading, and map services software. Since data sharing (including, for example, joint display of different sources through the same map service) is an important capability of a geospatial portal, interoperability of services components is an important consideration when selecting them. This implies capabilities to support open standards specifications so service providers can develop client applications based on standard interfaces, without needing explicit knowledge of the underlying infrastructure that provides a service. There are a number of

application services suites available that provide these capabilities. Examples include the GeoNode open source platform, ESRI's ArcGIS Server Map and Metadata Server products, Intergraph's GeoMedia Server Products, MapInfo's MapXtreme, as well as the University of Minnesota's MapServer products.

Web Server Software: This software manages web traffic and web requests and is responsible for translating and routing requests to their application server components. A number of products have high performance capabilities, including IBM's WebSphere, Microsoft's IIS, Oracle WebLogic, Red Hat JBoss, and Sun's iPlanet products. Also there is the open source Apache Tomcat product, although it should be noted that a higher availability version of this product is encapsulated within WebSphere.

Web Client Software: These software components are typically built as browser applications and provide the user with a number of capabilities that typically draw on the application server components. In a standards-based environment, developers may build and deploy any number of functions and capabilities using standard protocols and interfaces to application servers. However, the basic applications that will likely have to be available for the portal include a map viewer and metadata search, query, and discovery tools. Examples of standards-based products that are available to meet these needs include GeoNode, ESRI's ArcExplorer and Metadata Explorer tools, Intergraph's GeoMedia Viewer, MapInfo's MapXtreme, as well as the University of Minnesota's MapServer acting as client component.

GIS Processing Software: Functions this software will have to address include metadata creation tools, as well as spatial data management and deployment. Both the portal and agency nodes will have a need for this software. However, requirements at agency nodes will likely be heavier given their need to support internal enterprise business needs.

Geospatial Data Clearinghouse

A Geospatial Data Clearinghouse is a spatial data server that has digital geographic data primarily for use in Geographic Information Systems (GIS), image processing systems, and other modeling software. These data collections can be searched through a single interface based on their descriptions, or "metadata." "Clearinghouse" is a generic name for an information distribution system using electronic information distribution media such as the Internet. The term "clearinghouse" refers to a system for retrieving and providing (meta-) data that is structured for the purpose of meeting requests of general users. The data is prepared by organizations participating in the clearinghouse and includes metadata that describe individual subject matters of the data. When structuring a clearinghouse system for providing geographic information, it is necessary for the clearinghouse to meet the following requirements of users:

- Allow spatial data to be retrieved with metadata as a key, describing concrete features of the data (including authors of data, purposes of use, spatial scope, a time window, quality, means of access, etc.);
- Allow users to appraise the data and judge relevancy to their needs without inquiry to a database administrator, indicate how to retrieve data and support users for their retrieval, if needed.

In addition, when a user delivers multiple simultaneous retrieval requests to a related clearinghouse, the system must be able to handle them in an organized manner and arrange results to be sent back to the user. It has been already found effective for the clearinghouse of geographic information to comply with the standard on geographic information metadata, ISO 19115, as well as the standard on information retrieval application services and protocols, ISO 23950.

The BNSDI Data Clearinghouse in the initial stage will hold the data from the LIC as well as hosting on behalf of other data custodians who may not yet be prepared to manage their own GeoNode portal. The stakeholders will provide the data to the BNSDI Data Clearinghouse in an exchangeable GIS format so it can be processed for loading into the Geodatabase. The Geoportal will have access inside the security zone to the Data Clearinghouse and make it available to the users.

The hardware and software required by the Data Clearinghouse are detailed under the Database Server and supplemented by the information below:

Data Server and Disk Space Requirements: The BNSDI Clearinghouse will have larger data holdings, especially, if data is provided in multiple formats. This is the case especially for large-scale data sources or FGDS custodians that will manage large amounts of image data. Even if such a repository is not directly available to end users (i.e., only index data may in fact be deployable over the Internet), maintaining such inventories so they are easily retrievable will still require significant disk capacity and data server infrastructure.

Staging and Development Environment: FGDS data that is made available as part of BNSDI must be separated from agency-specific data and processed for BNSDI-specific deployment. This implies a staging and development environment where operational staff will perform the necessary GIS processing functions to structure information content for BNSDI purposes and quality check and deploy it to the shared environment. In terms of hardware, the staging requirement will require a database server and a GIS processing software platform. In terms of software, the environment will require GIS processing software, RDBMS software, and possibly tools and utilities that can manage file and format conversions.

Realizing efficiencies in infrastructure by sharing facilities: While many BNSDI nodes will ultimately host large data repositories, many agencies' holdings will not have the necessary technical infrastructure to deploy a FGDS data server. In those circumstances, the BNSDI Clearinghouse will be the host of these data for as long as needed. The central data clearinghouse may also be used as a secure, central repository of all the most valuable information as a security and fail-safe data protection and preservation measure.

Availability of the environment: The Data Clearinghouse should be made available in a high-reliability, high-availability environment. This should be top priority component of the initial BNSDI phase.

GIS processing software

While GIS processing requirements on the portal may be limited to tools that, for example, provide metadata creation capabilities, or perhaps simple processing operations, GIS processing software for the agency nodes will also have to support potentially complex editing operations. These capabilities will be made available on the protected or secured area.

Portal Container Architecture and Integration with the Geospatial Portal

A portal can be seen as a site featuring a suite of commonly used services, serving as a starting point and frequent gateway to the web (web portal) or a niche topic (vertical portal). The Geospatial Portal should provide the necessary built-in capacity to become a portlet (JSR 168 Java Portlet Specification) on a future stage if the eGov initiative moves toward it.

Connectivity & bandwidth.

The connectivity and bandwidth of the nodes can be described in terms of:

- Internal connectivity to the GIS & SDI support infrastructure i.e. to the Enterprise GIS platform in the case of an enterprise node or to the BNSDI data center in the case of the Central node;
- External connectivity i.e. the internet or other communication platform that may adopted among the government agencies.

A distributed BNSDI implementation depends on the availability of appropriate network resources. A review of requirements revealed that network resources may be limited in some circumstances, even among government agencies. This will require careful consideration of the types of services to provide at what level in the near-term. However, it should be noted that even in limited network environments a considerable amount of services could be made available to broad user bases, even over dial-up lines. This is particularly true for services

related to metadata search and query (i.e., those critical to data discovery), since these services tend to require only small amounts of network traffic.

Best practices and benchmarks for network design and performance provide performance guidelines for GIS and web mapping applications in terms of data volumes, data transfer rates, and network bandwidth. When implementing a geospatial data portal as well as BNSDI nodes, these best practices should be utilized in conjunction with monitoring processes to tune the portal and BNSDI node environments.

Network Communication Guidelines for GIS Applications: best practice design benchmarks show the number of clients that can access GIS software by environment type and type of LAN or WAN connection for dedicated usage. They should be used as guidelines.

Network Performance for Web Mapping Solutions: Implementation of web map services, which is one of the most common applications on a typical NSDI node or portal, places additional impacts on a network. The level of impact depends on the complexity of the map services. Map services with limited complexity or with less than 10 KB of data, will likely have little impact on network traffic. Best practices provide an overview of network performance characteristics that should be considered for a web mapping solution. Web products should be designed to support user needs, which may be dominated by available bandwidth. Standard map services should produce image sizes of 30 to 50 KB to minimize network transport time.

Data Download Performance: Another application that may have to be supported on a BNSDI node or portal includes data downloading services. Data downloading times can be considerable for even comparatively small GIS data sets when bandwidth is limited. Data downloads can very easily dominate available bandwidth and degrade performance of other web mapping clients, especially where large imagery files are involved. Therefore, data downloads should be restricted to protect web site Internet service bandwidth, especially where network resources are limited.

Security/ Reliability.

Reliability will require a high availability environment as described below. Security of the geospatial portal will comply with the security requirements that are described in the Security Layer Architecture component in the ISO27001 "Information Security Management" standards.

High Availability Environment

To always allow users to search and discover published data holdings, the portal environment should be configured as a high availability environment. High-availability

operations require redundant server solutions, configured so the site remains operational in the event of any single platform failure. This configuration includes the following strategies:

Network load balancing: Network load balancing routes the traffic to each of the web and application servers during normal operations and only to the active web and/or application servers if one of the servers fails;

Application server load balancing: Application server load balancing distributes server processing load between the two server platforms to avoid having requests back up on one server when extra processing resources are available on the other server;

Two data servers clustered and connected to a common storage array data source: The primary data server supports query services during normal operations, and the secondary data server takes over query services when the primary server fails.

Geospatial Portal Security

Maintaining a secure system is important in protecting the integrity of the information being used by multiple stakeholders, as well as ensuring data access only to those with the authorization to do so. Considerations include:

Authentication and access to GIS processing services: The initial stage of the Geospatial Portal must comply with the security policies defined by the stakeholders as well as the ones that may be placed by CITO as part of the government initiative. The Geospatial Portal will have two defined areas: one public and another restricted to stakeholders.

Public area: open to the community with limited access to search the metadata database and view data that have been determined to be appropriate and useful for the general public. This area does not require a password.

Restricted to stakeholders: a password protected area not visible to the general public. The security schema will be defined and agreed upon by the members of the agency technical representation. The members will have full access to the Data Clearinghouse and web map services according to their rights defined by the agency technical representation. There may be multiple levels of restricted access, depending on government policies in this regard.

System Monitoring

While the specifications provided in best practices are based on experience with existing BNSDI nodes and portals, environments should be monitored to determine request volume,

how long events on servers are taking, and the size of those events. It will be important to know the actual statistics of the following common operations:

- Image requests
- Image builds
- Number of data requests
- Size of data requests
- Duration of data requests
- Server busy measurements
- Total response time to requests

This type of system monitoring is required to decide if a specific node is operating properly and according to expectations. It will be needed to define which image products need maintenance and if there are servers that become overloaded. It will also help troubleshoot problems in the event of user complaints. A number of tools exist to capture this type of information. Tools range greatly in their capabilities, price, and complexity. An important consideration in selecting such a tool will be to determine how well it can read and analyze the statistics that are provided by the various software components. An example of a commonly used tool is WebTrends.

Service Management Support Infrastructure

The BNSDI Service Management comprises a suite of functional requirements that collectively support the following main functions: system monitoring, deviations detection, analysis and action tools. The management tools that are proposed below to support the above functions are compatible with ITIL disciplines for service and support delivery, which are listed in the table below.

-	ITIL Service Delivery Disciplines]	ITIL Support Delivery Disciplines
1.	Service Level Management	1.	Configuration Management
2.	Capacity Management	2.	Problem Management
3.	Contingency Planning	3.	Change Management
4.	Availability Management	4.	Service/Help Desk
5.	Cost Management for IT Services	5.	Release Management

Management tools are based on four main functions:

- Monitoring tools provide status monitoring of the IT infrastructure, components, processes, services, and service levels it was designed to monitor.
- Detection tools detects deviations from normal operations by analyzing log files, performance thresholds, SNMP traps, business process rules, and other data. After collecting data, it then alerts administrators or process owners of the deviation so that they can take corrective action. Alerts are timely and reliable.

- Analysis tools provide administrators and service managers with decision-support information, such as where a deviation has occurred, what caused it, and how to correct it.
- Action tools which use built-in functionalities that restore backups, restart services to provide administrators and service managers with the ability to physically restore any component in the IT infrastructure to normal status. This function's primary purpose is to facilitate the implementation of corrective actions in a controlled and efficient manner

The BNSDI Program Coordination Team shall select an IT service management tool which offers tight and seamless integration of IT processes to enable the flow of information between the various applications to ensure fast and well informed problem resolutions. For example, organizations are integrating the network, system and service data with Service Desk so that events (or incidents) and service-state information are automatically forwarded to first-line support staff. Such solutions also enable IT staff to visualize, monitor, and configure IT services across multiple infrastructure components and service-level agreements (SLA). As a result, these tools are used to help increase overall customer satisfaction and improve service quality and agility as well as to help reduce costs, risks, and complexity.

The IT Service management solutions should be modular, flexible, and capable of integrating with third-party software, internal software, and industry-standard integration buses. However, this capability alone does not necessarily improve cooperation between the people managing various aspects of a service. It takes multiple-hardware, software, and labor components to provide an IT service and each component must be configured, synchronized, and managed. This can be complex; for example, each piece of hardware (e.g., server, PC, router, switch, and printer) typically has its own hardware-specific software to configure and manage it.

An IT Service Management family of applications should provide an integrated out-of-box solution for managing and automating critical service support and service delivery functions, including Service Desk Incident Management, Problem Management, Configuration Management, and Service Level Management functions, as specified by ITIL. The solution should deliver ITIL compatible best-practice procedure-level workflows built into each application. Moreover, the applications should be easily tailored to implement unique service support processes and workflows in a way that best meets the needs of each organization. The integrated applications should share a common workflow foundation and unified data model, directly supporting the integrated process approach outlined in the ITIL framework. The IT Service Management application tool should be certified to the minimum functional requirements for ITIL compatibility by certification bodies such as Pink Verify certification. Basic functions that are included within this application grouping are as follows:

Service Desk: Perhaps the most important function in an IT service support organization is the Service Desk (i.e., Help Desk, Call Center). The primary goal of the IT Service Desk is to provide a single point of contact for customers and users and to facilitate the restoration of normal service with minimal business impact. Specifically designed to optimize communications regarding incoming requests, the Service Desk tool should ensure efficient and expeditious handling of customer interactions. The tools should provision for categorizing, routing, tracking, of all requests. It should provide published and open APIs that offer broad integration capabilities including integration with Network and Systems Management products. The BNSDI will require that Service Desk personnel have familiarity with GIS and BNSDI specifications, or can route such issues to SDCC.

Incident Management: The out-of-box capabilities of the Service Desk application should be compatible with the Incident Management Process as defined by ITIL. The service Desk is designed as the main support tool used by IT staff to manage the complex process of resolving incidents. The service desk should track and solve an incident in a procedural manner as specified by the ITIL Incident Management guidance, irrespective of the entry process. The application should ensure fast access to key incident information, such as related configuration items and overall incident history. The application should ensure close integration with the other IT Service Management applications, such as Problem management, Asset Management, Service Level Agreements, and Change Management. Georeferencing of incident reports can often provide significant value to identify geographic patterns, to associate incidents with census and other contextual data, and other uses.

Problem Management: The Problem Management process as defined by ITIL defines a proactive approach to identifying the root cause of problems and then managing actions to correct the errors. Such functionality is achieved by ensuring the integration with Incident Management processes to allow the IT support staff to capture, at any time, all entered incidents related to a reported problem. The application should have a classification system that creates problem records separate from incidents, tracks them according to ITIL procedure, provide automated matching of incidents with problems, tracking and monitoring of problems through defined stages, as well as the capability to route and escalate problems, based on urgency and severity code.

Asset Management: The use of the Asset Management application should serve an ITIL-compatible Configuration Management process, by providing an integrated solution for capturing and maintaining IT configuration data for assets and the relationship between them, including software, hardware, documentation, and processes. It provides the Configuration Management Database that maintains a record of all configuration items that make up the IT infrastructure, such as model, serial number, physical location, user, owner, maintenance contract information,

lease, warranty, and financial information. Configuration items stored in Asset Management application is integrated with the other components of the IT Service Management applications, allowing for seamless integration with the Service Desk, Change Management application, and Service Level Agreements.

Configuration Management: The primary goal of the ITIL Configuration Management process is to achieve, through the implementation of Asset Management, a single integrated configuration management database for all configuration items. The application seamlessly supports Incident Management, Problem Management, Change Management, and Service Level Management processes. Configuration Management function is very critical for a successful and smooth operation and maintenance of the BNSDI Program. It deals with the entire process of change and configuration management related to the BNSDI system components i.e. data, applications, hardware, staff capacity building and procedures. It includes, but is not limited to, the following:

- System development automation procedures
- System maintenance automation procedures
- Logging and tracking BNSDI Enhancement Requirements
- BNSDI System Administration
- Helpdesk
- Other requirements

Change Management

Change Management delivers a best-practice process to systematically manage the response to a change request in accordance with the ITIL framework. A Change Management application tracks a change from the moment it is proposed, through the implementation in the live environment, to the evaluation of the end result. The outof-box Change Management capabilities facilitate the gathering of changes from all identified stakeholders into a change repository. It includes planning changes based on priority, impact, or urgency. Change Management considers business and technical impact, impact on other services, the effect of not implementing the change, as well as resources required. It includes use of a back-out plan and a robust approval server that manages the request through a complex approval process. It automatically assigns tasks needed to complete the change. If problems arise during implementation, automatic escalations and notifications are performed. Repeated changes can be completed consistently with change templates. Reports are used to evaluate changes for desired effect, on time, on budget. The use of a Change Board and an integrated software application is essential to maintain a proper balance of the need for change with the potential negative impact on other elements of the IT infrastructure. Change Management is an indispensable tool used by the Change Advisory Board as specified by ITIL.

Service Level Agreements:

A Service Level Agreements management process should provide the functionality to register SLAs, correlate SLAs to the underlying technical infrastructure, and observe real-time compliance with the SLAs for all service support processes as defined by ITIL. Service Level Agreements application includes a variety of integrated and automated out-of- box best practice capabilities specified by ITIL as supporting Service Level Management, including:

- Definition of rules to implement the service agreements between IT, customers, and any external resource.
- Service level agreement records that contain information on the IT provider, customer, and specific services and specified service performance and that can be created, changed, and deleted.
- Tracking of all Service Desk requests to contractual parameters.
- Proactive alerts that can identify issues and trigger actions prior to service levels being violated.
- Integrated graphical interface that shows real-time status of a wide variety of SLAs
- Reports that show performance of IT services compared to service level agreement.

Availability, Performance & Security Management

BNSDI system performance is critical for a successful system operation and utilization by the end users. The performance management function focuses on the design, development and deployment of performance management tools that support the monitoring and control of system performance according to pre-set metrics and performance benchmarks. It includes, but is not limited to, the following:

- Communication infrastructure monitoring tools;
- Spatial information infrastructure Performance Management tools (database, network, applications).

Performance management monitoring tools maintain information related to adequate functioning and performance of the system based on pre-defined benchmarks. This may include metrics measurements, alarms and signals, status reporting, etc...The above information, which may be handled by a suite of software/ functional solutions that monitor applications and network tip-to-tip performance may be maintained in disparate applications that are hosted on the BNSDI data center platform, the network administration environment and possibly the stakeholder agencies platforms or nodes. A dashboard interface may be developed as well that assembles all the metrics, signals and alarms as well as reporting requirements in one GUI environment where federated data is aggregated from disparate performance management systems.

Availability Management is the practice of identifying levels of IT Service availability for use in Service Level Reviews with Customers. All areas of a service must be measurable and defined within the Service Level Agreement (SLA).

To measure service availability the following areas are typically included in the SLA:

- Agreement statistics such as what is included within the agreed service
- Availability agreed service times, response times, etc.
- Service/Help Desk Calls number of incidents raised, response times, resolution times
- Contingency agreed contingency details, location of documentation, contingency site, 3rd party involvement, etc.
- Capacity performance timings for online transactions, report production, number of users, etc.
- Costing Details charges for the service, and any penalties should service levels not be met

Availability is usually calculated based on a model involving the Availability Ratio and techniques such as Fault Tree Analysis, and includes the following elements:

- Serviceability where a service is provided by a 3rd party organization, this is the expected availability of a component
- Reliability the time for which a component can be expected to perform under specific conditions without failure
- Recoverability the time it should take to restore a component back to its operational state after a failure
- Maintainability the ease with which a component can be maintained, which can be both remedial or preventative
- Resilience the ability to withstand failure
- Security the ability of components to withstand breaches of security

Security can most commonly be defined as, "the management, operational, and technical safeguards and protections designed, developed and instituted for information systems and supporting computing and network infrastructure(s) intended to protect their confidentiality, integrity, and availability." Once implemented, security and its associated controls must be assessed to determine the extent to which it has been implemented correctly, is operating as intended, and is producing the desired results with respect to meeting the security requirements for the organization.

Security best practices generally indicate that a comprehensive security program, when correctly and successfully conceived, designed and implemented, will have three major components – Management, Operational and Technical.

 Management refers to the safeguards or countermeasures that focus on the management of risk and the management of information system security.

- Operational refers to the safeguards or countermeasures that primarily are implemented and executed by people (as opposed to systems).
- Technical refers to the safeguards or countermeasures that are primarily implemented and executed through tools, platforms, frameworks and mechanisms contained in hardware, software and network components.

The security related software tools may include the following:

- Firewall software (including the network firewalls and application)
- Internet security software
- Routers and switches security encryption and configuration software
- Security Zones and their associated software
- Network Traffic Encryption
- TCP/IP Filtering
- Internet Protocol Security (IPSec)

Core BNSDI Software maintenance

This functional area refers to the core software that will be deployed in the BNSDI environment. Delineation of software requirements is not simple taking into consideration the complexity of interfaces with third party applications that may be residing in the nodes belonging to the individual key stakeholder agencies. For the sake of the current requirements analysis, the core BNSDI software will include deployment, upgrade and maintenance of the entire suite of core BNSDI software as described below.

- Web Portal
- Database software (including RDBMS and spatial management software where applicable)
- GIS web enabled editor software
- GIS web enabled viewer & query software
- Advanced spatial analysis and statistics software
- Advanced GIS extensions
- Middleware software
- Advanced visualization software
- Performance Management software
- Application Programming Interfaces (APIs)
- Firewall protection software
- Software used for Disaster Recovery and BNSDI development servers as opposed to production servers
- Business-specific software (refer to application functional requirements that are identified under the various application groupings above). The final functional requirements will be developed during program design and implementation strategy and the following implementation sub-programs

Licensing requirements are considered part of the core BNSDI software requirements. Several goals shall be achieved through the management process of the licensing requirements:

- An economy of scale through the procurement, deployment and maintenance of multi-user licenses with the vendors
- A monitoring environment for licenses utilization and planned capacity. This
 will be important in order to fulfill system availability and QoS requirements
- Direct communication channels with vendors support services in order to ensure smooth handling of software patches, upgrades and maintenance activities. This may be achieved through Memorandums of Understanding (MOUs) that are signed between central coordinating agency and the Vendors where licenses maintenance and warranty and service conditions are elaborated.
- Integration of the software licensing management activity in the Configuration Management Plan and daily routine system maintenance activities

ITIL is adopted here as a reference platform for IT operations. BNSDI Service Management is a central management function that is meant to serve the key stakeholder agencies. The functional requirements that are addressed under this application grouping include configuration management, service level agreements, helpdesk management, availability, performance and security management. Those are the least common denominator areas between the BNSDI data center and the agencies nodes taking into consideration that the performance of the system may be impacted by the performance of any one node in the BNSDI network.

Most of these will require familiarity with geoprocessing concepts, principles and practices that are outside the expertise of classical ICT staff. Technical resources with experience in BNSDI Service Management are scarce in the international and local market. Therefore, it is envisaged that the BNSDI Project Management Office may outsource those services during early system operation while building in parallel the capacity of the local resources.

The development of the BNSDI Service Management capabilities will need to follow the mantra of "think big and act small". In this regard, the first priority during early program design and deployment is to ensure that basic helpdesk support, basic configuration management concepts and basic access to spatial and tabular information are provided thru a reliable platform.

5.2 Network

The BNSDI will utilize the Country's data communications infrastructure, including mechanisms for connecting remote locations and mobile devices. This is expected generally to fit within the eGovernment infrastructure, but in certain cases may place requirements on the network that are unique to the geoprocessing field.

Network Connectivity & Bandwidth. Connectivity and bandwidth for the BNSDI may be available using a combination of several platforms:

- LAN/ Wireless LAN
- WAN
- Internet

The final configuration should follow the general parameters of the e-government implementation strategy. The CITO is in the process of establishing a comprehensive government network that is characterized by the following:

- Single backbone by which each entity only needs one connection to interface with all other entities
- Central web-based index for access to all government entities

All geospatial portal traffic should ultimately feed into and out of a government data center through the single backbone.

Reliability/ security. Reliability and security of the communication infrastructure platform should be compliant with international standards such as ISO27001.

5.3 Enterprise

Each participating agency will be responsible for structuring their enterprise computing infrastructure in a manner that is compatible and integrated with their BNSDI node. In cases where agencies have not yet developed the capacity to manage a full BNSDI node, mechanisms will be established to allow them to access and publish their information to the central Clearinghouse.

The enterprise computing infrastructure requirements are proportional to level of maturity of the ICT infrastructure in general and the enterprise GIS infrastructure evolution in particular in the organization. The driving need behind those requirements is the business developments in the organization, including the incorporation of GIS as a key facet of each organization's enterprise information infrastructure. The latter is more or less dictated by the management vision for digital business transformation and for spatially enabling the organization business operation, and government-wide policies towards modernization and computerization of government operations.

The existing ICT and GIS status in the BNSDI stakeholder entities participating in the current study were observed generally to establish the level of readiness for enterprise GIS and participation in the BNSDI. Findings identified a functional level of ICT readiness in most government agencies in general:

• The majority of government entities have lower to mid-range IT readiness levels;

- Many government entities have introduced PC's for general office work and most office workers are functional using these applications;
- Some agencies have implemented Local Area Network (LAN) and wireless connectivity, but only a few have implemented Wide Area Network and/or central server services;
- Very few agencies have developed or implemented ICT enterprise strategies;
- Overall, Belize government entities have moderate IT Infrastructure and office applications, however need improvements in the areas of enterprise system development, integration, security and operations

Going forward, it is expected that CITO will actively continue to support government entities in their IT readiness and IT architecture & standards compliance efforts. The e-Government strategy and associated policies were under development and not available in the timeframe of this writing. Once available this section should be updated with any findings that are relevant to the implementation of the BNSDI. The following assumes that the e-Government strategy and approach incorporates international standards that are reflected in the following statements:

Hardware & Software

The architecture and standards requirements introduced by CITO should set the framework for future enterprise hardware and software developments in the government agencies in the following dimensions that have relevance to the BNSDI:

Implementation of Business Architecture: Implementation of government-wide system development business architecture within the Government of Belize requires the adoption of standard system development processes and procedures. All systems development activities should include the development of data and process models. In each case, there should be a model of the existing situation and of the required logical situation. These may then be implemented using a combination commercial off-the-shelf (COTS) products, open source and/or custom programmed solutions but only after appropriate analysis of the integration and full lifecycle costs are considered in the implementation decision. Key activities include:

- Re-use existing investments wherever possible and share application services across Government entities. This can be facilitated by centralizing data and process records;
- Adopt a standard cross-Government development process for customization and development;
- Outsource specialized application development and management reduce cost and risk through proven partners.

The term "business architecture" can be defined as a combination of:

- Architectural and design patterns
- Business tools

Guidance and operating models

The above principles capture the goals and objectives of a business to ensure that solutions acquired and developed assist the business to meet its objectives. Business architecture commonly encompasses logical organizational design.

Adoption of a Service Oriented Architecture (SOA) framework for integration of services: The SOA framework is meant to be adopted in the future as a common framework for information technology architecture development that is based on a service oriented perspective. This will drive the government agencies and their service providers into the following:

- Adopt a business centric approach for business process management and business activity management;
- Adopt normalized metadata management standards and specifications across the board. This will need to include the adoption of standards for geospatial metadata as discussed earlier;
- Comply with normalized application development web services tools across the board which facilitates interoperability and reutilization of application services;
- Comply with normalized message oriented middleware for data exchange using XML;
- Migrate gradually toward recommended service integration and management (SIAM) best practices in line with international standards such as Information Technology Infrastructure Library (ITIL)
- Comply with stringent security standards for all components of Belize IT architecture and standards. This includes security standards for the following components that are described in the standards section:
 - o Business Layer Architecture
 - o Access & Presentation Layer Architecture
 - o Application Layer Architecture
 - o Data Layer Architecture
 - Integration Layer Architecture
 - o Security Layer Architecture
 - o Operation Layer Architecture
 - o Infrastructure Layer Architecture

Platform component standards of the infrastructure layer architecture may be optional leaving flexibility for the government agencies to adapt them to their internal needs. The platform components include:

- Servers
- End User Devices
- Peripherals
- Storage

Mobile devices

Connectivity & bandwidth

Connectivity and bandwidth requirements should be described under the infrastructure layer architecture e-Government system architecture and standards guidelines. The network components include:

- WAN
- LAN
- Wireless LAN
- Voice Network
- Mobile Access

As described in the previous sections, there are international best practices that help provide initial design benchmarks for the bandwidth requirements of enterprise GIS applications. As the Enterprise GIS systems become operational in government agencies, those benchmarks can be supplemented by performance indicators that allow identifying the performance of the system as it evolves in complexity and which allows adapting the capacity of the system to the growing demand. In this case, the priorities in development of the communication infrastructure within the jurisdiction of any one government agency will be dictated by the business imperatives of that particular agency. On the other hand, as the BNSDI program operation evolves in the future, another layer of requirements may be added based on the common needs of the BNSDI Community which may be agreed upon collectively by the BNSDI stakeholders.

Reliability & security

The reliability and security of the Enterprise GIS services offered by a government agency will be defined by several driving needs:

- The business needs of the agency in a service oriented market driven by a competitive environment for quality of service;
- The needs of the Belize government to protect and preserve its information infrastructure assets. This will need to include the protection of the Country's critical fundamental geospatial data sets (FGDS) information;
- The common needs of the BNSDI Community in order to spatially enable and enhance the effectiveness of government services.

5.4 Supportability

Standardizing techniques and systems for capturing, processing, analyzing and sharing geographic data are crucial for the BNSDI to work effectively. ICT framework for the coordinating center systems and the BNSDI network of interoperable nodes will need to comply with Country-wide architecture blueprint and technical standards that should be described comprehensively in the Belize e-Government ICT architecture & standards

guidelines. The document is organized into several chapters that are summarized below and provides architecture blueprint and technical and business standards for Belize Government ICT framework. The objective of this sub-section is to provide a summary of standards & architecture that should be considered in the context of the Belize e-Government program with emphasis on the requirements and their implications on the BNSDI technology infrastructure. This will provide input to the BNSDI program design where compliance with potential future standards is expected. Also being proposed are recommended GIS/SDI standards and specifications to be adopted in the future within each one of the eight layer architectures, which include:

- Business Layer Architecture
- Access & Presentation Layer Architecture
- Application Layer Architecture
- Data Layer Architecture
- Integration Layer Architecture
- Infrastructure Layer Architecture
- Security Layer Architecture
- Operation Layer Architecture

Business Layer Architecture

The Business Layer Architecture encompasses standards for the following:

- BPEL by OASIS for Business Architecture
- Recommended Business Process Modeling Notation (BPMN) and Unified Modeling Language

In addition, the following standards can be considered in relation to the BNSDI program requirements:

Business Process Execution Language for Web Services (BPEL4WS).

Access & Presentation Layer Architecture

Access & Presentation Layer Architecture standards encompass the following mandatory requirements:

- Web Browser Client- W3C HTML V4.01, XHTML V2, XML V1.1, Persistent and Session cookies and Applets and scripts disabled, Active X use;
- Thick Client- sensitive data encrypted, .NET Framework (1.1 or higher) for VB/C++/C# and JDK 1.4 or higher for Java applications;
- Productivity suite client- Word processor software must support .txt, .rtf, .doc, .xml, .html formats, Spreadsheet software must support .csv, .txt, .rtf, .xls, .xml, .html formats, Presentation software must support .ppt, .gif, .jpg, .tif, .png, .rtf formats and IMAP / POP3 compliant email client;
- Telephony Device Touch Tone Telephone.

In addition, the following standards can be considered in relation to the BNSDI program requirements:

- Geography Markup Language GML (ISO 19136),
- Web Map Server Interface (ISO 19128),
- Open GIS Styled Layer Descriptor (SLD),
- DAML-based Web Service Ontology (DAML-S).

Application Layer Architecture.

The Application Layer Architecture includes the following components:

System Applications Components

- Web Server Handles all web based requests
- Application Server Handles business application requests
- RDBMS Database Server Handles all data requests
- File Server Handles all file requests
- Email Server Handles all email requests
- Mobile Device Server Handles all Mobile Device communication
- Telephony Server Handles telephone based communication

The Application Layer Architecture standards encompass the following mandatory requirements:

- Web Server- HTTP / HTTPS/ SSL/ SOAP V(Protocols);
- Application Server- .NET Framework (3.5 or Higher) Application Server for VB/C++/C# and J2EE 1.4 SDK or higher for Java Application Server;
- Database Server- ANSI/ISO SQL-92 Compliance;
- File Server- FTP support;
- Email Server- SMTP, X.400 Message Handling System (MHS) from ISO and POP3.

In addition, the following standards can be considered in relation to the BNSDI program requirements:

- OGC Web Feature Service (WFS)/ ISO19142
- OGC Web Coverage Service (WCS),
- OGC Coverage Portrayal Service (CPS),
- Open GIS Web Map Service (WMS)/ ISO: 19128 2005,
- Open GIS Web Map Context Specifications,
- ISO Geographic Information- Portrayal (ISO 19117:2005),
- The Web Services Description Language (WSDL);
- The Universal Description, Discovery and Integration (UDDI);
- The Simple Object Access Protocol (SOAP);
- ISO 19116 Positioning services (Pub)
- ISO 19119 Services (Dev)
- ISO/TR 19120 Functional standards (Pub)
- ISO 19125-1 Simple feature access Part 1: Common architecture (Pub)

- ISO 19125-2 Simple feature access Part 2: SQL option (Pub)
- ISO/DIS 19128 Web Map Server Interface (Dev)
- ISO/NP 19132 Location based services possible standards (Dev)
- ISO/DIS 19133 Location based services tracking and navigation (Dev)
- ISO/CD 19134 Multimodal location based services for routing and navigation (Dev)
- ISO/CD 19136 Geography Markup Language (GML) (Dev)

Open GIS Abstract Specifications

- Topic 4 Stored Functions and Interpolation
- Topic 12 The Open GIS Service Architecture
- Topic 13 Catalog Services
- Topic 15 Image Exploitation Services
- Topic 16 Image Coordinate Transformation Services

Open GIS Implementation Specifications

- CT Coordinate Transformation Services
- Filter- Filter Encoding
- AOS GO-1 Application Objects
- Common OGC Web Services Common Specification
- OLS Core Open GIS Location Services: Core Services [Parts 1-5]
- SLD Styled Layer Descriptor
- WCS Web Coverage Service
- WFS Web Feature Service
- WMC Web Map Context Documents
- WMS Web Map Service

Business Applications Components

- Knowledge Management Manages all enterprise intellectual capital
- Content Management Manages all enterprise content
- Collaboration Manages enterprise communication
- Customer Relationship Management Manages all Client contacts
- Human Resource Management Manages all HR functions
- Accounting and Financial Management Manages Financial and Accounting functions
- Procurement and Logistics Manages all contracting functions
- Business Intelligence Manages advanced enterprise reporting

Standards for Business Applications Components may not be mandatory.

Data Layer Architecture.

The data layer architecture encompasses standards for the following:

- Data Access using SQL ANSI standard
- Archiving
- Backup and recovery
- Metadata Management
- XML schemas

In addition, the following standards can be considered in relation to the BNSDI program requirements:

- Quality Assurance
- Ontology

The following additional standards may have relevance to the BNSDI program requirements:

- Open GIS Filter Encoding Specification/ ISO 19143
- Spatial Data Transfer Standard (SDTS): FGDC-STD-002
- Raster Profile and Extensions: DFGC-STD-002.5
- Computer-Aided Design and Drafting (CADD) Profile: FGDC-STD-002.7-20009
- OGC Coordinate Transformation Services (CTS)
- ISO Geographic Information- Metadata (ISO 19115:2003);
- ISO Geographic Information- Metadata Extensions for imagery and grid data (ISO 19115-2);
- Open GIS Catalogue Service Specification (CAT).
- ISO 13249-3:2003 (Spatial)
- Simple Features for SQL, CORBA, OLE/COM
- Open GIS Reference Model (ORM)
- Open GIS Web Service Common Specification (OGC Common)
- ISO 6709:1983 Standard representation of latitude, longitude and altitude for geographic point locations (Pub)
- ISO 19101:2002 Reference model (Pub)
- ISO/WD 19101-2 Reference model Part 2: Imagery (Dev)
- ISO/PRF TS 19103 Conceptual schema language (Dev)
- ISO/DIS 19104 Terminology (Dev)
- ISO 19105 Conformance and testing (Pub)
- ISO 19115 Metadata (Pub)
- ISO/WD 19115-2 Metadata Part 2: Extensions for imagery and gridded data (Dev)
- ISO 19106 Profiles (Pub)
- ISO 19107 Spatial schema (Pub)
- ISO 19108 Temporal schema (Pub)
- ISO/FDIS 19109 Rules for application schema (Dev)
- ISO 19110 Methodology for cataloguing (Dev)
- ISO 19111 Spatial referencing by co-ordinates (Pub)
- ISO/CD 19111 Spatial referencing by co-ordinates (Dev)
- ISO 19112 Spatial referencing by geographic identifiers (Pub)
- ISO 19113 Quality principles (Pub)
- ISO 19114 Quality evaluation procedures (Pub)
- ISO/TR 19121 Imagery and gridded data (Pub)
- ISO/FDIS 19123 Schema for coverage geometry and functions (Dev)
- ISO/CD 19126 Profile FACC Data Dictionary (Dev)
- ISO/PRF TS 19127 Geodetic codes and parameters (Dev)

- ISO/CD 19130 Sensor and data models for imagery and gridded data (Dev)
- ISO/CD 19131 Data product specification (Dev)
- ISO/DIS 19135 Procedures for registration of geographic information items (Dev)
- ISO/DIS 19137 Core profile of the spatial schema (Dev)
- ISO/CD 19138 Data quality measures (Dev)
- ISO/CD TS 19139 Metadata XML schema implementation (Dev)
- ISO/WD 19141 Schema for moving features (Dev)

Open GIS Abstract Specifications

- Topic 0 Overview
- Topic 1 Feature Geometry
- Topic 2 Spatial Reference Systems
- Topic 3 Locational Geometry
- Topic 5 The Open GIS Feature
- Topic 6 The Coverage Type
- Topic 7 Earth Imagery
- Topic 8 Relations between features
- Topic 10 Feature Collections
- Topic 11 Metadata

Open GIS Implementation Specifications

- Acronym Name
- CAT Catalog Interface
- GML Geography Markup Language
- GC Grid Coverages
- SFC Simple Features CORBA
- SFS Simple Features SQL
- SFO Simple Features OLE/COM

Integration Layer Architecture. The Integration Layer Architecture is based on a Service Oriented Architecture (SOA) and Web Services with the following:

- Business Event and Service Choreography
- Enterprise Service Bus
- Adaptors

The Integration Layer Architecture standards encompass the following requirements:

- Web Services with mandatory Web Service Communication using SOAP V1.1, Web Services Description Language using WSDL V2.0, Universal Description, Discovery and Integration (UDDI V3) registry, Hyper Text Transfer Protocol (HTTP 1.1) and HTTPS as the application-level communication protocol and LDAP V3
- Message Oriented Middleware with mandatory use of XML as data exchange standard and JMS Compliance for all J2EE MOM

In addition, the following standards can be considered in relation to the BNSDI program requirements:

- Business Process Management complying with Workflow Management Coalition Specifications (WMC)
- Business Activity Management
- Adaptors

Infrastructure Layer Architecture.

The Infrastructure Layer Architecture comprises network components and platform components:

Network Components

- WAN
- LAN
- Wireless LAN
- Voice Network
- Mobile Access

The network components encompass the following standards:

- Policy connectivity standards must be addressed in accordance with the security layer
- TCP/IP suite of protocols (wired/ wireless networks)
- DMZ segmentation in the Public Network
- Network components (LAN/ WAN) standardized
- SMTP for e-mail delivery
- DHCP and NAT within government agencies
- MPLS Technology using IP (managed external provider)
- Redundancy for critical links
- LAN standards

Platform Components

- Servers
- End User Devices
- Peripherals
- Storage
- Mobile devices

In addition, the following standards can be considered in relation to the BNSDI program requirements:

NMEA 0183 for GPS

Security Layer Architecture.

As pointed out previously, security and authentication are critical for spatial data processing and operations. Even a simple service such as rendering a map layer has security implications. Different sources of spatial data may have different levels of sensitivity in terms of who is allowed to see them. The need for security and authentication mechanisms

increases with the need to share information in an open and interoperable environment, particularly in those operations that create or update data. The BNSDI must provide for the authentication and authorization of clients when required. Ideally, the security model will provide harmonization of identification, certification, authorization and authentication across jurisdictions, for both private and public-sector users. Access to information and services will be authenticated to the degree required by the specific information and services. The BNSDI security and authentication is an enabling layer that can be implemented with all documented Web services. The Security Layer Architecture is mostly based on ISO17799 and covers all suggested components such as:

- Business Architecture Security Component Standards
 - o Adoption of a Common asset classification
 - o Information disposal procedures
 - o Information protection (authorization of assets removals)
 - o Power supply security
 - o Business continuity and disaster recovery plan (including plan testing)
 - o Defining rules and retention guidelines
 - o Cryptographic solutions (approved algorithm)
 - Audit planning
 - o Security awareness (training & testing within 30 days)
 - o Security violation response process
 - o Employee screening
 - o Contracts with employees (confidentiality agreements)
- Access Presentation Layer Architecture Component Standards
 - o Enable authentication, authorization/ access control, confidentiality and integrity of information systems (platform, application and network levels)
 - o Users awareness (use of passwords, and security of user equipment)
 - o Registration process between government organizations and their respective business partners
 - o User registration must follow control standards (refer to S&A document)
 - Access privilege management (refer to S&A document)
 - o User identification & authentication (min. ID and password)
 - o External connection identification and authentication (password rules, password maintenance and authorization)
 - o Review of access rights ((refer to S&A document)
 - O User responsibility (written, binding agreement to abide by the requirements for confidentiality and the appropriate use if IT resources, security for unattended IT assets, sharing authentication credentials, security considerations for mobile computing)
 - o SSLv3/TLS
 - SET (Secure Electronic Transactions)
 - o Security Assertion Mark-up Language (SAML)

- Applications Layer Architecture Component Standards
 - o Prevent unauthorized access to information held in business applications
 - O Prevent loss, modification or misuse of data in application systems (appropriate controls, audit trails or activity logs including validation of input data, internal processing and output data)
 - Secure coding requirements
 - o Control of internal processing
 - o Message integrity
 - Information access restrictions
 - o Sensitive system isolation (virus/malware, spyware protection)
- Data Layer Architecture Component Standards
 - o Commonly agreed understood procedures and guidelines
 - o Considerations for removable media
 - o Disposal of media
 - o Handling sensitive data (encryption of transmitted and stored information, authorized access to backup media, waste copies destroyed)
 - o Retention period (as required by statutes, regulations or business needs)
 - o Procedure for using faxes
 - o Conference services and collaboration tools (closed community)
 - O Use of encryption (sensitive information stored on removable media or mobile devices and electronic storage)
 - Security of system documentation
 - o Agreements for shared information and software (follow Belize internal practices, regular audits, penalties and liabilities for failure, agreements shall cover use, protection, duplication and re-transmission)
 - o Service Level Agreements for systems used consistently over periods of time (availability, usability, affordability, reusability and remedies for failure)
 - o Considerations for electronic commerce security (software subject to vulnerability assessment, cryptograph, encrypted information when exchanged beyond trusted network)
 - o E-mail security (SMTP traffic scanning, scanning of network traffic)
 - Electronic office systems security
 - o Security for publicly available systems (secure transport with server certificates, daily backup, web server with security controls)
 - Security of production software (executable code, configuration and operational data)
 - o Security of non-production data
 - o Access control for source code
- Infrastructure Layer Architecture Component Standards

- o Operating System (OS) access control (A/C) must be hardened
- o Operating System log-in banners must not reveal information that could lead to possible hacking
- Identification and authentication for OS
- o Password management for OS
- o Time out due to inactivity
- o Procedure for terminal log on
- o Network services usage policy
- Criteria for system access management
- Network routing control (must not cross firewall unless explicitly permitted, traffic must be filtered)
- o Protection against remote port scanning
- o Network segregation (multiple firewalls)
- o Encryption for sensitive information storage (capability of encrypting partitions)
- o Cryptographic controls for desktops and mobile devices
- o Databases, directory and data warehouses (deployed in secured domains of the network with authentication and authorization mechanisms)
- o Encryption mechanisms
- o Encryption for transmission
- Digital signatures
- Cryptographic controls (key management)
- o Capacity planning
- System planning and acceptance
- o Network controls (security policy, "default deny", security functionality must not be reduced by the integration of system technologies from different vendors)
- o All servers facing un-trusted networks must be placed under DMZ)
- Business continuity management process to ensure availability
- Incident management, system documentation, security training and security audit by 3rd party)
- Operations Layer Architecture Component Standards
 - o Documentation for operational procedures
 - o Operational change control
 - o Procedure for incident management
 - o Segregation of duties (administrator of the operation of the system, administrators of external support applications i.e. KPI, IDS, firewalls, etc.. services/applications must be configured to run their own accounts, access to server administration functions log into the system with system account and then gain administration access)
 - o Separation of operational and development environments

- o Managing external parties/ facilities
- o Malicious software control
- o Information backup
- o Administrator and Operator Logs
- o Audit logging
- o Fault logging and event logging
- o Process for change control
- o Technical review of OS changes
- o Covert channels and Trojans
- o Software development outsourcing
- o Reporting security incidents and malfunctions
- o Smart Card Standards
- o Vulnerability and Threat Management Standards (recommended)
- o Public Key Infrastructure (PKI) Standards (recommended)

Operation Layer Architecture. The Operation Layer Architecture is defined by the concept of Service Integration and Management (SIAM) which has been developed in line with the Information Technology Infrastructure Library (ITIL). The adoption of ITIL is recommended but not mandatory.

6 HUMAN CAPACITY

Developing, managing and using the BNSDI requires a variety of skills. Development of the suitable human capacity needed to fulfill the requirements in each part of the system will be important to ensuring that the system is reliable, secure and accessible, and in gaining maximum benefit from the program. In many respects, this is true of all computing usage across the Government of Belize, and the BNSDI will benefit from and build on the capacity building that is taking place across the e-Government program. Specific types of human capacity that will affect the BNSDI include ICT, GIS, domain expertise, and BNSDI governance as described in sections following.

6.1 Information, Communications, and Technology

General computing skills among office workers has increased significantly in recent years, and any remaining deficiencies it is assumed will be addressed through the e-Government program and the internal capacity building efforts of individual agencies.

6.1.1 General computer use skills and IT awareness

Using and managing spatial data requires a wide range of basic computing skills, so it will be essential to have a large pool of people with such skills to provide a foundation on which BNSDI, eGovernment and overall modernization of society in Belize can build. Computer literacy and information literacy are two distinct but related areas. Information literacy can be defined as "an intellectual framework for understanding, finding, evaluating and using information – activities which may be accomplished in part by fluency with information technology, in part by sound investigative methods, but most important, through critical discernment and reasoning" (Association of College and Research Libraries - ACRL). Computer literacy is equally complex, involving a number of different aspects and a range of levels.

At its most fundamental level, a core set of essential computing skills are necessary for all BNSDI users. While use of the term "computer literacy" does imply some interplay with the competencies identified as "information literacy", the emphasis here is on the acquisition of computing skills enhanced by an understanding of the principles underlying various computing platforms and software packages. General computer skills and IT awareness are broken down into nine categories, and within each one the minimum required to advanced skill levels are identified:

Category	Minimum required	Advanced
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Category	Minimum required	Advanced
Basic computer	Moderately complex operations	Full use (running several programs
operation	(setting up computer and peripheral	simultaneously, customize the look
	devices, loading software, printing,	and sounds, programs and
	and use of most of the operating	techniques such as using virtual
	system tools like the clipboard,	memory to maximize computer
	clock, note pad, find command, and	system)
	trash can, and virus protection)	
File management	Files are organized in folders and	Optimizing and backup or archive
	subfolders and backed up regularly.	programs used routinely
	Files may be accessible from a	
	storage server	
Time	Substantive use of time and	Online access to time, tasks, and
management and	organization tools, possibly	contacts management
organization	synchronized with PDA device	
Word processing	Word processing and spreadsheets	Importing spreadsheet into a word
and spreadsheets	used for many documents	processing document or
		presentation program
Database use	Functions understood, ability to	Use of databases for professional
	locate information and add/delete	applications (defining fields and
	data	creating layouts, search, sort, print),
		use of formulas for summarization,
		mail merge in a word processing
		document
Graphics and	Use both pre-made clip art and	Full use of graphics and images,
digital image use	simple original graphics in word-	such as for creation of a newsletter,
	processed documents and	or for basic editing of digital video
	presentations (edit, drawing tools,	
	group and un-group objects, import)	
Presentation	Navigate through a pre-made	Can create computer presentations
software use	presentation program. Can create a	(navigation buttons, sounds,
	simple presentation using a	dissolves, graphics, and text fields)
	program's templates or wizards	
Network and	Use networks to access professional	Participation in on-line discussions,
Internet use	and personal information from a	can download files and programs
	variety of sources, use of email	from remote computers
Ethical use	Know that some copyright	Understand the difference between
understanding	restrictions apply to computer	freeware, shareware, and
	software	commercial software and the fees
		involved in the use of each

It is presumed that the e-Government Strategy under development by CITO will include some level of e-maturity assessment and e-literacy promotion program. Such an approach

could include CITO conducting studies that identify the extent and magnitude of ICT literacy deficit in Belize, in addition to a yearly process that would measure how prepared Belize is to use and benefit from ICT developments. Once completed, CITO could then identify the gaps and would be expected to develop specialized ICT focused training and education programs as well as an initiative to help identify improvement opportunities in all ICT-related services and initiatives which are then used to shape the eGovernment program. It is expected that e-maturity issues relative to the geoprocessing field can be added to this ongoing monitoring and assessment program to ensure that equivalent progress is supported to increase the value of the BNSDI. These assumptions will be adjusted once the eGovernment Strategic Plan can be provided by CITO.

6.1.2 System administration

As a general principle, the BNSDI nodes and linkages to Enterprise systems will be administered in alignment with CITO ICT and e-Government Architecture Standards, once these have been adopted. Certain aspects of system and database administration, service desk support and other areas will require extension to accommodate those issues that are particular to GIS and BNSDI. Some of the areas that are likely to be handled differently than in the standard IT domain include:

- Setting up spatial web services;
- Domain account requirements of spatial web services;
- Spatial database resource usage, configuration, and indexing;
- Raster versus vector data storage;
- Maintaining versioned edit environments;
- System sizing.

6.2 GIS

GIS skills range from those who use the technology indirectly through user oriented applications that require little specialized knowledge, to "power users" that are adept in all aspects of reprocessing, spatial analysis, and spatial programming.

6.2.1 System planning and design

This involves planning the needs before embarking on system acquisition and application and database development. This includes the design of solutions that are highly responsive to each organization's needs and fully integrated with applications, external models, and system operations. The types of specific activities could include the following:

- Assessment of user needs and evaluating existing situation, especially data;
- Requirements analysis;
- Institutional planning;
- Cost/Benefit analysis and cost recovery strategies;
- System design and engineering (conceptual and physical database design, application system design, and system configuration).

This sort of work requires a fairly broad range of GIS skills, including the following:

- Basic understanding of data management concepts;
- Data modeling: Data concepts, nomenclature, application domains;
- Thematic or sectoral application areas (e.g. cadastral, natural resources, municipal);
- Data interchange, geospatial processing models;
- Knowledge of basic GIS standards: metadata, data attribute dictionary, feature instance identification standard, land cover classification;
- Spatial data collection parameters.

6.2.2 Data capture and management

The design, development, and quality assurance of data automation and database development is a critical activity, and one that accounts for the greatest proportion of the total resources expended in developing and operating spatial technologies within an organization. The activity focuses on developing efficient and cost-effective methods for interpreting, automating, integrating, and quality checking geographic information, and can cover data collection, data interpretation, developing procedures, actual data capture, conversion, and integration, and quality contro. This sort of work requires a fairly narrow range of GIS skills, including the following:

- Extensive knowledge in georeferencing: projection systems, transformations, GPS technology;
- Knowledge of basic GIS standards: metadata, data attribute dictionary, feature instance identification standard, classification;
- Storage and management of spatial data structures;
- Spatial data and attribute data linkage abilities;
- Database processing: polygon data management, buffering, spatial algorithms; attribute and spatial data query processing;
- Digital imagery: remote sensing, scanner technology, image processing tools;
- Integration of different GIS file formats;
- Basic skills: installing GIS software, license manager files, creating a GIS database, inserting layers into the database, linking external databases.

6.2.3 Application development and interface design

Whether developing applications and interfaces for part of the organization or for the whole enterprise, the process may include the same range of activities, including:

- Requirements analysis;
- Application design;
- Development (pilot, prototype, full);
- Change and configuration management;
- Documentation (technical and user guides).

Application development requires a fairly focused range of GIS skills, including the following:

- Strong programming skills;
- Strong RDBMS skills including development skills;
- Broad ranging IT technical skills;
- Data interchange;
- Data modeling;
- Graphic user interface design;
- Various IT skills: software installation, license manager files, creating a database, linking external databases;
- Spatial data and attribute data linkage abilities.

6.2.4 Spatial analysis

Once data has been developed and the systems for its use are in place, analysts need to manipulate and model information that comes in a variety of shapes and forms, in addition to diversity in its core qualities (content, place, time). This requires various skills, including:

- Statistical analysis:
- Georeferencing: projection systems and transformation;
- Spatial data and attribute data linkage;
- Digital imagery: remote sensing, image processing tools;
- A thorough understanding of the enterprise's application areas and relevant data models;
- Data interchange;
- Spatial interpretation skills;
- Attribute and spatial data query processing;
- Geospatial processing models;
- Raster and vector integration, overlay techniques.

6.2.5 Cartographic design

While in many instances data is being manipulated, analyzed, and viewed by domain experts, there is often a need to disseminate spatially compelling messages to a more general audience, whether in digital or hard copy formats. This requires fairly specialized skills, encompassing graphic design but also domain-specific cartographic standards. This could be expected to include the following:

- Computer mapping: digital representation of map data, data types and representation, map objects, symbology, map generalization;
- Atlas preparation;
- Cartographic skills: map design, layout, map elements;
- Graphic communication design and delivery;
- Ability to integrate raster and vector GIS file formats.

6.2.6 Current situation

It was evident during interviews and discussions that there is quite a bit of variation within and among agencies as far as geospatial information systems skills. In general it would

appear that GIS skills are not often being developed within most organizations in a systematic way, or at least that for service agencies GIS has not yet been introduced as an enterprise solution. Summarizing from the findings of the BNSDI Stakeholder Situation Update Survey, one can make several observations.

Little evidence of system planning and design. Most agencies have not developed systematic GIS Roadmaps for the design and development of enterprise GIS, nor established internal staff skilled in assessment, requirement analysis, institutional planning, and other factors that would assist in comprehensively addressing GIS evolution within the agency.

Imbalance between data capture and management and maintenance of data. Much of the data capture is delivered through projects, typically outsourced to contractors. There are few examples of sufficient resources with editing skills or high quality data management practices such as metadata, while maintenance of data is often deferred whereby it becomes another project.

Insufficient use of applications customized to core businesses. Other than in the land administration domain, FGDS data has been developed but customized software has not been developed to integrate GIS and the usage of data into the core businesses.

Some analysis and domain use of data. Staff at a number of agencies are making extensive use of the data available for their core businesses, but do not routinely share data with other organizations and have not developed their data in consideration of potential external stakeholder needs.

Visualization of data is limited. While many users access and view FGDS data extensively, there are few that have the cartographic experience required for generating hard copy or digital representations that are graphically impressive or instructive.

There are many staff at all levels among the agencies involved in the BNSDI that are in a position to play a significant role in the development of GIS capabilities in their own organizations, and in contributing to the larger BNSDI initiative. This will require the development of strong professional development programs within the agencies individually, and the promotion and delivery of professional development opportunities through the BNSDI initiative, generally.

There has been limited university programs involving GIS education in Belize thus far, outside of the environmental sector. This has resulted in little opportunity within Belize for the development of solid professionals. It is expected therefore that the development of the BNSDI requires such skill sets to be developed, and as well can contribute to the

development of qualified personnel. This needs to address both the theory of geospatial systems and science, as well as the principles and professional practice of GIS systems and database design, application development, geospatial analysis, and geospatial thinking and critical problem solving in general. Graduates from such programs will have the high-level critical thinking and technical skills necessary to lead GIS development within agencies, and to participate in cross-agency BNSDI activities. In addition to university level GIS training, it is expected that there will be a need for skilled GIS technicians that can be fulfilled through technical school training. Graduates of this level curriculum will have the technical skills necessary to participate in GIS development within agencies, and to provide ongoing technical operations support to other agency staff.

6.3 Domain Expertise

It will be important that there are individuals involved in both enterprise GIS and BNSDI to ensure that domain specific business requirements are well represented in both environments. This means that such staff, who may be well versed in conducting their business in classical ways using traditional domain-specific tools, need to find ways to integrate the spatial dimension more fully into their business processes. This can include making spatial representation more explicit – for example electrical engineers switching between a schematic network and a geographically corrected version of the network in order to better appreciate the spatial relationship with other features – to a deeper usage of location in domain-specific modeling – for example combining real time weather data with network load data for load modeling and outage management.

It is likely that most domain experts lack fundamental knowledge or skills needed to effectively add a spatial dimension to their business functions. As far as capacity is concerned, it is rather a case of first increasing awareness in order to raise interest and making sure this is a demand-driven transformation. Once the demand is established, it is then a case of providing training in various types of GIS areas.

6.4 BNSDI Governance

The building and maintenance of multi-sector partnerships, facilitation and coordination of BNSDI activities, and support of common needs across the community requires certain knowledge, technical skills, partnership brokering approaches and other skill sets that are particularly needed for managing the BNSDI initiative. This section outlines those governance issues and requirements that are particular to the BNSDI that will need to be considered in the further extension and refinement of the BNSDI Policy and the development of Strategic Plan and Program Design.

6.4.1 Partnership brokering

Partnership brokering for BNSDI is necessary because unlike contractual relationships or public-private partnerships they seek not to shift responsibility and risk from one stakeholder

to another, but to share costs and risks, pool resources and talents and deliver mutual benefits for all stakeholders.

However, there may be obstacles to establishing agreements between or roles of stakeholders; stakeholders may view certain issues differently, and on occasions harbor mistrust of other stakeholders. Community building, like any relationship, needs regular attention to respond to external business-related and political realities. There is a need for two basic types of partnership broker:

Internal brokers. Middle managers from the agency stakeholders who are (or who anticipate) taking on the role of either preparing their own agency for collaborating in the BNSDI community, or negotiating their agency's involvement in the community and/or playing a key role in managing a specific arrangement. It is also critical that executive management in the stakeholder agencies be involved and there is established a forum for peer discussions to ensure that high level organizational interests are well represented as well as to maintain common dialog and understanding of issues and priorities at this level.

External brokers. Parties that come from a coordinating entity or independent third-parties contracted either to explore the feasibility of adopting a partnership approach; facilitate negotiations to develop a partnering agreement; maintain or monitor the effectiveness of partnerships over time; or institutionalize partnerships within an agency.

Some of the specific activities that partnership brokering will include are:

- Develop and manage Service Level Agreements (SLAs) with service providers and participant agencies;
- Overlook Program development milestones;
- Coordinate ongoing technical SDI training for the SDI community;
- Develop and maintain business and technology performance indicators;
- Develop training and capacity building programs for agencies;
- Develop and implement a Configuration Management Plan;
- Establish and maintain executive level understandings and agreements.

6.4.2 Strategic planning

As in any other domain, strategic planning for BNSDI involves assessing the current situation of stakeholders, analyzing the requirements (inclusive of gap analysis relative to international best practice as an additional reference and benchmark), developing a program design, and coming up with an implementation plan for a phased development approach. The current BNSDI consulting effort includes creating an updated strategic plan for the initiative. Once developed and additional implementation efforts are underway there will need to be a process for revisiting one or more parts as the strategy for periodic calibration and updating, typically every one to two years.

There are a variety of perspectives, models and approaches used in strategic planning. The way that a strategic plan is developed depends on the nature of the organization's leadership, culture of the organization, complexity of the organization's environment, size of the organization, expertise of planners, etc. Quite often, the persons engaged in strategic planning already know much of what will go into the various components. However, the process greatly helps to clarify the community's plans and ensure that key leaders are all "on the same script". Far more important than any strategic plan document, is the strategic planning process itself.

Carrying out such a process requires a team of individuals that may be drawn from the stakeholders themselves and/or may be made up entirely from some coordinating agency, or a combination. In addition to developing the components addressed above, the strategic planning team will more generally be responsible for the following:

- Provide strategic direction for future utilization of BNSDI within the agencies;
- Ensure that government vision, policies and strategies are adopted and complied with over time;
- Perform the more complex BNSDI analysis;
- Communicate goals and objectives to the stakeholders;
- Guide program strategic direction;
- Foster a sense of ownership of the plan among the stakeholders;
- Focus resources on the key priorities;
- Provide a base from which progress can be measured and establish a mechanism for informed change when needed.

Strategic planning requires a fairly broad and multi-disciplinary range of skills, including the following:

- Translating mission statements into reality;
- Ability to recognize organizational barriers to planning;
- Capable of identifying threats and opportunities;
- Able to sell a strategic plan component to senior management and stakeholders;
- Skills in developing and facilitating groups;
- Conflict management and facilitation skills;
- Creative thinking for setting goals and how they will be reached;
- Innovation for designing strategies, or methods to reach goals;
- Problem solving.

An initial BNSDI Strategic Plan is to be prepared under the current BNSDI consultancy and in part shaped around the findings and insights of this requirements and gap analysis. This Plan will be adopted prior to the development of the Program Design report to ensure that the Design is in alignment with major policy direction in Belize. It is also expected that parts of the Strategic Plan will need to be revised and updated on a yearly or bi-yearly basis to reflect new insights, shifting priorities and opportunities.

6.4.3 Legal and financial

Currently there is no central mandate for identifying and maintaining legal and financial frameworks that are required to support the BNSDI, other than the Belize National Spatial Data Infrastructure (NSDI) Policy that was approved at a meeting of the Government of Belize Cabinet held 21st August, 2012, Cabinet-Confidential Memorandum No. 40 of 2012. According to the Memorandum, the Cabinet approved the draft NSDI policy as:

- a) The first step in the start of developing of a fully functional NSDI in Belize; and,
- b) The commencement of a pilot project of the NSDI.

It is important that the policy framework for the BNSDI is expanded and refined in a manner that is aligned and consistent with other related policies in the Country.

6.4.4 Standards

There are a variety of basic standards that will be important to the BNSDI and the ability of participating organizations to develop and share information in a mutually beneficial manner. In general, standards are produced by organizations or federations of organizations to gain mutual benefit in coordinated action, uniformity of a measure, levels of quality, information compatibility and other benefits. Some standards are established internationally, while others may be adopted formally or informally through de facto common practice by communities of interest. Experience with other SDI efforts around the world and in consideration to the specific context in Belize suggests that the following types of standards will be most important to the BNSDI:

Data content. Data content standards define the basic informational content and levels of accuracy to be addressed.

Data format. Data information content must be structured to a form that can be stored, managed and analyzed in a GIS to support a variety of applications.

Metadata content and format. It is critical that a metadata standard is used by all stakeholders in a community to document the key FGDS information that they manage so this information can be combined and searched by all others.

Catalog services. Catalogue services support the ability to publish and search collections of descriptive information (metadata) for data, services, and related information objects.

Web-based mapping services. Web Map Service (WMS) is a specification that defines a map as a picture or set of features, information about the content of a map, and information about what types of map a server can deliver.

Standard operating procedures (SOPs). Standard Operating Procedures (SOP's) can be developed and implemented for those activities that require a consistent, task-oriented process.

It will be important that the stakeholder community be directly involved in the formulation and adoption of standards that will affect them to ensure that these meet their needs. Concerned stakeholders will need to be tasked, through various Working Groups and other mechanisms, to prepare the various standards required by the BNSDI, with support where

necessary from Subject Matter Experts (SME). Once established, Service Level Agreements (SLA) will be developed for the implementation of such standards, the standards will have to be disseminated, where relevant training provided on the implementation of the standards, and finally a monitoring and evaluation vehicle will be developed to ensure that standards are being applied appropriately and consistently.

As previously mentioned, SMEs may be used to assist in the initial development of initial standards; however there will be the need to have one or more personal within the spatial data coordination function to be responsible for managing and coordinating the process.

6.4.5 Stakeholder community communications and outreach

It is critical during all stages of SDI development to maintain close and proactive communications with various levels of governments, academia, the private sector, professional societies, and others, and to ensure that the initiative and its accomplishments are visible to that community, decision makers and the public.

This requires building a comprehensive and effective outreach program. This program can inform others national and internationally about what is being accomplished by an SDI initiative, build communication and coordination channels and partnerships, liaison with other communities of interest inside government and with the private sector, and actively seek to uncover areas where support is needed across the SDI community. Some of the specific activities that are part of communications and outreach are:

- Coordinate the preparation of SDI specific promotion material;
- Prepare, develop and disseminate outreach activities;
- Maintain BNSDI portal content;
- Receive guests and manage public relation activities:
- Participate in conferences and exhibitions and represent agencies in Public Outreach events;
- Deliver periodic management orientation seminars;
- Seek continuously management involvement and awareness in SDI program.

Persons responsible for communications and outreach are expected to have the following types of skills:

- Ability to work effectively and collaboratively with others;
- Strong written and oral communication skills;
- Facilitation skills;
- Knowledge of wide variety of outreach media, such as web, journals, newspapers, etc.;
- Basic graphic design skills.

6.4.6 Business process engineering

Transforming a business, or business process engineering (BPR), is a management approach to increase the efficiency of business processes. Such processes may be confined within a single agency (e.g. updating water quality from well monitoring stations), or may be processes across several agencies (e.g. permit issuing for construction of a polluting facility). The BNSDI is mostly concerned with business processes that involve the maintenance of FGDS and the publishing of that information for access by the BNSDI community. Gaining optimum benefit from the BNSDI of course is also highly dependent on how the stakeholder organizations arrange their business procedures and methods internally to take maximum advantage of what the BNSDI has to offer. It is expected that these organizations will be responsible for undertaking their own enterprise developments in this regard, in alignment with the eGovernment standards reference architecture, once that has been developed.

The key to BPR is to design the process keeping a focus on the underlying business logic and purpose. Some of the most typical activities that are carried out during BPR that will involve GIS and the BNSDI include:

- Review business processes to identify implications on enterprise GIS;
- Conduct business analysis with attention given to using GIS data and spatial analysis techniques where applicable, and taking maximum advantage of the broader range of data that will be available through the BNSDI;
- Compile and assess requirements from agencies, especially in regards to the maintenance, dissemination or usage of geospatial information across institutional boundaries:
- Translate requirements into application functional requirements for either enterprise usage of GIS, or for data or services that might be made available in common through the BNSDI.

Business process engineering requires a moderately broad and multi-disciplinary range of skills, including the following:

- Ability to apply logical and spatial analytical thought to a business issue (domain analysis, with the enhancement of spatial problem solving skillsets);
- Modeling/mapping of business processes (as-is and to-be);
- Understanding of what IT and in particular GIS systems can and cannot do;
- Able to state requirements in terms of effort, time, and costs;
- Can place discrete requirements in relation to larger business and/or project goals, both as these might relate to agencies individually, or to the BNSDI community as a whole;
- Able to identify what data needs to be carried over into the new systems and/or analysis around what can be achieved with a new system;
- Capable of using domain-specific as well as GIS terminology and concepts;
- Sound understanding of full project life cycle including business requirements gathering, current and future state work flow development etc;

General skills include UML, process flows, use cases, interview skills, and workshop facilitation, communication skills, understanding of a variety of technologies and platforms (client/server and mainframe), ERD, and relational database concepts, and object-oriented technologies.

7 INSTITUTIONAL FRAMEWORK

The BNSDI institutional environment provides the foundation on top of which the information infrastructure and related business solutions are implemented. This will build on the existing adopted BNSDI policy, while adding new elements that are designed specifically to meet the special needs of this initiative. This section covers aspects related to policies, procedures, standards, finance and organization. Those variables provide the framework upon which the BNSDI Program is implemented in an adaptive and step-by-step approach while aligning with the variety of existing policies that have some relevance to this subject.

In the area of policy making, management will need to consider issues of SDI formation decree and enabling legislation, copyright, licensing and intellectual property protection, privacy protection, security protection, charging for data and services, outreach, public/private partnerships and outsourcing, data coordination, BNSDI Service Level Agreements, monitoring & enforcement and SDI human resources.

In the area of procedures development and adoption, there is a particular focus on cross-agency business process automation with emphasis on FGDS data flow and maintenance, configuration management of the information infrastructure inside the central node as well as between the central node and the individual nodes in all aspects related to system components i.e. data, applications, computing infrastructure and staff training, the establishment of service level agreements that provide a framework of cooperation among several stakeholders including the program central coordination and facilitation, key stakeholder agencies, and third party suppliers of services as well as a mechanism for performance monitoring and continuous innovation.

The finance area addresses issues related to financial management such as budgeting, capital sructure, and cash-flow management, tangible and non-tangible financial targets. It addresses also interagency benefits and payments in order to ensure that the agencies that are producing the most added values from the suite of BNSDI services offered to the community are compensated in the same proportion; for them to be encouraged to lead the transformation process. The same analogy applies to the agencies that are mostly consuming and benefiting from the above services. In this case, an adequate equation should be created for chargeability according to public use.

The organization area considers the capacity building of the community through participation as members of the BNSDI community, interagency cooperation and partnership and internal agencies organization. The above will support the creation of an institutional operational environment that consists of several components including, without being limited to, creation of executive and technical representations, recruitment and training of resources in the program central coordination and facilitation unit as well as in the agencies where applicable, active participation of the agencies in system design and their commitment to

their part of services through well-articulated and agreed upon service agreements and finally agencies internal capacity building.

Every one of the areas and sub-areas that are summarized above are described in detail in the sections below while addressing, for each sub-area, including issues, opportunities and constraints for future consideration during program design, implementation strategy and later stages of program development.

7.1 Policy and Regulatory

Beyond issues that are highly specialized to geospatial information, the policy and regulatory component of the BNSDI relies heavily on many issues that affect information in general in Belize society, including copyright, security, privacy, confidentiality and charging of fees for government data and/or services. Openness of information regulates the obligations of government to openly provide access to information that is collected as part of governmental activities. It is also important that the rights of the private sector and civil society are supported. For BNSDI, these policies will need to generally support BNSDI goals for data sharing while balancing these against other considerations. In general, the more clear data access policies are and the lower the cost of obtaining information assets, the more readily end users are willing to engage in data sharing and the broader the usage and benefits to be derived from such usage will be realized.

The policy and regulatory environment for the BNSDI will need to ultimately consider and address a variety of major topical areas, including at a minimum the following:

- Alignment with national development policies;
- SDI formation decree and enabling legislation;
- Intellectual property protections;
- Privacy protection;
- Security protection;
- Charging and utilization constraints for data and services;
- Public/private partnerships and outsourcing;
- Data coordination authority;
- Agency data sharing agreements;
- Monitoring & enforcement;

The following sections provide a summary and status of each topical area and current understanding of policy and regulatory refinements or additions that may need to be carried out to ensure and effective framework that can support the BNSDI and provide alignment with related matters nationally.

7.1.1 Alignment with national development policies

It will be important the policy and regulatory framework under which the BNSDI is further developed can show direct alignment with national policies and plans. This is important to

ensure that the initiative is contributing directly and substantively to the achievement of national strategic aspirations and the international and internal political commitments that have been made in moving the Country forward. Those that were identified and analyzed in the context of this study are summarized below.

National Policy Framework Plans. Belize has identified its development priorities in a number of planning instruments developed through national consultative processes. These include the Horizon 2030 Development Strategy, the 2009-2013 National Poverty Elimination Strategy and Action Plans (NPESAP); and the National Medium-Term Development Strategy (MTDS) (2010-2013). These instruments identify those sectors critical for long term policy actions and investments and in varying degrees serve to focus sector specific strategies and plans. Although Horizon 2030 was presented shortly after the Government's Medium Term Development Strategy, national planning institutions indicate that Horizon 2030 now serves to inform adjustments to the MTDS. Although not inherently spatial, these policy plans provide a logical framework that projects and programs that do have spatial consequence are responding to as part of their formulation and justification.

Belize National Land Use Policy for Land Resource Development. The 2011 policy attempts to incorporate all current and proposed activities undertaken by government department and ministries that are likely to have an impact on the use of land and its resources. Ministries and departments have stated their intentions and aspirations over the next few years and these statements have been translated into a first comprehensive land use policy. The document consists of a series of policy statements and policy strategies. Policy statements relate to land tenure, land administration, land tax and rent, and population growth and distribution. Specific land use strategies concern land use management for rural areas, urban development, natural resources and conservation, water resources, climate change, national infrastructure, land use planning in relation to flood risks, agricultural land use, aquaculture land use, and tourism land use. These considerations should be reflected in the various projects and programs around which the BNSDI requirements are being framed.

Belize National Climate Resiliency Investment Plan. The NCRIP provides a framework and implementing principles and strategy for a \$112.5M USD program to build climate resiliency across key affected sectors in the country. Expected outcomes include integration of climate change issues into development planning, reduced cost of operations in the public and private sectors, resilience to weather impacts in key sectors, institutional leadership and collaboration in dealing with climate change, strengthening of critical infrastructure, increased awareness in the population, and addressing of gender-specific climate related planning. Major investment components include technical data and knowledge transfer, physical infrastructure improvements, non-physical interventions in weather sensitive areas of the economy, policy and regulatory strengthening, coordination, monitoring and evaluation.

e-Government Strategy and Policies. The e-Government Strategy and associated policy development was under development at the time of this writing. CITO provided a draft copy for review. The BNSDI consultant reviewed the Strategy document and provided feedback to CITO. As of this writing the feedback from those comments has not been received. In general, the current Strategy is well written and covers many important subjects required for an effective and responsive eGovernment program in Belize. However, the geospatial dimension is not directly included in the document and the BNSDI consultant's suggestions relate directly to components of the Strategy where the geospatial dimension of eGovernance can add value.

The BNSDI strategy and further implementation plans and actions should contribute directly to supporting programs intended to achieve the National Policy Framework and the National Land Use Policy for Land Resource Development. Likewise, any aspects of the e-Government strategy that relate to the provision of information technology, data and services that could have implication for geospatial information and services should be aligned.

7.1.2 SDI formation decree and enabling legislation

The Belize National Spatial Data Infrastructure (NSDI) Policy was approved at a meeting of the Government of Belize Cabinet held 21st August, 2012, Cabinet-Confidential Memorandum No. 40 of 2012. According to the Memorandum, the Cabinet approved the draft NSDI policy as:

- a) "The first step in the start of developing of a fully functional NSDI in Belize; and,
- b) The commencement of a pilot project of the NSDI."

The Policy is clear in its intention to approve the initiation of the NSDI development process, and giving the "Ministry responsible for lands" the responsibility to facilitate the process "in collaboration with Five (5) NSDI Working Committees and various local and regional agencies". The Terms of Reference for each of the Working Committees is provided in an Annex to the Policy. Additionally the Policy establishes the Executive Committee "made up of the Chairperson and Vice-Chairperson of each of the above Working Committees (these were newly elected at the 6th October, 2011 Working Group Workshop held in Belmopan), spatial data experts, and the head of the Land Information Center (LIC)".

The Policy is prescriptive in the adoption of the metadata (data catalog) standard to be adopted, the establishment of a Geoportal (with alternate technologies mentioned), and the general responsibilities of those data custodian agencies that would establish their own "GIS Nodes". It also indicates that these "GIS Nodes are responsible for granting access and defining any restrictions to their own data".

In regards to data access and security, the Policy indicates that "Agreements/licenses shall be developed to clearly define terms of use, access, and distribution protocols for spatial data". It indicates that the geoportal to be developed "will allow producers/creators to advertise the availability of data and users to search for, access, and use the data based on policies that promote easy, equitable, and minimally constrained access and use of data". Jurisdiction and control over datasets "by the official entity in the country shall be respected". Later the Policy indicates that "GIS Nodes are responsible for granting access and defining any restrictions to their own data".

The role for validation of data "will be done through the Land Information Center in collaboration with the relevant agencies prior to publication via the NSDI portal".

The Policy makes provision for two categories of data access, including "Restricted/Sensitive and Public Access".

In regards to NSDI maintenance and oversight, the Policy indicates that the "The Government Ministry responsible for lands shall serve as the steward of this resource". It also states that the NSDI Committee will be charged with "drafting the overall policy and submitting draft policies and protocols to the Cabinet for approval and allocation of resources as required". It indicates that the costs for maintaining the NSDI "shall be shared in an equitable manner among stakeholders and users" and that the "...Government Ministry responsible for lands shall be responsible for the basic infrastructure costs and modification costs will be equitably distributed among other stakeholders and users". The latter is to be addressed in the development of a business plan that will include a cost-sharing mechanism.

In several places the Policy indicates that the official custodians of specific data layers will be responsible to develop, maintain and catalog their information "adhering to the best practices discussed in the Data Quality and Data Standards Policy statements. It also calls for the development of a "maintenance protocol" to be developed for each data asset.

The Policy refers to fees for the provision of data in multiple places. It indicates that "No fees are to be charged for Foundation data accessed by participating stakeholders" but does not define what "Foundation data" is other than a referral to a "Data Dictionary" which is not included as an official annex to the Policy. Also the Policy has no provision for a consistent government-wide approach to data charging and further states that "Data owners can levy charges for certain data and on users as they deem necessary".

The existing Belize NSDI Policy acknowledges only the general objectives for the initiative, initiation of the process for its formulation and the very general instructions and terms surrounding this initiation. As stated it is "one of the first steps in developing a fully functional SDI for Belize". It called for the implementation of a pilot of the SDI within 6 months to one year, without defining the scope or intended outcomes of the effort. It also

defines a schedule for amendments to the NSDI Policy "...will be done after year 1, thereafter every 2 years to reflect advances in available technologies, structure of the NSDI framework, expansion in user groups and other considerations".

Issues relative to existing Belize NSDI Policy that will require further consideration

- 1. Noted that the existing Policy is only a starting point. This is to be extended and refined in part through the current BNSDI consultancy;
- 2. Pilot program specification with clear indication of outcomes, roles, responsibilities, timeframe and commitment of resources needed to be able to move ahead in a planned way;
- 3. Working Groups need a specific plan of action and unambiguous commitment of the appropriate persons from each of the involved agencies for the time required to complete the stated objectives and outputs of each.
- 4. The "Executive Committee" as stated in the policy needs to be reformulated as a Technical Advisory Committee overseeing the work of the Working Groups and other stated functions. A true Executive Committee comprising CEO's from the appropriate agencies needs to be formulated to consider matters that have government-wide policy implications.
- 5. Policy matters related to geospatial data access and charging of fees can have government-wide impacts that should not be left up to individual agencies to decide. It is suggested that such matters be considered in a structured manner by the CEO Executive Committee for decision, or to make recommendation to the Cabinet for adoption.
- 6. There is no reference in the existing Policy to the Belize Freedom of Information Act, SIB Act, or other relevant policies that the Belize NSDI will need to align with. This will also need to include aligned and reconciled with the relevant policies and regulations being framed for the e-Government program.
- 7. Requirements for initial capital expenditure to support the development of the initial program have not been defined and only minor funds committed since. The specific requirement need to be defined and committed to ensure the proper level of resources are available for the pilot and foundation building activities to move forward in a planned manner.
- 8. What constitutes "Foundation data" needs to be confirmed and stated more explicitly as part of a more comprehensive policy statement about data access and charging.

7.1.3 Reconciliation of BNSDI policies relative to other societal information infrastructure initiatives.

There are other existing policies and initiatives that are underway and evolving that have direct relevance to the BNSDI and require mutual alignment and consistency. The more prominent of these include the following:

e-Government strategic plan and policies. During the timeframe of this writing, CITO was in the process of developing the e-Government strategic plan and associated policies. These

were not yet finalized and therefore not available for review for this Requirements Analysis. Once available it will be important that care is taken to ensure the BNSDI and e-Government policy frameworks are consistent and in alignment with each other.

Freedom of information act. The Belize Freedom of Information Act Chapter 13, 1.38.4 revised Edition 2000 is a revised edition of the law, prepared by the Law Revision Commissioner under the authority of the Law Revision Act, Chapter 3 of the Laws of Belize, Revised Edition 1980 - 1990. The Act addresses both the responsibility of the government to publish certain documents for public dissemination, as well as the rights of persons to request certain information from government. In both cases, "document" includes public contracts, grants or leases of land, or any written or printed matter, any map, plan or photograph, and any article or thing that has been so treated in relation to any sounds or visual images that those sounds or visual images are capable, with or without the aid of some other device, of being reproduced from the article or thing, and includes a copy of any such matter, map, plan, photograph, article or thing, but does not include library material maintained for reference purposes."

Exceptions to the above information include a broad range of types, including:

- Documents affecting national security, defence and international relations.
- Cabinet documents.
- *Documents affecting enforcement and administration of the law.*
- *Documents to which secrecy provisions of enactments apply.*
- Certain documents concerning operations of Ministries, etc.
- Documents affecting personal privacy.
- Documents affecting legal proceedings or subject to legal professional privilege.
- Documents relating to trade secrets, etc.
- Documents affecting national economy.
- Documents containing material obtained in confidence.
- Documents the disclosure of which would be contempt of National Assembly or contempt of court.
- Crown privilege in judicial proceedings not affected.
- *Duty of authorities to act in good faith.*

Statistical Institute Belize (SIB). The SIB was established on April 1, 2007, replacing the Central Statistical Office as the national statistical agency of Belize. The functions of the Institute as stated in the formation Act is to include "collection, compilation, extraction, analysis and release of official statistics relating to demographic, social, environmental, economic and general activities and conditions of Belize". Those parts of the Act that have the most direct impact on the BNSDI relate to confidentiality, rights for public access and charging of fees for data, as outline below.

<u>Confidentiality and rights for data access</u>. Under the first schedule of the Act, it is indicated that the SIB is required to:

2b - Produce data and statistics subject to the principles of reliability, objectivity, relevance, <u>statistical confidentiality</u>, <u>transparency</u>, <u>specificity</u>, <u>and proportionality</u>, which mirror as faithfully as possible the real situation;

2c - Disseminate data and statistics to the public and the users thereof in a neutral and impartial way, focusing on the phenomena which are <u>essential for decision makers and honouring the citizens' rights to public information</u>.

The Act further defines confidentiality as, "confidential data" means data obtained by the Institute for the production of official statistics when such data allow <u>statistical units to be identified directly or indirectly, thereby disclosing individual information</u>" (underlines added for emphasis).

Furthermore, the Act indicates that "No information obtained in any way under this Act which can be related to an identifiable person or undertaking shall, except with the written consent of that person or undertaking or the personal representative or next-of-kin of that person, if he be deceased, be disseminated, shown or communicated to any person or body" (with very specific exceptions). It also stipulates that "Every person involved in research or a statistical project for which information is disclosed pursuant to this section shall subscribe to the oath of secrecy".

As indicated in the SIB Act, the confidentiality of individuals is considered sacrosanct, thus requiring that any published information be sufficiently "anonymized". Up to this point a very conservative interpretation of this requirement has been applied, which has also limited the usefulness of the information for planning purposes. For example the population census information has traditionally only been summarized for distribution at the District and Town levels, with all other communities being grouped typically as "Rural" within a District. Given the diversity and distributed nature of villages and other smaller communities in each District, the generalization of census information to this level seriously limits the utility of this information for most land use and infrastructure planning, social and economic program development purposes.

In other countries for example in North America and Europe, much census data is made available at a block or similarly disaggregated level, while also applying techniques to ensure that the privacy of individuals and families is not compromised. The SIB has indicated recently that it will be exploring international sound practices and techniques for anonymizing its data to comply with the law while also increasing the specificity and utility of those data topics that are most critical to planning, policy and decision making.

7.1.4 Intellectual property protections

Intellectual property refers to creations of the mind such as trademarks, patents, industrial designs and copyright. Geospatial maps and data that are at the core of the BNSDI initiative are important works that require some level of protection, in alignment with other factors

such as government transparency, freedom of information for public access, security and privacy considerations.

The Belize Intellectual Property Office (BELIPO), established under Part II of the Patents Act (Chapter 253), Revised Edition 2000, is the National Intellectual Property Registry for Belize. The following summarizes the current situation as it may apply to geospatial data and the BNSDI.

Copyright, licensing and intellectual property protection. Copyright is a set of exclusive rights regulating the use of a particular expression of an idea or information. At its most general, it is literally "the right to copy" an original creation. A license is the document demonstrating that permission. License may be granted by a party ("licensor") to another party ("licensee") as an element of an agreement between those parties. Copyrights and licenses are critical to the protection of individual and institutional rights regarding data, software and other BNSDI components. Intellectual Property laws and regulations establish rights of ownership and ensure proprietary information (for example a value added data product is legitimately protected from distribution to the public domain). According to available documentation, Belize seems to have maintained copyright and licensing regulations through the BELIPO since the 1980's, however the existing copyright act refers only vaguely to a "drawing" being "inclusive of a diagram, map, chart or plan" as being an article that can be subject to copyright law. It also refers to a "graphic work" as "any painting, drawing, diagram, map, chart or plan".

The issue of protecting maps as creative work versus data that underlies the maps is more prevalent now since in the digital age, geospatial data components can be clearly separated from the (creative) end product such as a hardcopy map. Also, geospatial data can now be more readily collected and disseminated in digital form. Currently, only a few organizations (government or private) are engaged in distributing (either commercially or for free) geospatial databases. Notable exceptions are the MNRA LIC which distributes parcel ownership information on a fee basis and restricts the redistribution of that information by contract with the purchasing entity. NEED TO CONFIRM WITH LIC.

As noted previously, the existing Belize NSDI Act indicates that "The data creator shall own the copyright of the data produced. Therefore, for value-added data, the producer shall own the copyright of only the value-added component of the data". The Act makes no reference to the Belize Copyright Act and does not provide any further definition or detail regarding geospatial or related materials that can be copyright protected, nor what constitutes "value-added data". This may require further development to ensure a proper balance between the protection of intellectual property and the free flow of useful information across the BNSDI community and the promotion and support of the use of government information for building new commercial businesses, products and services.

In addition, procurement and development activities related to the BNSDI Program should all comply with Software and/ or Hardware Intellectual Property Rights that are governed by local regulations and international treaties. One of the areas that will need to be revisited is the law that specifies regulations with respect to maintaining security on mapping projects. These regulations address approval processes an organization (including government and private sector) has to go through in order to obtain and/or create aerial photographs, maps, and other land survey information.

Geospatial information acquisition and dissemination. In the process of conducting this study there were no laws or rules uncovered in Belize specifically covering the issues concerning spatial data acquisition and dissemination, outside of those that are specifically mentioned in the Acts relating to the MNRA LIC and the SIB. As a consequence, all activities related to spatial data dissemination amongst the various stakeholders are subject to a lack of confidence in the distribution process, and protections related to the data itself. This condition may have an impact on the efficient development of spatial data usage in the Country.

As outlined above there are many existing information laws and agency decrees that will have some relationship and impact relative to the goals and objectives of the BNSDI. These will need some level of harmonization and refinement among them to ensure that they are all compatible and internally consistent with one another, and new laws may need to be developed to cover areas of the required BNSDI legal framework that are not logically included within existing legislation. This framework of enabling legislation will provide the foundation or enabling environment upon which specific data development and sharing arrangements can be developed.

7.1.5 Privacy protection.

While open access to information is desirable for BNSDI, providing some data can truly compromise privacy and should therefore legitimately be limited from distribution. This may include personal or family details, health records, personal employment and household information among others. Laws governing privacy and confidentiality of data should ideally not conflict with those that govern open access of information. The latter may provide tremendous economic benefit in several areas that include:

- Commercial reuse of government information in a sense that data procured or generated by government agencies can be distributed/ reutilized by the remaining government agencies as part of agreed upon commercial and licensing agreements;
- Commercial sector involvement:
- Public/ Private participation;
- Outsourcing;
- Commercial application/ reapplication and value added.

Whether or not the existing privacy laws would hold up to a challenge based on policies and laws requiring open access to information is untested. Since issues of privacy and

confidentiality in any country are usually based on strong societal values, it is likely that laws mandating open access to data would not be strong enough, unless handled properly, to override existing privacy laws to support potential benefits of data sharing that are envisioned by the BNSDI. Legal hurdles and obstacles related to data access/ sharing could result, unless resolved, in significant constraints to the BNSDI Program implementation. Therefore, any issues and constraints related to laws, practices and cultural barriers should be surfaced out early on and dealt with as necessary.

The grounds for limiting access to fundamental GIS data shall be interpreted in a restrictive way, taking into account for the particular case the public interest served by providing this access. In every particular case, the public interest served by disclosure shall be weighed against the interest served by the limiting or conditioning the access. Member agencies may limit public access to spatial data sets and related services where such access would adversely affect, for example, any of the following:

- The confidentiality of the proceedings of public authorities, where such confidentiality is provided for by law;
- The confidentiality of commercial or industrial information where such confidentiality is provided for by national or Community law to protect a legitimate economic interest, including the public interest in maintaining statistical confidentiality and financial secrecy;
- The confidentiality of personal data and/or files relating to a natural person where that person has not consented to the disclosure of the information to the public, where such confidentiality is provided for by national or Community law;
- The interests or protection of any person who supplied the information requested on a voluntary basis without being under, or capable of being put under, a legal obligation to do so, unless that person has consented to the release of the information concerned;
- The course of justice, the ability of any person to receive a fair trial or the ability of a public authority to conduct an enquiry of a criminal or disciplinary nature;
- Member agencies shall ensure that the requirements of directives by government, parliament and councils in charge of information laws adoption such as the protection of individuals with regard to the processing of personal data and on the free movement of such data is complied with.

7.1.6 National security and safety

Clearly, some geospatial information is truly vital to national security, and should be protected from general distribution. At the same time, the level of data protection will have to take into account technological realities as well as new requirements with respect to building a more comprehensive geospatial data infrastructure that supports the information age where information is considered as a societal asset. More open and free information will eventually have a positive impact on several facets of public governance including transparency, corruption control and public competence. This strongly implies that existing laws regarding geospatial information and national security will have to be modernized. The BNSDI Program design should be able to accommodate the existing and future security

requirements and data sharing rights such as who should be able to access what type of information and how.

7.1.7 Charging for data and services.

The member agencies that supply spatial data sets and services will have certain rights as established in policy and in the law. The mechanisms for sharing spatial data sets and services between the various stakeholders may involve laws, regulations, licensing or financial arrangements or administrative procedures, for instance to protect the financial viability of those member agencies that have a duty placed on them to raise revenue.

7.1.8 Commercial applications of government data

The Belize government agencies could rely on GIS and BNSDI data producers, technology service providers, integrators and subject-matter professionals in order to help develop, operate and maintain the BNSDI Program. Some countries have also established policy frameworks to leverage government data in the development of new products and services that incentivize private sector development, diversify the economy, create jobs and provide additional societal value.

7.1.9 Data coordination.

Data coordination involves ensuring that data custodianship for each data theme or topic is clearly defined, that stakeholders that are dependent upon that data have a voice in the establishment, content and format of the shared version, that data are made accessible to those that are authorized to have it, and that clear terms of usage are agreed upon and followed. International experience with NSDI suggests that the requirements listed in the following sections be addressed.

Custodianship assignment. The BNSDI Data Inventory and Assessment document has identified over 50 fundamental data themes comprising over 225 data topics that are of interest to multiple organizations. To the extent possible, custodianship for each theme and/or topic should be officially assigned to the organization that owns the primary business process that is required to record that information first and/or most completely. For example, the capture of building footprint information should be captured as part of the building permit process by the organization responsible for that process. This specific example can be expedited by requiring that the building footprint information be submitted by applicants in a GIS-ready form, as is already the case with plot boundary information. In some cases the logical custodian for a theme or topic may not yet have the technical capacity to develop or maintain such information in digital form. In these cases it may be necessary to temporarily assign custodianship to another entity or provide outsource services until such time that the capacity can be developed within the responsible agency. In these cases a specific timeframe for the development of that capacity and assuming of future responsibility

for ongoing updates should be clearly and specifically defined in the BNSDI implementation planning.

Data access authorization. Some data is sensitive or of a proprietary nature that will constrain it from being made universally available. This includes data that is restricted from distribution by existing laws (national security, privacy, intellectual property rights, etc.), data for which financial charges are involved for certain users, and other such matters. Authorization for data access and use will need to be explicitly defined and codified into the administrative and technical procedures by which users are classified and provided access to the network of available data resources.

BNSDI Service Level Agreements. It is important to establish explicit commitments for the development and regular maintenance of each data theme or topic by the custodian organization. It is equally important that those having access to this information comply with specific limitations on the use of that information, for example respecting restrictions of redistribution of information without the permission of the data owner. Service Level Agreements (SLAs) are often used to translate the intent into specific agreements among agencies as to what specific information is to be shared, in what form and periodicity of updating among other matters. Typically an SLA is developed between the custodian organization and the central coordinating body for the BNSDI on behalf of the rest of the community.

Monitoring and enforcement. Maintaining the integrity, reliability and security of the BNSDI will require that the provisions of the user authorizations and service level agreements are carefully monitored and enforced. This includes ensuring that data custodians comply with their commitments for periodic data updating, that data access authorizations and limitations on usage and redistribution are respected. There must also be specified consequences and mitigation plans in place to be able to respond to any delinquent or non-compliant matters.

The BNSDI central coordination and facilitation entity will need to develop business performance indicators that will be monitored periodically in order to keep in check the performance of the entire program. Those indicators will be reviewed also periodically and realigned in light of program evolution where necessary. The business performance management plan addresses a comprehensive review of all components affecting performance i.e. the BNSDI central coordination and facilitation entity itself, member agencies as well as the performance of the various representative bodies that comprise the BNSDI organization structure.

7.2 Operating Procedures

International experience suggests that an effective BNSDI will require very focused and specific facilitation, promotion and support by an entity that has been assigned the specific authority and provided the adequate resources to do so. Among other issues, this entity will

need to be responsible for defining and overseeing a variety of standard operating procedures that need to be followed by themselves as well as others in the BNSDI stakeholder community. Basic operating procedures that will need to be defined include, at a minimum the following:

- Cross-agency business process coordination
- Configuration Management
- Service Level Management
- Performance monitoring & assessment

7.2.1 Cross-agency business process coordination.

The business processes governing the relationships among the stakeholder agencies may be serving either intra-governmental activities or directly supporting the provisioning of public services from which they are originating. The BNSDI will need to be responsive to both types of requirements.

Business process automation and transformation are usually one of the major challenges in any enterprise and national information program developments due to the important resistance to change by the constituents. Sponsor backing and open communication channels are very important in order to avoid bottlenecks during the implementation including the ones related to administrative and bureaucratic barriers.

7.2.2 Configuration management.

The purpose of the configuration management is to develop a comprehensive configuration management program that establishes the necessary change management and system maintenance procedures to keep the BNSDI central and distributed nodes in synchronization. This issue goes beyond the configuration management requirements outline in the computing infrastructure section of this report to include other technical and institutional aspects of the program. Configuration management developments may include the following:

- Development of a Configuration Management Plan (CM) where configuration management roles and responsibilities are defined;
- Incorporation of the configuration management business rules in the configuration management software;
- Ensuring that the configuration management plan involves change management and control of the various system design components i.e. software, data, hardware, training and procedures;
- Integrating the CM tools with the help desk functions and the document management system in place;
- Performing periodical audits and preparing management reports in order to ensure that agreed upon CM procedures are being followed.

Based on the above, it is important during program design to assign a leadership role to oversee the Configuration Management Plan related to the BNSDI Program coordination

function and to ensure that the configuration management plan is integrated in the early stages of BNSDI program development.

7.2.3 Service level management.

At present, various levels of GIS agreements exist among government agencies that can be described as follows:

- Various inconsistent levels of data sharing and agreements (most of the time on a case by case basis;
- Selective data sharing policies on a case by case basis;
- Lack of inter-agencies cooperation i.e. bilateral coordination activities that are not yet mature or normalized across agencies

The central data coordination function will need to develop and maintain agreements with the key stakeholder agencies that reflect their level of contribution, participation and commitment to the BNSDI activities. There are a variety of techniques and templates that can be used to express the agreements depending primarily on the criticality of the role of the member agency in the provision of fundamental services such as Fundamental Geospatial Data Set (FGDS) data. Different types of agreements such as Service Level Agreements (SLAs), Memorandum of Understanding (MOUs), Executive Orders, etc. will apply depending on the circumstances. Data exchange and sharing environment at the national level is governed normally by licensing legislations that define the role of each party in the process, its responsibilities and liabilities. Therefore, the BNSDI policy should articulate clear requirements and consequences related to compliance and non-compliance of the participating agencies and their commitment to the data sharing SLAs. Also, the existing BNSDI policy will likely have to be strengthened to more clearly establish the conditions under which geospatial data is shared, as well as clarify government ownership rights with respect to geospatial data.

7.2.4 Performance monitoring and assessment.

The purpose of the program monitoring and assessment is to develop a performance monitoring framework, policies and procedures that will define, among other things, the relationship of the BNSDI central node with the other stakeholder BNSDI nodes and the adaptive management development process that will apply the results of such assessments. Program Performance has several dimensions: Business Performance, System Performance and Nodes Performance can be described as follows:

- Business performance is meant to ensure that the system developments are taking place according to the original goals and objectives. This can be verified through periodical program oversight audits as described under scope of services in order to avoid scope creep that may derail the program from its original track.
- System performance depends on several variables: servers' capacity, communication network capacity and software/ applications performance. Effective performance is achieved through adequate system dimensioning, system configuration and

- optimization after deployment and reliable enterprise information management / application architecture platform, all of which should provide jointly acceptable user response time for different types of concurrent transactions on the system.
- The boundary jurisdiction of the BNSDI system stops at the interface point with the nodes representing the various individual agencies in the network. From a policy perspective, certain type of agencies have a critical role in the BNSDI network such as the Survey Agency since it provides the basemap updates that are the backbone of the BNSDI fundamental data framework. Therefore, in order to lay out a solid performance management environment, two-way Service-Level-Agreements (SLAs) should be developed between the BNSDI central system and the nodes.

Based on the above, there is a need to develop a comprehensive Performance Management Program that handles all aspects of BNSDI program performance during the design stage as well as during the operational and maintenance stage. Failure to develop a Program performance management plan early on during initial program implementation may result in the program digressing from its objectives with consequent lack of system utilization after rollover.

7.2.5 GeoMaturity management.

Related to the performance assessment and management topic addressed previously but called out for special attention here is the notion of "GeoMaturity". Attaining optimum benefits from GIS and the BNSDI will require that the Government of Belize adopt a proactive program for the development and management of GeoMaturity across the stakeholder community. This is important at the level of individual entities as well as the community as a whole. At the level of individual entities this involves the development of individual GIS Roadmaps that provide a specific program design and a plan for its implementation to move them from the existing situation to a future target state based on international sound practice for each organization, sector and business area. That target state should define the elements of an "Enterprise GIS" for each entity that supports the streamlining and increased efficiencies in government operations and the improvement of services to the public. International experience suggests that the development of enterprise GIS requires some level of initial investment to move from current practices to technology supported processes, but that positive impacts and return on investment can be gained within a relatively short timeframe, depending on the complexity and size of the organization. This return on investment is also enhanced by the efficiencies, elimination of redundant data collection, better evidence-based decision making and increased collaboration and coordination that can be supported through the BNSDI.

There are well considered and tested processes for GeoMaturity management already in place in many organizations internationally. These models can provide a useful starting point for the adaptation and development of a model that is specifically responsive to the conditions, needs and priorities in Belize. The management of such a program is an

important function of a centralize BNSDI support facility, involving monitoring and reassessment every two years or so. Such reassessments can be used to track how well each entity is proceeding with its GIS Roadmap and GeoMaturity improvement process and to identify areas of additional support or resources that may be needed for organization to achieve their objectives. By managing this program centrally it is important to relate the need of individual organizations to the needs of multiple other stakeholders who may have interdependencies on data custodians and/or related business processes.

7.3 Organization

The BNSDI is intended to support stakeholder GIS activities while creating coordination, synergy and mutual benefit across the community. While the MNRA has been designated as the coordinating agency for moving the BNSDI initiative forward, it will be important that the initiative is ultimately "owned" by the community, and supported through direct representation from all the involved stakeholder organizations. It will also be important that there is clear delegation of authority and unambiguous articulation of roles and responsibilities across all elements of the BNSDI organization structure.

International experience suggests that the following organization elements will need to be addressed in the BNSDI:

- Agency executive representation
- Agency technical representation
- SDI program central coordination and facilitation
- Topically focused coordination and joint development
- Community engagement, outreach and communications
- Agency internal coordination

7.3.1 Agency executive representation.

While there are several candidate configurations for the executive participation, the main role is to ensure that the vision, mission and strategic direction of government are reflected in the BNSDI Program development as well as the handling of budget and regulatory considerations. An agency executive representation body will be needed as the primary interagency leadership and decision-making body in regards to BNSDI policies, agreements and priorities. The agency executive representation central focus is to provide the executive leadership for the coordination of national geospatial activities between, among, and within agencies. This function may be carried out as an Executive Oversight Board assigned by the Parliament, or as an Executive Oversight Committee comprising management representation from all the key participating agencies.

7.3.2 Agency technical representation.

Agency technical participation will be needed and should include membership in a Technical Committee comprising representatives from each of the participating stakeholder agencies.

Initial representatives will be assigned by the respective agencies. This technical representation is the operational-level interagency group responsible for facilitating BNSDI program development. The central focus of the technical representation will ultimately be to carry out working level responsibilities under an extended and refined BNSDI policy that is guided by the BNSDI executive representation directions and decisions. The technical representation facilitates the coordination of government geospatial activities between, among, and within agencies to eliminate duplication of effort and data, avoid redundant expenditures, reduce resources spent on unfunded mandates, and leverage geospatial investments. Through its outreach and communication efforts, the BNSDI shall also seek to involve state, and local governments, academia, the private sector, professional societies, and others to aid in the development and implementation of the BNSDI. In addition, the technical representation facilitates the use of geospatial data in the development of electronic government to meet the needs and expectations of citizens and agency programmatic mandates, and to improve the efficiency and effectiveness of public resources management.

Provision will need to be made for departments or agencies that are not initially members of the BNSDI but have significant activities in geographic information or spatial data collection or use have a mechanism to request membership in the BNSDI. Upon acceptance, they should have the same responsibilities and privileges as other members of the BNSDI. Non-government organizations that have significant activities in geographic information or spatial data collection or use should be encouraged to request membership as a BNSDI Partner to the executive representation body. All BNSDI stakeholders should also be encouraged to participate on subcommittees and working groups, and participate in BNSDI activities to the fullest extent that benefits both individual stakeholders as well as the community as a whole.

7.3.3 BNSDI program central coordination and facilitation.

A BNSDI program central coordination and facilitation function will be needed to facilitate, coordinate, and support the development of the BNSDI, manage and operate a central Geospatial Data Clearinghouse and network of interoperable nodes, and provide limited technical services to the BNSDI community on an as-needed basis. Primary functions of this entity, presently supported in part by the MNRA LIC will include, but not be limited to the following:

- Provide overall oversight and coordination of the BNSDI implementation plan;
- Oversee and interact with major FGDS data development projects to ensure compliance with BNSDI principles and community interests;
- Support executive representation functions;
- Chair technical representation, participate and support regular meetings and other functions;
- Maintain BNSDI Portal with information about the BNSDI initiative;
- Maintain Geospatial Portal and associated services;
- Manage and operate a central geospatial data clearinghouse. Data stored in this clearinghouse will primarily include those FGDS that are needed in common across

- the community, but whose custodian agency is not yet prepared to host and provide that information from their own distributed BNSDI node;
- Manage and operate an BNSDI "help desk" to receive, log and route requests for information and support to the appropriate place;
- Maintain a library of common reference resources in both digital and physical form on behalf of the rest of the BNSDI community, and make those resources available to others;
- Oversee topically focused coordination and joint development functions, and participate directly in Working Group activities where relevant;
- Prepare policies and policy refinements for recommendation to the Executive representation;
- Provide special technical support to BNSDI community. A limited technical consulting and support capability will be maintained to allow the BNSDI program central coordination and facilitation entity to assist other organizations on an asneeded basis. Any such services that are beyond the normal operating functions of the BNSDI program central coordination and facilitation entity will be charged to the receiving organization;
- Administer and manage the BNSDI program central coordination and facilitation facility and staff.

While the MNRA LIC is currently tasked, by adopted policy, to facilitate and coordinate the development of the BNSDI, it is not currently staffed or resourced to effectively carry out the required functions. This issue will be addressed in the development of the BNSDI program design and implementation plan.

7.3.4 Topically focused coordination and joint development.

The purpose of the topically focused coordination and joint development is to initiate and mobilize topically focused technical groups in the BNSDI community that supplement the work that is carried out by the BNSDI technical representation. The groups may be of two categories: permanent (Special Interest Groups), or temporary (Working Groups) depending on their mandate and the themes for which they are charged. Two types of groups will be needed including those that will involve sector themes such as urban planning, transportation, utilities, and others, or by activities of common interest that cross-cutting or affect several data themes such as metadata, standards, geospatial applications, etc. Each group will require a charter defining its purpose, process and intended outputs, and members will need to be involved in developing a work plan and to report their progress periodically to the technical representation body.

The topically focused coordination and joint development whether permanent and/ or on asneed basis, provide the basic structure for institutions and individuals to interact regarding all aspects of SDI implementation. Collectively, they establish and implement strategic guidance and specific actions that support improved collection, sharing, dissemination and

use of geospatial data, contributing to the development of the BNSDI. In the future, it is anticipated that public interest groups will participate within the technical representation structure to ensure that their needs are included in developing the National infrastructure. Building an effective BNSDI requires a well-coordinated effort among all levels of government, and academic institutions, as well as a broad array of private sector geographic, statistical, demographic, and other business information providers and users. Involving these stakeholders in the development of the BNSDI addresses nationwide data needs of end-users in Belize.

7.3.5 Community engagement, outreach and communications.

One important function of the BNSDI coordination function will be to maintain effective communications and coordination across the stakeholder community. A BNSDI Outreach program will need to be mobilized and administered to both support community engagement on an ongoing basis as well as to inform others nationally and internationally about what is being accomplished by the BNSDI initiative, build communication and coordination channels and partnerships, liaison with other communities of interest inside government and with the private sector, and actively seek to uncover areas where support is needed across the BNSDI community. The outreach strategy will need to address the following, at a minimum:

- SDI website
- Web-based application services such as Request for Information
- International relations
- Media
- Professional conferences and exhibitions
- Stakeholder relations

7.3.6 Agency internal coordination.

The purpose of the BNSDI Program agency internal coordination is to ensure that the internal capacity of the enterprise nodes is built as needed and that the data, metadata and services are rolled up and shared as per the agreed-upon Service Level Agreements. A strong communication channel shall be maintained between internal and external coordination functions. Internal agencies organization and capacity building requirements raise the crucial role of human resource capacity building to support the BNSDI community inside the agencies. This requires the development of the appropriate human resource procedures such as recruitment practices, job descriptions, performance evaluation, promotion and employee incentives and ongoing education and training updates to keep abreast of new developments and capabilities. As mentioned previously in regards to GeoMaturity management, agencies need to consider how to optimize GIS and related technologies within their own organizations as an integral component of their information infrastructure and business modernization plans.

The BNSDI project team will provide the necessary support to internal coordination as needed and required by the stakeholder agencies.

7.4 Finance

The equitable distribution and management of financial resources related to the BNSDI will significantly affect how agencies interact and share information. Many agencies are being asked to contribute time, data and other resources to make the BNSDI reality. Bottom-line, for the BNSDI to be a useful and sustainable asset to the government of Belize it will be important that participation by the agencies represents a net material and financial benefit to them individually, as well as collectively. This will require careful attention to how costs and benefits are spread among the community, and sensitivity to the individual priorities and benefits of the constituents as a prerequisite to the sustainability of the collective.

The BNSDI Finance environment requirements include the following topical areas:

- Government financial management;
- Interagency benefit and payment;
- Commercial benefit and payment;
- Public and private partnership arrangements;
- Outsourcing;
- Public benefit and payment.

7.4.1 Government Financial Management.

Enterprise financial investment depends on the management vision and the role they foresee the technology will play in their business practices. As a baseline principle, the financial justification for GIS implementation at the enterprise level should already be established as an enterprise matter. Beyond this, the BNSDI seeks to leverage that investment by making the information available for use by other organizations, both to eliminate redundancy and to increase the breadth of information generally available which will in turn add value to the efficiency of government operations and increase interagency coordination. However the reciprocal benefits between data providers and users will not always be spread equally, and can become an issue especially when some agencies may be asked to maintain data at a level that is beyond their immediate enterprise business needs. It is necessary therefore to establish mechanisms by which custodian agencies are provided with sufficient resources to ensure that they can fulfill their responsibilities to the community, beyond those that they need to carry out for their own internal agency needs.

Beyond the stakeholder agency financing issue, it will also be critical to ensure long-term financial commitments for the development and sustainability of the BNSDI central spatial data coordination entity as a permanent function to support the facilitation and coordination of the initiative. Several considerations will need to be addressed in the program design including, but not limited to, the following:

- Decide on the process by which the BNSDI Program will be financed through its entire evolution stages;
- Identify yearly budget and yearly cash flow requirements;

- Ensure that there is synchronization between the management vision and the supporting procurement process especially in regard to budget margins and risk estimation;
- It is important to recognize that the return on investment usually have a tangible component as well as a non-tangible component that can be equally significant. In order to measure the expected Return On Investment (ROI), the BNSDI Program coordination team will need to setup a framework of hard and soft metrics that will be measured and/or evaluated on a period basis. Some of the soft metrics may include risk factors and their incorporation in the financial equation as well as the impact on the social welfare and quality of public experience and services.

The following budgeting considerations for the various entities in the BNSDI Program will need to be addressed:

BNSDI Central Program Coordination and Facilitation Operating Budget. It has been identified that a central program coordination and facilitation and staffing is needed at the minimum level required to efficiently and cost-effectively facilitate and coordinate the BNSDI initiative, and to provide technical assistance only at the level demanded by the BNSDI community and not effectively provided through other data producers, service providers or the private sector. This is important to ensure that the central program coordination and facilitation entity stays focused on coordination of the initiative, rather than becoming a primary provider of consulting and technical services. It is suggested therefore that the central program coordination and facilitation entity operating budget be funded as a matter of national priority through the sponsoring agency, and that such financing be assured long term to maintain the continuity and stability necessary to support a reliable, accessible and secure BNSDI network and services.

BNSDI Central Program Coordination and Facilitation Service Bureau Revenue. It is expected that the central program coordination and facilitation will need to maintain a minimal service bureau capacity to provide specialized consulting and technical support to other organizations on an as-needed basis. Fees for providing such services could be calculated based on the total cost of providing such services (direct labor, general and administrative costs, etc.), with any surcharge above cost to be decided by the executive representation body. The investment of extra revenues derived from any such surcharge should likewise be determined by the executive representation body.

Agency Budgets. All agencies that will be GIS users need to develop some level of internal technology and staff skills to take advantage of what the technology has to offer. The initial development of digital geospatial datasets is the largest single cost line item for GIS development in any organization. Initial data conversion projects often require the compilation, integration and automation of information from a

variety of legacy data sources, and some of these will also require additional field verification. Agencies would normally develop these datasets according to their own internal business requirements; however in the context of the BNSDI, it will be important that these datasets be developed in a manner that will also support the broadest range of user requirements practical. In some cases meeting these broader requirements will involve more resources and cost. It will therefore be important that such additional costs be recognized by the government budgeting process, and the required resources provided accordingly. Likewise, agencies will need to develop the computing infrastructure and technical staff skills needed to maintain and use their own GIS, as well as access the resources of the BNSDI network. Some organizations will develop the capability to develop and maintain their own BNSDI distributed agency node services, and this should be promoted and supported through the agency budgeting and financing process.

Data Charges. The primary benefit of the BNSDI is to promote and support the free exchange and use of geospatial information resources across all sectors. Government to government, government to private sector, and government to education and public interest entities will all need to be worked out once there is clear policy direction in this matter set through the BNSDI Strategic Plan.

The following considerations will need to be accounted for during program design and later implementation:

- Agencies should be given sufficient resources to carry out those aspects of their geospatial data maintenance and management that are required by the BNSDI community, but are beyond their own internal enterprise needs;
- The spatial data coordination entity shall be given sufficient resources to carry out its role fully and efficiently;
- The BNSDI program is a continuous development exercise. A successful implementation of the program heavily relies on buy-in and strong sponsoring support. Therefore, as long as management vision and business objectives are properly articulated, are visible within the program, and the net return on investment in the BNSDI program continues to be positive, then financial backing becomes merely an administrative process;
- The regulatory environment may deal with information sharing and exchange, financial policies, human resource practices, laws and legislations, etc. Regulatory environment may make or break developments in a specific sector and can significantly impact the viability and achievability of a knowledge based economy in Belize. Therefore, it will be important that all policy and regulatory issues are surfaced out and dealt with prior to and during the implementation of the BNSDI Program;
- Taking into consideration that the prevailing regulatory environment may take long time to evolve in line with new policy and technological requirements, temporary

- solutions and/or measures may need to be adopted meanwhile by the BNSDI central coordination entity.
- That the BNSDI be built on current investments in data to capture the value that is recognized in these data sets. Many existing data sets will require restructuring to make them useable. Clearly, all data sets are not worth for reasons of currency, accuracy or content. Additional investment should be made in acquiring spatial data that can be included in the repositories at any level. This could be accomplished by developing license agreements with suppliers or by funding data collection programs that contribute to satisfying a known requirement;
- That the SDI be built on current investments in systems and technologies that have been made by the stakeholders. In addition to the extensive work done to establish systems in several agencies there has been a parallel effort in the municipalities and even in the private sector. While it may not be possible to incorporate all of these systems as they currently stand they do present a large body of knowledge and experience for broadening the SDI.

7.4.2 Interagency benefit and payment.

It is expected that during the early stages of BNSDI development that most data exchange will be between government agencies. This will either be direct exchange, or with contractors who are carrying out government projects. In such cases, decisions will need to be made whether to make this data available free of charge, and use the budgeting process mentioned previously to ensure that custodian agencies have sufficient resources to be able to make this service available beyond their own needs. In addition, some agencies are at the Country level while others are Federal or quasi-government. There are budgeting and financing issues at each level that will need to be addressed depending on what data is to be maintained by what agencies, and how their budgets or fees are structured among these levels.

Anecdotal evidence around the world has generally shown that attempts by public agencies to raise funding through the sale of geodata to one another have not been financially successful unless structured as an involuntary subscription or other form of monopoly. Such charging and the administrative, legal and financial systems needed to manage and enforce such systems also has a net effect of increasing administrative costs while reducing data utilization, thus decreasing the societal benefits that might otherwise be gained.

In contrast to the above, however, it should also be recognized that agencies may have specialized expertise that can periodically benefit others. When one agency requires specialized service from another agency that has not been built into operating budgets, then perhaps there will be sufficient justification for the charging of fees for this type of service support. These issues will need to be surfaced and vetted as a key issue in the development of the BNSDI Strategic Plan.

7.4.3 Commercial benefit and payment.

International experience has also shown that the private sector can be very effective in using government data to create new products and services. At present in Belize there is some concern that private companies acquire government information then turn around and sell it to another. This may be attributable to the lack of systematic data sharing and some interpretations of the legal and administrative frameworks now in place to protect intellectual property rights associated with government information. It may be argued that with a more open and systematic approach that government will not purchase data that it can acquire at little or no cost elsewhere if it knows about and has convenient access to such information. In addition, government can choose to actively promote private sector entrepreneurship in order to comply with current policies of the government of Belize to grow and diversify the economy.

Public and private partnership arrangements. In line with the Country's strategic policy directions, the BNSDI should be positioned to promote and participate in public/private partnerships wherever these can be of benefit to government through increased efficiency of effectiveness, or to overall improve the provision of services to the public. The financial structure of such arrangements will need to protect government interests and maximize public benefit while respecting the investment and reasonable return needed to make such partnerships financially feasible for the involved companies. Such partnerships should be carried out in an open and competitive environment that ensures that government is able to secure the most beneficial and cost-effective arrangement.

Privatization and outsourcing. The government of Belize has in the past looked to privatize certain government functions to the private sector (e.g. land surveying services), where such activities might be carried out in a more effective and cost-efficient manner. Temporary outsourcing in certain cases may also be beneficial to the government where additional capacity is needed for a certain period or until internal capabilities can be developed to carry out a certain activity. Outsourcing of certain geospatial functions may be a viable option in some cases and some provision for this should be reflected in BNSDI related financing approaches.

Public benefit and payment. Charging for geospatial data and services to the public requires careful consideration of public benefit, public information access rights, government service levels and other issues. This issue is critical to the development of a healthy knowledge economy, but needs to also consider the prevailing culture and socio-economic environment. This issue will need to be highlighted and addressed in the BNSDI Strategic Plan as a key issue.

APPENDIX A - GLOSSARY OF TERMS AND ACRONYMS

APAMO	Association of Protected Areas Management Organizations
BACONGO	Belize Association of Conservation NGOs
BAD	Belize Archives Department
BAHA	Belize Agricultural Health Authority
BAS	Belize Audubon Society
BBIS	Belize Biodiversity Information System
BCB	Banana Control Board
BCC	Belize City Council
BCCI	Belize Chamber of Commerce and Industry
BCS	Belize Country Strategy for Adaptation of the Sugar Industry
BEL	Belize Electric Company Limited
	Belmopan City Council
Bmp CITCO	A •
BNSDI	Belize National Spatial Data Infrastructure
BERDS	Biodiversity and Environmental Resource Data System of Belize
BEST	Belize Enterprise for Sustainable Technology
BLPA	Belize Livestock Producers Association
BNCC	Belize NSDI Coordination Center. Function or unit proposed to provide the
	facilitation, coordination, promotion and support that is needed to build and
DAG	operate an NSDI
BNE	Belize Natural Energy Ltd.
BNSDI	Belize National Spatial Data Infrastructure
BRDP	Belize Rural Development Programme
BSI	Belize Sugar Industry
BTB	Belize Tourism Board
BWSL	Belize Water Service Limited
CARDI	The Caribbean Agricultural Research and Development Institute (CARDI)
	was established in 1975 to serve the agricultural research and development
G L TTYLY L G	needs of the member states of the Caribbean Community (CARICOM).
CATHALAC	Water Center for the Humid Tropics of Latin America and the Caribbean (in
	Spanish "CATHALAC" - Centro del Agua del Trópico Húmedo para America
	Latina y el Caribe) is an autonomous international organization dedicated to
	promote sustainable development through applied research and development,
	education, and technology transfer in the areas of integrated watershed
	management, climate change, environmental modeling and analysis, and risk
CARICOM	management in Latin America and the Caribbean Caribbean Community
CRA	· · · · · · · · · · · · · · · · · · ·
CBD	Central Building Authority
CBO	Convention on Biological Diversity
CBO	Community Based Organization
CCB	Citrus Company of Belize
CCCCC (5C's)	Caribbean Community Climate Change Center
(5C's)	Coulth our Development Part
CEO	Caribbean Development Bank Chief Everyting Officer / Chief Equipmental Officer
CEO	Chief Executive Officer / Chief Environmental Officer
CFR	Chiquibul Forest Reserve
CGA	Citrus Grower's Association
CH4	Methane
CIARMP	Community Initiated Agricultural Resources Management Project
CITES	Convention on International Trade in Endangered Species of Wild Fauna and

	Flora
CNP	Chiquibul National Park
CO	Carbon Monoxide
	Carbon Monoxide
CO2	Carbon Dioxide
CPA	Country Poverty Assessment
CPACC	Caribbean Planning for Adaptation to Climate Change
CRIP	Climate Resilient Infrastructure Project.
CZMAI	Coastal Zone Management Authority and Institute
DfID	Department for International Development (formerly ODA)
EIA	Environmental Impact Assessment
	The second of th
Enterprise GIS	Enterprise GIS refers to a geographic information system that is effectively
	integrated as a fundamental component of an organization's information
	infrastructure, business processes and customer services.
EPA	Environmental Protection Act.
ERI	Environmental Research Institute of the University of Belize
ESTAP	Environmental and Social Technical Assistance Project
EU	European Commission / Union
FAO	The Food and Agriculture Organization of the United Nations leads
	international efforts to defeat hunger. Serving both developed and developing
	countries, FAO acts as a neutral forum where all nations meet as equals to
	negotiate agreements and debate policy. FAO is also a source of knowledge
	and information. We help developing countries and countries in transition
	modernize and improve agriculture, forestry and fisheries practices and
	ensure good nutrition for all. Since our founding in 1945, we have focused
	special attention on developing rural areas, home to 70 percent of the world's
	poor and hungry people.
FCD	Friends for Conservation and Development
FD	Forest Department
FGDC	Federal Geographic Data Committee (USA)
FGDS	Fundamental Geospatial Data Set. This is any data theme or topic that is
	needed in common across a stakeholder community.
FIRMS	Fire Information for Resource Management System
FPMP	Forest Planning and Management Project
GBIF	Global Biodiversity Information Facility
GDP	Gross Domestic Product
GEF	Global Environment Facility.
GeoNode	GeoNode is an open-source, web-based application and platform for
	developing geospatial information systems (GIS) and for deploying spatial
	data infrastructures (SDI)
GEO	Group on Earth Observations
GEO	Global Environment Outlook
GeoMaturity	A set of performance standards for the measurement and assessment of the
	optimization of GIS technology within an organization, sector and NSDI
	community
GHG	Green House Gas
GIS	Geographic Information System. A Geographic Information System is a
	computer system designed to allow users to collect, manage, and analyze
	large volumes of spatially referenced and associated attribute data. The major
	components of a GIS are: a user interface system; data base management
	capabilities; data base creation/data entry capacity; spatial data manipulation
	and analysis packages; and display/product generation functions.

GoB	Government of Belize
GPA	Global Programme of Action for the Protection of
0111	the Marine Environment from Land-Based
	Activities (UNEP)
	Tienvinos (CIVEI)
GPS	Global Positioning System
HDI	Human Development Index
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
Hydromet	Belize National Meteorological Center
IABIN	Inter-American Biodiversity Information Network
ICRAN	International Coral Reef Action Network
ICT	Information and Communication Technologies
IDB	Inter-American Development Bank
IICA	The Inter-American Institute for Cooperation on Agriculture (IICA) is a
	specialized agency of the inter-American system, and its purposes are to
	encourage and support the efforts of its Member States to foster agricultural
	development and rural well-being in their territories.
IP	Internet Protocol
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization of Standardization
ISP	Internet Service Provider
IT	Information Technology
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
IWRM	Integrated Water Resource Management
KB	Kilobyte
KCB	The Ke'kchi Council of Belize
LIC	Land Information Centre
LLES	Limited Level Environmental Study.
MAR	Mesoamerican Reef
MARPOL	International Convention for the Prevention of Pollution from Ships
MBRS	Mesoamerican Barrier Reef System
MDG	Millennium Development Goals
MEA	Millennium Ecosystem Assessment
Metadata	Standardized catalog of information about each geospatial data set
MFED	Ministry of Finance and Economic Development
MFFSD	Ministry of Forestry, Fisheries and Sustainable Development
MLGRD	Ministry of Local Government and Rural Development
MNRA	Ministry of Natural Resources and Agriculture
MoESTPU	Min of Energy, Science & Technology, and Public Utilities
MoFED	Ministry of Finance and Economic Development
МоН	Ministry of Health
MoWT	Ministry of Works and Transport
MPAs	Marine Protected Areas
MPRFR	Mountain Pine Ridge Forest Reserve
NASA	The National Aeronautics and Space Administration (NASA) is the agency of
	the United States government that is responsible for the nation's civilian space
	program and for aeronautics and aerospace research
NAVCO	National Association of Village Councils Organization
NBII	National Biological Information Infrastructure (USA)
NBSAP	National Biodiversity Strategy and Action Plan

NCB	National Coordinating Body
NCCC	National Climate Change Committee was established to advise government
Weee	on issues regarding climate change
NCRIP	National Climate Resilient Investment Plan
NEAC	National Environmental Appraisal Committee. The Committee was
1,210	established to review development projects in the context of the national
	environment.
NEAP	National Environmental Action Plan
NEMO	National Emergency Management Organization
NFAB	National Fisheries Advisory Board established to provide guidance on
1,1112	fisheries commodities extraction strategies and policies
NFP	National Focal Point
NGO	Non-Governmental Organization
NICH	National Institute for Culture and History
NMS	National Meteorological Service
Node	A facility that is connected to other facilities over the Internet for the purpose
1,000	of publishing and sharing data
NPAC	National Protected Areas Committee. This Committee was established to
· -	advise the government of Belize on issues concerning the national protected
	area system
NREPS	Natural Resource and Environmental Sub- committee was established to
	increase the national understanding and acceptance of the linkages between
	natural resource and environmental protection and socio-economic
	development
NSDI	National Spatial Data Infrastructure. An institutional and technical
	framework for coordinating and sharing geospatial information across a
	stakeholder community.
OAS	Organization of American States
ODA	Overseas Development Administration
OIRSA	The International Regional Organization for Plant and Animal Health
	(OIRSA) is a technical organization established to provide administrative and
	technical support to the Ministries or Secretariats of Agriculture from its
	member countries, to protect and develop their agricultural resources in order
	to achieve a healthy production to satisfy population's demands and provide
	well-being. OIRSA's assistance is focused on its member countries' projects
	and plans for plant and animal health, food safety and facilitation towards
	agricultural commerce
PACT	Protected Areas Conservation Trust
PAHO -	Pan-American Health Organisation
PCPU	Policy Coordination and Planning Unit
PEU	Programme Execution Unit
PFB	Programme for Belize
PUC	Public Utilities Commission
QuickStart	An activity that is an accelerated portion of a longer term initiative, intended
_	to result in near-term, visible and compelling results.
RAMSAR	Convention on Wetlands of International Importance Especially as Waterfowl
	Habitat
REDD	Reduction of Emissions from Deforestation and Degradation
SERVIR	Regional Visualization and Monitoring System
SIB	Statistics Institute of Belize
SICB	Sugar Industry Control Board
SIF	Social Investment Fund
OII.	

SIRDI	Sugar Industry Research and Development Institute
SISE	San Ignacio/ Santa Elena Town Council
SPAGs	Spawning Aggregation Sites
Spatial Data	Common repository of geospatial information, often composed of data
Clearinghouse	provided by multiple custodians
SIG	Special Interest Group. A permanent multi-stakeholder body that is
	established to provide communication, coordination and support around a
	particular common interest or practice.
Stakeholder	Any organization or person that will be involved in the development and/or
	use of the Belize NSDI
SCADA	System Control and Data Acquisition
SWMA	Solid Waste Management Agency
SWOT	Strengths, Weaknesses, Opportunities and Threats
TBSL	Total Business Solutions Ltd.
TNC	The Nature Conservancy
TOR	Terms of Reference
UB	University of Belize
UN	United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Project
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WB	World Bank
WCMC	World Conservation Monitoring Centre
WCS	Wildlife Conservation Society
WMO	World Meteorological Organisation (UN)
Working Group	A temporary body, normally consisting of representative members from
	multiple concerned organizations, assigned to address a particular subject
	over a certain period of time
WRI	World Resource Institute
WWF	World Wildlife Fund
XML –	eXtensible Markup Language

APPENDIX B1 – BUSINESS AREA GROUPINGS (LAND/SEA USE – LAND ADMINISTRATION – UTILITIES & INFRSTRUCTURE)

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MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	 Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history 	1	1		1			2	1		1							
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Construction Permits	 Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history 	1		2					1		1							
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	 Review planning context of other initiatives Identify potential existing hazards and those that may develop due to climate change 	2	2		2	1			1		1							
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	 Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies 	1				2			1		1							

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MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	 Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies 	1				2			1		1							
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	 Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas 	1	1			1			1									
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Land Use Planning Task Force	 Provide planning analysis in support of Municipal Development Project Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context Assess municipal development plans relative to projected climate change impacts and vulnerabilities Assess cumulative societal implications of combined municipal development plans 	2	1		2	1			1	1	1							
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	 Manage inventory of all National Estate lands Assess land value for leasing purposes Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases 	1						2	2	2	1							
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	 Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales 	1							2	2	1							
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information							2	1									
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	 Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries 	1							2	1	1							

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MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	 Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time 	1						2	2		1						
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	 Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files 	1						2	1		1						
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system	1							1		1						
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	 Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request 	1							1		1						
MNRA	Lands and Surveys Department	Land Information Center	Develop and Disseminate GIS Data	 Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs 	1							1		1						
MNRA	Lands and Surveys Department	Land Information Center	Publish Environmental Statistics	 Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards 	1															
MNRA	Lands and Surveys Department	Land Information Center	Support Data Custodianship On Behalf of Other Organizations	 Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog 	1							1		1						
MNRA	Lands and Surveys Department	Land Information Center	Support Capacity Building	 Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies 	1							1		1						

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MNRA	Lands and Surveys Department	Land Information Center	Provide Ad Hoc Technical Services	 Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use 	1							1		1							
MNRA	Lands and Surveys Department	Land Information Center	Facilitate the Belize NSDI	 Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders 	1							1		1							
MNRA	Central Administration	IT Department	Prepare and implement IT Strategy.	 Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing MNRA use of information technology 								2									
MNRA	Central Administration	IT Department	Conduct system and database administration.	 Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks 								2									
MNRA	Central Administration	IT Department	Provide general IT support.	Provide specialized IT support for GIS users								2									_
MNRA	Central Administration	IT Department	Support application development and maintenance.	Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program								2									
MNRA	Central Administration	IT Department	Develop and maintain MNRA website.	 Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness	1							1		1							

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MNRA	Central Administration	IT Department	Maintain BNSDI geographic portal.	 Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now. 	1							1		1							
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	 Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas 	1							1									
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	 Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time 	1							1									
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	 Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize 	1							1									
MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Implement NIWRA Master Plan.	 Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Establish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects 	1							1		1							

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MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Process Water Abstraction Licenses.	 Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources 	1							1		1							
MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Collect and Manage Hydrological Data.	 Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring 	1							1		1							
MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Conduct Special Projects.	 Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors 	1							1		1							
MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Conduct Groundwater Resource Assessment	 Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends 	1							1		1							
MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Conduct Water Resource Outreach	 Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments 	1							1		1							

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MNRA	Agriculture Department	Policy Coordinatio n Unit, NIWRA and Hydrology Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	 Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information 	1							1		1							
MNRA	Natural Resources	Belize Solid Waste Managemen t Authority	Oversee execution and implementation of the Solid Waste Management Project	 Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize 	2							1		2							
MNRA	Natural Resources	Belize Solid Waste Managemen t Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	 Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets 	1														2	2	2
MNRA	Natural Resources	Belize Solid Waste Managemen t Authority	Conduct public relations and outreach activities.	 Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur 															2	2	2
MNRA	Natural Resources	Belize Solid Waste Managemen t Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management scenarios, waste to energy schemes, recycling efforts, and other potential future innovations. 														2	2		

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MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	 Inventory of the location and characteristics of farm properties, farmers, and production statistics; Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; Crop production forecasting; Land capability and suitability mapping; Local and export market analysis; Access to markets and export infrastructure analysis; Farm feasibility assessment and planning; Market location price monitoring and product sources; Production and forecasting tracking; Climate change agriculture risk and vulnerability assessment and mitigation planning; Disaster damage assessment and recovery planning; Provide trade associations with access to government geospatial resources to support their planning and operations; Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time. 	1									1							
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics	1							1		1							
MNRA	Agriculture Department	Aquaculture and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	1							1		1							

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MNRA	Agriculture Department	Cooperative s	Promote and support agricultural cooperatives	 Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time. 	1									1							
MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	 Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize. 	1							1		1							
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	 Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files 	1							1		1							

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MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	 Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers 	1						1		1							
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	 Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time. 	1						1									
MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	1						1		1							
MNRA	Agriculture Department	Central Farm	Promote and Support Agro- Processing in Belize	 Record and track the location and characteristics of farmers that are involved in agroprocessing; Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; Based on the above, assess needs and develop program responses that are suitable for each geographic area; Track school locations and their participation in school feeding program; Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time. 	1						1		1							

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MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	 Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time. 	1							1		1						
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	 Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time. 	1							1		1						
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	 Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time. 	1							1		1						
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	 Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time. 	1							1		1						
MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	 Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business 	1							1		1						
MoWT	Works Department	Section	Support transportation planning	 Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications. 	1							1	2	1						

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MoWT	Works Department	Section	Manage materials lab.	 Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers 	1									1							
MoWT	Works Department	Section	Oversee road design and construction.	 Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.); 	1							1		1							
MoWT	Works Department	Section	Maintain roads infrastructure.	 Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time. 										1							
MoWT	Works Department	Section	Maintain other civil infrastructure	 Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance. 	1							1						2	2	2	
MoWT	Works Department	Section	Manage road safety	 Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS. 																	

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MoWT	Works Department	Section	Administer driver and vehicle licensing registration	 Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time. 															
MoWT	Transport Department	Section	Conduct transit planning.	 Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling. 	1							1							
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	 Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security 	1							1							
MoWT	Transport Department	Section	Conduct traffic enforcement.	 Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures. 															
MoWT	All Departments	All Sections	Participate in emergency planning and response.	 Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures. 	1									1					
MLLGRD	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 															

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MLLGRD	Village Councils	Section	Develop and administer municipal development plans and land use zoning	 Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements. 	2	1		1	1			1		1							
MLLGRD	Village Councils	Section	Issue development permits	 Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time. 	1	1		1	1			1		1							
MLLGRD	Village Councils	Section	License and inspect petrol stations and garages	 Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time 	1							1		1							
MLLGRD	Village Councils	Section	Maintain streets and street lighting	 Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities. 	1							1						2	2	2	
MLLGRD	Village Councils	Section	Facilitate utility coordination	 Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching 	1							1			2	2	2	2	2		
MLLGRD	Village Councils	Section	Facilitate and support community services coordination	 Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services 										1							

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MLLGRD	Village Councils	Section	Maintain storm drainage system	 Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities. 	1										2	2	2	2	2	2	
MLLGRD	Village Councils	Section	Manage refuse	 Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material. 	1							1			2	2	2	2	2	2	
MLLGRD	Village Councils	Section	Issue littering tickets	 Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education. 																	
MLLGRD	Village Councils	Section	Manage parks and recreation areas	 Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning 	2	2		2				1		1							
MLLGRD	Village Councils	Section	Manage public slaughterhouse facilities	 Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities 	1							1			2	2	2	2	2		
MLLGRD	Village Councils	Section	License, rent and inspect market facilities	 Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets. 	1		2					1		1							
MLLGRD	Village Councils	Section	Manage local cemetery	 Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas 	1							1		1							

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MLLGRD	Village Councils	Section	Manage local property taxation	 Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time 	1							2		1						
MLLGRD	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	 Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications; 	1															
MLLGRD	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 															2	
MLLGRD	Village Councils	Section	Manage public water closets and latrines	 Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones 	1									1						
MLLGRD	Village Councils	Section	License billboards and banners	 Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues. 	1									1						
MLLGRD	Belize City Council	Section	Manage local public health	 Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.) 																

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MLLGRD	Belize City Council	Section	Manage local tourism	 Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities 																	
MLLGRD	Belize City Council	Section	Manage city traffic and licensing	 Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.); 																	
MLLGRD	Belize City Council	Section	Manage public works	 Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); Provide foundation information for street furniture and pavement management; Provide foundation information of storm drainage system management; Provide foundation information for park management; Provide foundation information for municipal building maintenance and space planning; Provide foundation information for municipal vehicle fleet management; Provide asset register as the basis for municipal asset financial management; Provide geographically-based asset register to support preventive and as-needed maintenance planning and response; Provide linkage to maintenance management system to track maintenance activities over time; Track maintenance performance indicators; 	1							1			2	2	2	2	2	2	2

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MLLGRD	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 	2							1		1						
MLLGRD	Belize City Council	Section	Manage environmental sanitation	 Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations 			2												2	
MLLGRD	Belize City Council	Section	Manage Municipal facility security	 Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface 																
MLLGRD	Belize City Council	Section	Conduct disaster planning and response	 Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities. 	1							1		1						

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MLLGRD	Belize City Council	Section	Conduct property valuation	 Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies 	1							2		1						
MLLGRD	Belize City Council	Section	Collect and monitor city revenues	 Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections 																
MLLGRD	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council information infrastructure	1							1		1						
MLLGRD	NEMO	Section	Hazard and vulnerability assessment	 Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment 	2							1		1						
MLLGRD	NEMO	Section	Disaster contingency planning	 Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter 	1							1		1						
MLLGRD	NEMO	Section	Disaster response	 Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status 	1							1		1						
MLLGRD	NEMO	Section	Disaster recovery	 Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.) 	1							1		1						

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MLLGRD	NEMO	Section	Education, Communication and Warning	 Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1						1		1							
MLLGRD	NEMO	Section	Medical and Relief Measures	 Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans 																
MLLGRD	NEMO	Section	Housing and Shelter	 Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1								1							
MLLGRD	NEMO	Section	Search, Rescue and Initial Clearance	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1								1							
MLLGRD	NEMO	Section	Collection, Control and Distribution of Food and Material	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Identify precise locations of food and material storage facilities and enterprises; Track and manage field staff activities during response and recovery operations; Record activities and assess effectiveness for post-disaster refinement of contingency plans 									1							

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MLLGRD	NEMO	Section	Assessment and Evaluation of Damage	 Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses; Manage and track damage repair and mitigation activities 	1									1						
MLLGRD	NEMO	Section	Foreign Assistance disaster management	 Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies 	1									1						
MLLGRD	NEMO	Section	Transport disaster management	 Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 	1															
MLLGRD	NEMO	Section	Environment and Utilities disaster management	 Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 											2	2			2	
MLLGRD	National Meteorological Office	Section	Conduct weather monitoring	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs 	1							1		1						

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MLLGRD	National Meteorological Office	Section	Analyze and report weather information and forecasts	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring 	1						1		1							
MLLGRD	National Meteorological Office	Section	Analyze weather and prepare agrometeorology reports for the agricultural sector.	 Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context. 																
MLLGRD	National Meteorological Office	Section	Participate in emergency preparedness and response	 Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios 	1						1		1							
MLLGRD	National Meteorological Office	Section	Provide data on as-needed basis	 Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly 	1						1		1							

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MHUD	Central Building Authority	Section	Intake, review and approve building permits	 Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting 	1						1		1							
MHUD	Central Building Authority	Section	Conduct building/site inspections;	 Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time 	1															
MHUD	Central Building Authority	Section	Carry out soil testing;	 Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts 	1								1							
MHUD	Central Building Authority	Section	Carry out concrete testing.	 Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time 	1															
MESTPU	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	 Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information 	1						1		1							
MESTPU	Geology and Petroleum Department	Section	Administer petroleum operating concessions	 Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets 																
MESTPU	Geology and Petroleum Department	Section	Review environmental impact assessments	 Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference. 	2			2												

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MESTPU	Energy Unit	Section	Develop and support national renewable energy development	 Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country 	1						1		2	2	2	2	2	2	2 2
MESTPU	Energy Unit	Section	Promote and support energy efficiency initiatives	 Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and outreach programs over time. 	1						1		1					2	1 2
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	 Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner 	1						1		1					2	2
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	 Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area 	1						1		1					2	2

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MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	 Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities 	1			1			1		1				2	,	
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	 Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts 	1			1			1		1				2		
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands	1			1			1		1						
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests	1			1			1		1						
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat	1			1			1		1						
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Project Development Process	 Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects performance over time 	1	2		1			1		1		2				2

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MESTPU	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	 Promote the use of geographic information science, systems and thinking in support of better planning and decision making in Belize Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector 	1						1		1						
MESTPU	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	 Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner 	1						1		1						2
MESTPU	Public Utilities Commission	Section	Review and approve Public Utility rates.	 Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes 									1						2
MESTPU	Public Utilities Commission	Section	Monitor Public Utility Performance	 Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities 													2		2
MFFSD	Department of Forestry	Section	Protected Areas Management Program;	 Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students 	2						1								

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MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	 Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format. 	1							2									
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	 Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory 	1							1									
MFFSD	Department of Forestry	Section	Law Enforcement Program;	 Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders. 	1		2					1									
MFFSD	Department of Forestry	Section	Wildlife Program;	 Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings. 	1		2														
MFFSD	Department of Forestry	Section	National and International Partnership Program;	 Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above. 	1																
MFFSD	Department of Forestry	Section	Manage National Herbarium.	 Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of plant can be found 																	

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MFFSD	Department of Environment	Section	Develop and manage environmental policies	 Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts 	2	2	2	2		1		1						

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MFFSD	Department of Environment	Section	Administer environmental impact assessments	 Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environment and issues impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance 	2			2		1		1						

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MFFSD	Department of En vironment	Section	Conduct environmental monitoring and enforcement	Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education	1									1						
MFFSD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 	1	2		2	1											

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MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain georeferenced bibliographic information; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public 	1																
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	 Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets 																	

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MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provided a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of historic storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of topographic and bathymetric information; Provide a mapped database of sea bottom types; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a mapped database of previous research activities; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 	2							1		1							
MFFSD	Department of Fisheries	Section	Manage marine protected areas	 Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities 	1		2														
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	 Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment 	1																

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MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	 Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government. 	1									1							
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	 Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government. 																	
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	 Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics 																	

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MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	 Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multi-stakeholder processes to calibrate interventions over time. 	2							1		1							
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	 Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area; 	1							1		1							
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	 Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture 	1							1		1							

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MTCCA	Ministry	Section	Oversee portfolio governance	 Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time 	1						1		1						
MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	 Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making. 	1						1		1						
MTCCA	Ministry	Section	Oversee tourism planning and development	 Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time. 	2						1		1						
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 	2						1		1						

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MTCCA	Belize Tourism Board	Section	Manage tourism data	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment. 	1							1		1						
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other 	1							1		1						
MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists. 	1							1		1						
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments. 	2							1		1						
MTCCA	National Institute for Culture and History	Institute of Archeology	Maintain inventory of archeological sites;	Maintain inventory of archeological sites	1							1		1						
MTCCA	National Institute for Culture and History	Institute of Archeology	Conduct archeological research and education;	Conduct archeological research and education;	1							1		1						

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MTCCA	National Institute for Culture and History	Institute of Archeology	Manage archeological parks and reserves.	Manage archeological parks and reserves.	1						1		1						
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours	1						1		1						

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MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;															
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives															
MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for ransport master plan and associated priority projects. 	1								1						
MFED	All Departments	Section	Bridge construction and refurbishment	 Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects. 	1								1						

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MFED	All Departments	Section	Road and highway construction and refurbishment	 Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities; 	1						1		1							
MFED	All Departments	Section	Improve road safety	 Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. 																
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	 Assess drainage facility capacity and vulnerability to major storm events; Provide basemap and geophysical data to support drainage facility engineering design; Provide geographically based project tracking system; Produce drainage asset inventory to support maintenance and financial asset management activities; 																
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	 Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies; 	1						1		1							
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	 Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects 																
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	 Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning. 	1						1		2							
MFED	All Departments	Section	Construction and refurbishment of community facility buildings	 Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting. 	1						1			2	2					
MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	 Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects. 	1						1			2	2					

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MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects. 	1						1			2						
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	 Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities; 	1						1				2					
MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	 Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities 	1										2	2	2			
MFED	All Departments	Section	Construction and upgrading of water supply network	 Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities; 	1										2	2	2 2	2	2	2
MFED	All Departments	Section	Improve rural water and sanitation governance	 Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards. 	1									2	2	2	2 2	2	2	2
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	 Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 	1									2	2	2	2			
MFED	All Departments	Section	Institutional capacity building for water system governance	Incorporate GIS management and technical capacity building in to the water system governance program										2	2	2	2 2	2	2	
MFED	All Departments	Section	Development of solar energy generation demonstration	Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project;										2						

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MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	 Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 											2						
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	 Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects. 											2						
MFED	All Departments	Section	Plan, design and implement agriculture services program	 Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact 	1									1							
MFED	All Departments	Section	Promote and support the development of integrated farming systems	 Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context. 	1							1		1							
MFED	All Departments	Section	Upgrade research and extension facilities	• Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector	1							1		1							
MFED	All Departments	Section	Conduct farmer training and capacity building activities	Support farmer training and extension service capacity building	1							1		1							
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	 Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy. 	1							1		1							

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MFED	All Departments	Section	Conduct community project for improvement of agriculture production for poor families	 Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time. 	1						1		1							
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time. 	1						1		1							
MFED	All Departments	Section	Support the expansion of rice seed production	 Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes. 	1								1							
MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 	1								1							
MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 	1						1		1							

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MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	 Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/ 																	
MFED	All Departments	Section	Conduct national cattle testing and certification program	 Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export. 																	
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	 Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations 	1									1							
MFED	All Departments	Section	Support targeted lending	 Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes. 																	
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	 Record location and characteristics of Coalition members; Monitor and assess program member performance 																	
MFED	All Departments	Section	Support financial services for poor farmers and rural communities	 Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area; Track and assess utilization of financial services over time. 																	
MFED	All Departments	Section	Administer small scale enterprise grants	 Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises 																	
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	 Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities 																	

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MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	 Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate 																	
MFED	All Departments	Section	Improvement of land management capacity	 Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities; 	1							2		1							
MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 	1							1		2					2		
MFED	All Departments	Section	Strengthen protected areas management	 Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time 	1							1									
MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	 Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues. 	2							1		1							

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MFED	All Departments	Section	Manage marine fisheries	 Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time. 	2																
MFED	All Departments	Section	Manage pollutant release and transfer registration	 Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time. 										1							
MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	 Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system. 	1									1							
MFED	All Departments	Section	Control and prevention of HIV/AIDS	 Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread; 																	

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MFED	All Departments	Section	Improvement of children's health and nutrition	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes. 																	
MFED	All Departments	Section	Improve health conditions among the poorest populations	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 										1							
MFED	All Departments	Section	Develop plans for the achievement of target MDG's	 Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	1							1		1							
MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	 Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes. 																	
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination										1							

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MFED	All Departments	Section	Computerization of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 															
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 	1						1		1						
MFED	All Departments	Section	Enhance rural development program activities	 Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises. 	1						1		1						
MFED	All Departments	Section	Develop and manage disaster risk management plan	 Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time. 									1						
MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 															
MFED	All Departments	Section	Support fire safety	 Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants. 															
MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures,	• Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;	1						1		1						

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			guidelines and standards.																	
MFED	Central Information Technology Organization	Section	Design and development of esolutions and government-wide applications	 CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community 	1						1		1							
MFED	Central Information Technology Organization	Section	Provide data center and internet services	Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.	1						1		1							
MFED	Central Information Technology Organization	Section	Provide information security services	 Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons 	1						1		1							
MFED	Central Information Technology Organization	Section	Develop and implement E- Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies	1						1		1							
MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	 Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation 	1						1		1							
MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs	1						1		1							
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	 Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize 	1						1		1							

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MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	 Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators 	1							1		1						
MFED	Statistical Institute Belize	Section	Conduct census taking	 Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow 	1							1		1						
MFED	Statistical Institute Belize	Section	Census publishing and distribution	 Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems. 	1							1		1						
MFED	Statistical Institute Belize	Section	Conduct between- census population estimation	• Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change	1							1		1						
MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	 Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level; 	1							1		1						
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	 Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems. 	1							1		1						
MFED	Statistical Institute Belize	Section	Develop special products	 Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public; 	1							1		1						

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MFED	Statistical Institute Belize	Section	Conduct original surveys		1							1		1							
MFED	Statistical Institute Belize	Section	Compile economic statistics	Provide tools for location-based field collection Utilize location-specific business and revenue information to prepare neighborhood and community level economic statistics	1							1		1							
MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	 Provide tools for location-based field data collection; Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; Test effectiveness of various geostatistical visualizations for communicating issues and concepts Test tools and methods for real-time analysis of information from sensor networks Test new geostatistical tools application to existing raw data 	1							1		1							
MFED	Social Investment Fund	Section	Identify potential projects	 Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time. 	1							1		1							
MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	 Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members; 	1							1		1							
MFED	Social Investment Fund	Section	Carry out project appraisals	 Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically. 	1							1		1							
MFED	Social Investment Fund	Section	Facilitate project approval process	 Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions. 	1							1		1							

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MFED	Social Investment Fund	Section	Manage project bidding process	 Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference; 	1							1		1						
MFED	Social Investment Fund	Section	Supervise project implementation	 Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF 	1							1		1						
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects	1							1		1						
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations	1							1		1						
МОН	All Departments	Section	Provide medical laboratory services;	 Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers. 																
МОН	All Departments	Section	Manage medical stores;	 Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks. 																
МОН	All Departments	Section	Provide public dental services;	 Provide map of all facilities where public dental services are offered; Track and monitor mobile clinic locations and history; Track and monitor urban and rural school dental visits and history; Utilize location-aware social media for connecting with dental patient community; Assess the location effectiveness of existing dental health facilities and services and site new programs; Analyze dental service delivery facilities relative to population census information; Produce statistical reports and maps concerning dental health at the community level; Track and analyze dental service delivery by locations over time. 																

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МОН	All Departments	Section	Support environmental health;	 Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues and trends over time; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time 										1							
МОН	All Departments	Section	Monitor and assess chronic and communicable disease;	 Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time. 																	
МОН	All Departments	Section	Manage health education and participation bureau program;	 Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis country-wide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues 																	

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МОН	All Departments	Section	Manage maternal and child health program;	 Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time. 																
МОН	All Departments	Section	Manage mental health program;	 Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time. 																
МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	 Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize. 	1															

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МОН	All Departments	Section	Manage pharmaceutical services and supplies;	 Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs. 																
МОН	All Departments	Section	Conduct public health planning and policy development;	 Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios 																
МОН	All Departments	Section	Manage health sector reform project;	 Geographically based analysis of public and private health facility and service demand and supply; Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels. 	1									1						
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records	1									1						
MNS	Police Department	HNCIB	Investigate crimes	 Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information; 																
MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	 Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic; 	1									1						
MNS	Police Department	Commander Operations	Conduct police dispatch activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 																

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MNS	Police Department	Commander Operations	Conduct drug intervention activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 																	
MNS	Police Department	Commander Operations	Monitor and track released felons	 Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities 																	
MNS	Police Department	Commander Operations	Carry out preventative patrols	 Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management. 																	
MNS	Police Department	Commander Operations	Conduct gang suppression activities	 Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use. 	1																
MNS	Police Department	Commander Operations	Conduct national traffic management	 Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports 																	
MNS	Police Department	Commander Operations	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 																	
MNS	Police Department	Commander Operations	Support joint emergency response	 Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response 	1									1							

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MNS	Police Department	Police Information Technology Unit	Conduct facility and asset management	 Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement 															
MNS	Police Department	Police Information Technology Unit	Develop, manage and operate crime information system	 Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geosptial analysis of CIMS records 	1								1						
Regional	CCCCC	Sections	Conduct climate modeling;	 Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time. 	1						1		1						
Regional	CCCCC	Sections	Conduct CARIWIG Project;	 Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods 	1						1		1						

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Regional	CCCCC	Sections	Manage SIDS DOCK Program;	 Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time. 	1								2	2	2	2	2	2	2	
Regional	CCCCC	Sections	Manage Pilot Program for Climate Resilience:	 Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for climate-smart, sustainable development. 	2						1									
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	 Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; Provide visualization tools to communicate issues and alternative plans to decision makers and the public; Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; Provide tools and methods for the effective inventory, management and utilization of standing forests; Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends; 	2	2	2	2			1		2	2	2					

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	 Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the various groups currently maintaining meteorological and hydrological data and projections 	1																
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Hazards and Risks	 Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments; 	1							1		1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	 Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data; 																	
Regional	cccc	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	 Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data; Provide geospatial framework for the inventory and monitoring of land use and land 																	
Regional	cccc	Sections	Caribbean regional environmental change observing network - Land Cover and Land Use	 Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks; 	2	2		2	2												

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	 Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning 	2															
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	 Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using water resource data; 	2						1		1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 	1								2							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Socio- Economic Status	 Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services; 																
Regional	cccc	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	 Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities. 							1		2	2	2					

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Regional	cccc	Sections	Conduct EU GCCA project	 Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing 	1							1		1							
Regional	CCCCC	Sections	Coordinate 2011- 2015 Caribbean regional resilience development implementation plan;	 Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness. 	1							1		1							
Regional	CCCCC	Sections	Coordinate 2012- 2013 Caribbean risk management program;	Provide GIS and NSDI as an enabling environment for climate smart government and development;	1							1		1							
Regional	CCCCC	Sections	Coordinate 2012- 2014 Australian Caribbean Coral Reef Collaboration;	 Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; Monitor and assess reef health and trends over time; Provide a geographic basis for reef protection and regulatory enforcement; Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments. 	1																
Regional	CCCCC	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	 Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and place-based manner. 	1																

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Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	 Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations 																	
Regional	CATHALAC	Sections	Provide education and training	 Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities 																	
Regional	CATHALAC	Sections	Provide specialized services	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring. 	1							1		1							
Regional	CATHALAC	Sections	Compile, manage and publish geographic information	 Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats 																	
Regional	CATHALAC	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 																	
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and information;	 Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources 																	

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Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 	1						1		1							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	 Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model. 																
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 	1						1		1							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 	1						1		1							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify built environment resources at risk	 Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding; Identify electrical, water, telephone and other critical infrastructure within high risk areas. 	1						1		1							

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	 Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas. 	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify populations at risk	Identify population concentrations within high risk areas																
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	• Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged.																
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	 Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network. 	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures;	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	• Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;	1							1		1						

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	 Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency 	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	Calculate potential loss of life and injury based on exposure and vulnerability assessments.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	 Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery. 	1							1		1						

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	 Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility. 	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues.	1							1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post- disaster payout.	Calculate hazard scenario and correlate to insurance provisions	1							1		1						
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	 Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data 	1							1		1						
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies 	1							1		1						

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Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor socioeconomic trends; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends. 	1							1		2	2						
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory. 	1							1		1		2	2	2			

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Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	 Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 										1				2	2	2	2
Utilities	Belize Electric Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 										1					2	2	2
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 										1	1	1	1	1	1	1	1

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Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor socioeconomic trends and their impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Environmental impact assessment for major planned facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 	1						1		2	2					
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory. 	1						1		1		2	2	2		

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Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network operations and maintenance	 Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 										1				2	2		
Utilities	Belize Water Supply Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 										1					2	2	2
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	 Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 										1							
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 										1	1	1	1	1	1	1	1

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Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	 Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize 	1							1		1						
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	 Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software 	1							1		1						
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	 Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting 																
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association. 	1							1		1						
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	 Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time. 	1							1		1						

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Professional Associations	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members. 	1							1		1							
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	 Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues. 																	
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	 Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.). 																	

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NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	 Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting 																	
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	 Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI 																	
NGO's	Friends for Conservation and Development	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	 Map and record inventory of ecological resources of the National Park and surrounding bio-geographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park; 	2							1									
NGO's	Friends for Conservation and Development	Sections	Conduct environmental education and awareness;	 Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted. 																	
NGO's	Friends for Conservation and Development	Sections	Conduct community support programs;	 Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories. 																	

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NGO's	Friends for Conservation and Development	Sections	Conduct environmental monitoring and research;	 Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making. 																	
NGO's	Friends for Conservation and Development	Sections	Development and promotion of policy recommendations;	 Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public. 																	
NGO's	Friends for Conservation and Development	Sections	Conduct bi- national cooperation;	 Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution. 	1																
NGO's	Friends for Conservation and Development	Sections	Conduct cave management;	 Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs 	1																
NGO's	Programme for Belize	Sections	Placeholder																		
NGO's	Belize Audubon Society	Sections	Placeholder																		
NGO's	Red Cross of Belize	Sections	Placeholder																		
Academic & Research	University of Belize	Environmen tal Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 	1							1		1							

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Academic & Research	University of Belize	Environmen tal Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	 Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	1							1									
Academic & Research	University of Belize	Environmen tal Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	1																
Academic & Research	University of Belize	Environmen tal Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;																	
Academic & Research	University of Belize	Environmen tal Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	 Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public. 	1									1							

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Academic & Research	University of Belize	Environmen tal Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	 Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations. 	1					1		1						
Academic & Research	University of Belize	Environmen tal Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	1					1		1						
Academic & Research	University of Belize	Environmen tal Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	1					1		1						

APPENDIX B2 – BUSINESS AREA GROUPINGS (COMMUNITY FACILITIES – TRANSPORT – PUBLIC SAFETY – PUBLIC HEALTH)

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MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	 Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history 								1				1				1	
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Constructi on Permits	 Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history 																	
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	 Review planning context of other initiatives Identify potential existing hazards and those that may develop due to climate change 								1				1				1	
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	 Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies 								1				1				1	

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MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	 Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies 							1				1				1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	 Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas 															
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Land Use Planning Task Force	 Provide planning analysis in support of Municipal Development Project Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context Assess municipal development plans relative to projected climate change impacts and vulnerabilities Assess cumulative societal implications of combined municipal development plans 							1				1				1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	 Manage inventory of all National Estate lands Assess land value for leasing purposes Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases 							1				1				1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	 Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales 							1				1				1
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information															
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	 Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries 							1								

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MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	 Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time 						1									
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	 Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files 						1									
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system						1				1				1	
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	 Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request 						1				1				1	
MNRA	Lands and Surveys Department	Land Informatio n Center	Develop and Disseminate GIS Data	 Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs 						1				1				1	
MNRA	Lands and Surveys Department	Land Informatio n Center	Publish Environmental Statistics	 Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards 															
MNRA	Lands and Surveys Department	Land Informatio n Center	Support Data Custodianship On Behalf of Other Organizations	 Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog 						1				1				1	

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MNRA	Lands and Surveys Department	Land Informatio n Center	Support Capacity Building	 Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies 						1				1				1	
MNRA	Lands and Surveys Department	Land Informatio n Center	Provide Ad Hoc Technical Services	 Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use 						1				1				1	
MNRA	Lands and Surveys Department	Land Informatio n Center	Facilitate the Belize NSDI	 Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders 						1				1				1	
MNRA	Central Administration	IT Departmen t	Prepare and implement IT Strategy.	 Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing MNRA use of information technology 															
MNRA	Central Administration	IT Departmen t	Conduct system and database administration.	 Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks 															
MNRA	Central Administration	IT Departmen t	Provide general IT support.	Provide specialized IT support for GIS users															
MNRA	Central Administration	IT Departmen t	Support application development and	 Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program 															

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			maintenance.																	
MNRA	Central Administration	IT Departmen t	Develop and maintain MNRA website.	Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness							1				1				1	
MNRA	Central Administration	IT Departmen t	Maintain BNSDI geographic portal.	 Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now. 							1				1				1	
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	 Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas 																
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	 Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time 																
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	 Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize 																

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MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Implement NIWRA Master Plan.	Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Establish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects													1	
MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Process Water Abstraction Licenses.	 Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources 													1	l
MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Collect and Manage Hydrological Data.	 Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring 						1			1				1	I

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MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Conduct Special Projects.	 Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors 							1				1				1	
MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Conduct Groundwater Resource Assessment	 Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends 							1				1				1	
MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Conduct Water Resource Outreach	 Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments 							1				1				1	
MNRA	Agriculture Department	Policy Coordinati on Unit, NIWRA and Hydrology Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	 Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information 							1				1				1	
MNRA	Natural Resources	Belize Solid Waste Manageme nt Authority	Oversee execution and implementatio n of the Solid Waste Management Project	 Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize 	2	2	2	2	2	2	1				1				1	

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MNRA	Natural Resources	Belize Solid Waste Manageme nt Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	 Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets 					2	2	1								1	
MNRA	Natural Resources	Belize Solid Waste Manageme nt Authority	Conduct public relations and outreach activities.	 Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur 		2			2						1				1	
MNRA	Natural Resources	Belize Solid Waste Manageme nt Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management scenarios, waste to energy schemes, recycling efforts, and other potential future innovations. 	2	2	2		2	2										

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MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	 • Inventory of the location and characteristics of farm properties, farmers, and production statistics; • Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; • Crop production forecasting; • Land capability and suitability mapping; • Local and export market analysis; • Access to markets and export infrastructure analysis; • Farm feasibility assessment and planning; • Market location price monitoring and product sources; • Production and forecasting tracking; • Climate change agriculture risk and vulnerability assessment and mitigation planning; • Disaster damage assessment and recovery planning; • Provide trade associations with access to government geospatial resources to support their planning and operations; • Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time. 						1		1	1					1	1
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics						1								1	
MNRA	Agriculture Department	Aquacultur e and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 						1									

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MNRA	Agriculture Department	Cooperativ es	Promote and support agricultural cooperatives	 Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time. 						1								1	
MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	 Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize. 						1				1				1	
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	 Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files 						1				1				1	

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MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	 Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers 							1				1				1
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	 Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time. 							1								
MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 							1				1				1
MNRA	Agriculture Department	Central Farm	Promote and Support Agro- Processing in Belize	 Record and track the location and characteristics of farmers that are involved in agro-processing; Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; Based on the above, assess needs and develop program responses that are suitable for each geographic area; Track school locations and their participation in school feeding program; Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time. 							1				1				1

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MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	 Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time. 							1				1				1
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	 Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time. 							1				1				1
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	 Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time. 							1				1				1 2
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	 Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time. 							1				1				1
MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	 Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business 							1				1				1

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MoWT	Works Department	Section	Support transportation planning	 Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications. 							2	2	2	2	1				1	
MoWT	Works Department	Section	Manage materials lab.	 Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers 							2									
MoWT	Works Department	Section	Oversee road design and construction.	 Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.); 							2				1					
MoWT	Works Department	Section	Maintain roads infrastructure.	 Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time. 							2				1					

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MoWT	Works Department	Section	Maintain other civil infrastructure	 Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance. 					2	1			2	1				1	
MoWT	Works Department	Section	Manage road safety	 Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS. 						2				2					
MoWT	Works Department	Section	Administer driver and vehicle licensing registration	 Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time. 						2	2								
MoWT	Transport Department	Section	Conduct transit planning.	 Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling. 						2	2	2	2						
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	 Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security 						2	2								
MoWT	Transport Department	Section	Conduct traffic enforcement.	 Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures. 						2				2				1	

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MoWT	All Departments	All Sections	Participate in emergency planning and response.	 Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures. 							2	2	2	2	1				1	
MLLGRD	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 																
MLLGRD	Village Councils	Section	Develop and administer municipal development plans and land use zoning	 Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements. 							1				1				1	
MLLGRD	Village Councils	Section	Issue development permits	 Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time. 							1				1				1	
MLLGRD	Village Councils	Section	License and inspect petrol stations and garages	 Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time 							1				1				1	
MLLGRD	Village Councils	Section	Maintain streets and street lighting	 Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities. 							1				1				1	

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MLLGRD	Village Councils	Section	Facilitate utility coordination	 Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching 							1				1				1	
MLLGRD	Village Councils	Section	Facilitate and support community services coordination	 Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services 	2	2	2		2	2	1				1				2	
MLLGRD	Village Councils	Section	Maintain storm drainage system	 Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities. 							1				1		2		1	
MLLGRD	Village Councils	Section	Manage refuse	 Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material. 	2	2	2	2	2	2	1				1				1	
MLLGRD	Village Councils	Section	Issue littering tickets	 Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education. 											2				2	
MLLGRD	Village Councils	Section	Manage parks and recreation areas	 Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning 	2	2	2	2	2	2	1				1				1	
MLLGRD	Village Councils	Section	Manage public slaughterhouse facilities	 Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities 	2	2	2	2	2	2	1								1	

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MLLGRD	Village Councils	Section	License, rent and inspect market facilities	 Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets. 							1			1				1	
MLLGRD	Village Councils	Section	Manage local cemetery	 Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas 	2	2	2	2	2	2									
MLLGRD	Village Councils	Section	Manage local property taxation	 Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time 															
MLLGRD	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	 Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications; 										1				1	
MLLGRD	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 					2	2	1		2						
MLLGRD	Village Councils	Section	Manage public water closets and latrines	 Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones 	2	2	2	2	2	2								2	
MLLGRD	Village Councils	Section	License billboards and banners	 Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues. 							1			1					

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MLLGRD	Belize City Council	Section	Manage local public health	 Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.) 											1				2
MLLGRD	Belize City Council	Section	Manage local tourism	 Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities 											2				
MLLGRD	Belize City Council	Section	Manage city traffic and licensing	 Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.); 							2	2			1				
MLLGRD	Belize City Council	Section	Manage public works	 Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); Provide foundation information for street furniture and pavement management; Provide foundation information of storm drainage system management; Provide foundation information for park management; Provide foundation information for municipal building maintenance and space planning; Provide foundation information for municipal vehicle fleet management; Provide asset register as the basis for municipal asset financial management; Provide geographically-based asset register to support preventive and as-needed maintenance planning and response; Provide linkage to maintenance management system to track maintenance activities over time; Track maintenance performance indicators; 	2	2	2	2	2	2	1				1				

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MLLGRD	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 							1				1			1	
MLLGRD	Belize City Council	Section	Manage environmental sanitation	 Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations 	2	2	2		2		1							1	ı
MLLGRD	Belize City Council	Section	Manage Municipal facility security	 Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface 											2				
MLLGRD	Belize City Council	Section	Conduct disaster planning and response	 Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities. 							1						2	1	ı

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MLLGRD	Belize City Council	Section	Conduct property valuation	 Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies 							1								
MLLGRD	Belize City Council	Section	Collect and monitor city revenues	 Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections 	2	2			2	2									
MLLGRD	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council information infrastructure							1				1				1
MLLGRD	NEMO	Section	Hazard and vulnerability assessment	 Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment 							1				1		2		1
MLLGRD	NEMO	Section	Disaster contingency planning	 Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter 							1				1		2		1
MLLGRD	NEMO	Section	Disaster response	 Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status 							1				1		2		1
MLLGRD	NEMO	Section	Disaster recovery	 Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.) 							1				1		2		1

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MLLGRD	NEMO	Section	Education, Communicatio n and Warning	 Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 							1				1		2		1	
MLLGRD	NEMO	Section	Medical and Relief Measures	 Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans 							1				1		2		2	
MLLGRD	NEMO	Section	Housing and Shelter	 Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 							1				1		2		1	
MLLGRD	NEMO	Section	Search, Rescue and Initial Clearance	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 							1				1		2		1	
MLLGRD	NEMO	Section	Collection, Control and Distribution of Food and Material	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Identify precise locations of food and material storage facilities and enterprises; Track and manage field staff activities during response and recovery operations; Record activities and assess effectiveness for post-disaster refinement of contingency plans 							1				1		2		1	

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MLLGRD	NEMO	Section	Assessment and Evaluation of Damage	 Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses; Manage and track damage repair and mitigation activities 													2		1	
MLLGRD	NEMO	Section	Foreign Assistance disaster management	 Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies 													2		1	
MLLGRD	NEMO	Section	Transport disaster management	 Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 							2				1		2			
MLLGRD	NEMO	Section	Environment and Utilities disaster management	 Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 											1		2			
MLLGRD	National Meteorological Office	Section	Conduct weather monitoring	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs 							1				1				1	
MLLGRD	National Meteorological Office	Section	Analyze and report weather information and forecasts	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasiblity for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring 							1				1				1	

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MLLGRD	National Meteorological Office	Section	Analyze weather and prepare agrometeorolo gy reports for the agricultural sector.	 Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context. 																
MLLGRD	National Meteorological Office	Section	Participate in emergency preparedness and response	 Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios 							1				1				1	
MLLGRD	National Meteorological Office	Section	Provide data on as-needed basis	 Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly 							1				1				1	
MHUD	Central Building Authority	Section	Intake, review and approve building permits	 Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting 							1				1				1	
MHUD	Central Building Authority	Section	Conduct building/site inspections;	 Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time 							1									
MHUD	Central Building Authority	Section	Carry out soil testing;	 Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts 							1									

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MHUD	Central Building Authority	Section	Carry out concrete testing.	 Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time 															
MESTPU	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	 Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information 						1				1					
MESTPU	Geology and Petroleum Department	Section	Administer petroleum operating concessions	 Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets 															
MESTPU	Geology and Petroleum Department	Section	Review environmental impact assessments	 Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference. 										1					
MESTPU	Energy Unit	Section	Develop and support national renewable energy development	 Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country 															
MESTPU	Energy Unit	Section	Promote and support energy efficiency initiatives	 Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and outreach programs over time. 															

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MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	 Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner 															
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	 Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area 															
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	 Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities 															
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	 Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts 															

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MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands																
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests																
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat																
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Project Development Process	 Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects performance over time 																
MESTPU	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	 Promote the use of geographic information science, systems and thinking in support of better planning and decision making in Belize Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector 							1				1				1	
MESTPU	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	 Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner 							1									

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MESTPU	Public Utilities Commission	Section	Review and approve Public Utility rates.	 Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes 															1
MESTPU	Public Utilities Commission	Section	Monitor Public Utility Performance	 Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities 															1
MFFSD	Department of Forestry	Section	Protected Areas Management Program;	 Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students 											1				
MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	 Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format. 							1								
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	 Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory 							1								

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MFFSD	Department of Forestry	Section	Law Enforcement Program;	 Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders. 						1				2					
MFFSD	Department of Forestry	Section	Wildlife Program;	 Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings. 										2					
MFFSD	Department of Forestry	Section	National and International Partnership Program;	 Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above. 										2					
MFFSD	Department of Forestry	Section	Manage National Herbarium.	 Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of plant can be found 		2	2	2	2 2										
MFFSD	Department of Environment	Section	Develop and manage environmental policies	 Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts 						1				1				1	

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MFFSD	Department of Environment	Section	Administer environmental impact assessments	Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide information and tools to support EIA training; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environment and issues impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance							1				1				1	

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MFFS	SD	Department of Environment	Section	Conduct environmental monitoring and enforcement	 Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education 												2					
MFFS	SD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 																	

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MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public 														
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	 Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets 														

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MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provided a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of historic storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of tides, waves and currents; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a mapped database of previous research activities; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 								1				1				1	
MFFSD	Department of Fisheries	Section	Manage marine protected areas	 Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities 												1					
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	 Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment 												1					

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MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	 Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government. 															1	
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	 Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government. 																
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	 Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics 																

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MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	 Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multi-stakeholder processes to calibrate interventions over time. 							1				1				1	
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	 Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area; 							1				1				1	
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	 Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture 							1				1				1	

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MTCCA	Ministry	Section	Oversee portfolio governance	 Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time 					1				1			1	
MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	 Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making. 					1				1			1	
MTCCA	Ministry	Section	Oversee tourism planning and development	 Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time. 					1				1			1	
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 					1				1			1	

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MTCCA	Belize Tourism Board	Section	Manage tourism data	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment. 							1				1				1	
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other 							1				1				1	
MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists. 							1				1				1	
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments. 							1				1				1	
MTCCA	National Institute for Culture and History	Institute of Archeolog y	Maintain inventory of archeological sites;	Maintain inventory of archeological sites							1									
MTCCA	National Institute for Culture and History	Institute of Archeolog y	Conduct archeological research and education;	Conduct archeological research and education;							1									

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MTCCA	National Institute for Culture and History	Institute of Archeolog y	Manage archeological parks and reserves.	Manage archeological parks and reserves.							1									
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours							1									

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MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;															2
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives															2
MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for ransport master plan and associated priority projects. 						2				1				1	
MFED	All Departments	Section	Bridge construction and refurbishment	 Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects. 						2				1				1	

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MFED	All Departments	Section	Road and highway construction and refurbishment	 Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities; 							2				1				1	
MFED	All Departments	Section	Improve road safety	 Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. 							2				2				1	
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	 Assess drainage facility capacity and vulnerability to major storm events; Provide basemap and geophysical data to support drainage facility engineering design; Provide geographically based project tracking system; Produce drainage asset inventory to support maintenance and financial asset management activities; 							2				1					
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	 Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies; 							2				1					
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	 Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects 							2								1	
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	 Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning. 							1				1				1	
MFED	All Departments	Section	Construction and refurbishment of community facility buildings	 Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting. 							1				1				1	

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MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	 Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects. 							2				1					
MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects. 															1	
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	 Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities; 															1	
MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	 Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities 															1	
MFED	All Departments	Section	Construction and upgrading of water supply network	 Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities; 															1	
MFED	All Departments	Section	Improve rural water and sanitation governance	 Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards. 															1	
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	 Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 															1	
MFED	All Departments	Section	Institutional capacity building for water system	Incorporate GIS management and technical capacity building in to the water system governance program																

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			governance																	
MFED	All Departments	Section	Development of solar energy generation demonstration project	 Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project; 																
MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	 Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 															1	
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	 Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects. 															1	
MFED	All Departments	Section	Plan, design and implement agriculture services program	 Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact 							1								1	
MFED	All Departments	Section	Promote and support the development of integrated farming systems	 Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context. 															1	
MFED	All Departments	Section	Upgrade research and extension facilities	Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector							1									
MFED	All Departments	Section	Conduct farmer training and capacity building	Support farmer training and extension service capacity building							1									

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			activities																
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	 Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy. 						1								1	
MFED	All Departments	Section	Conduct community project for improvement of agriculture production for poor families	 Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time. 						1								1	2
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time. 						1								1	
MFED	All Departments	Section	Support the expansion of rice seed production	 Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes. 						1									

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MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 							1								2	
MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 							1								1	
MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	 Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/ 							1				1				2	
MFED	All Departments	Section	Conduct national cattle testing and certification program	 Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export. 							1								1	
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	 Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations 							1				1				1	
MFED	All Departments	Section	Support targeted lending	 Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes. 															1	
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	 Record location and characteristics of Coalition members; Monitor and assess program member performance 																

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MFED	All Departments	Section	Support financial services for poor farmers and rural communities	 Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area; Track and assess utilization of financial services over time. 															2
MFED	All Departments	Section	Administer small scale enterprise grants	 Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises 															2
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	 Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities 														2	2
MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	 Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate 															
MFED	All Departments	Section	Improvement of land management capacity	 Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities; 															
MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 						1									
MFED	All Departments	Section	Strengthen protected areas management	 Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time 															

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MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	 Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues. 							1				1				1	
MFED	All Departments	Section	Manage marine fisheries	 Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time. 																
MFED	All Departments	Section	Manage pollutant release and transfer registration	 Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time. 							1								2	

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MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	 Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system. 							1								1	
MFED	All Departments	Section	Control and prevention of HIV/AIDS	 Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread; 															2	
MFED	All Departments	Section	Improvement of children's health and nutrition	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes. 															2	
MFED	All Departments	Section	Improve health conditions among the poorest populations	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 															2	
MFED	All Departments	Section	Develop plans for the achievement of target MDG's	 Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 							1				1					2

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MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	 Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes. 																2
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination							1									
MFED	All Departments	Section	Computerizati on of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 							2				1					
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 							1				1				1	
MFED	All Departments	Section	Enhance rural development program activities	 Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises. 							1				1				1	
MFED	All Departments	Section	Develop and manage disaster risk management plan	 Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time. 							1				2				1	

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MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 											2					
MFED	All Departments	Section	Support fire safety	 Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants. 											2					
MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures, guidelines and standards.	Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;							1				1				1	
MFED	Central Information Technology Organization	Section	Design and development of e-solutions and government-wide applications	 CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community 							1				1				1	
MFED	Central Information Technology Organization	Section	Provide data center and internet services	• Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.							1				1				1	
MFED	Central Information Technology Organization	Section	Provide information security services	 Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons 							1				1				1	
MFED	Central Information Technology Organization	Section	Develop and implement E-Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies							1				1				1	
MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	 Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation 							1				1				1	

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MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	 Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs 							1				1				1
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	 Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize 							1				1				1
MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	 Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators 							1				1				1
MFED	Statistical Institute Belize	Section	Conduct census taking	 Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow 							1				1				1
MFED	Statistical Institute Belize	Section	Census publishing and distribution	 Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems. 							1				1				1
MFED	Statistical Institute Belize	Section	Conduct between- census population estimation	• Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change							1				1				1

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MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	 Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level; 							1				1				1
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	 Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems. 							1				1				1
MFED	Statistical Institute Belize	Section	Develop special products	 Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public; 							1				1				1
MFED	Statistical Institute Belize	Section	Conduct original surveys	Provide tools for location-based field collection							1				1				1
MFED	Statistical Institute Belize	Section	Compile economic statistics	• Utilize location-specific business and revenue information to prepare neighborhood and community level economic statistics							1				1				1

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MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	 Provide tools for location-based field data collection; Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; Test effectiveness of various geostatistical visualizations for communicating issues and concepts Test tools and methods for real-time analysis of information from sensor networks Test new geostatistical tools application to existing raw data 							1				1				1
MFED	Social Investment Fund	Section	Identify potential projects	 Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time. 							1				1				1
MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	 Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members; 							1				1				1
MFED	Social Investment Fund	Section	Carry out project appraisals	 Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically. 							1				1				1
MFED	Social Investment Fund	Section	Facilitate project approval process	 Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions. 							1				1				1
MFED	Social Investment Fund	Section	Manage project bidding process	 Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference; 							1				1				1
MFED	Social Investment Fund	Section	Supervise project implementatio n	 Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF 							1				1				1
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects							1				1				1
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations							1				1				1
МОН	All Departments	Section	Provide medical laboratory services;	 Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers. 															2

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МОН	All Departments	Section	Manage medical stores;	 Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks. 															2	
МОН	All Departments	Section	Provide public dental services;	 Provide map of all facilities where public dental services are offered; Track and monitor mobile clinic locations and history; Track and monitor urban and rural school dental visits and history; Utilize location-aware social media for connecting with dental patient community; Assess the location effectiveness of existing dental health facilities and services and site new programs; Analyze dental service delivery facilities relative to population census information; Produce statistical reports and maps concerning dental health at the community level; Track and analyze dental service delivery by locations over time. 															2	
МОН	All Departments	Section	Support environmental health;	 Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues and trends over time; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time 															2	
МОН	All Departments	Section	Monitor and assess chronic and communicable disease;	 Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time. 															2	

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МОН	All Departments	Section	Manage health education and participation bureau program;	 Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis countrywide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues 														2	
МОН	All Departments	Section	Manage maternal and child health program;	 Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time. 														2	
МОН	All Departments	Section	Manage mental health program;	 Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time. 														1	

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МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	 Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize. 															2	
МОН	All Departments	Section	Manage pharmaceutical services and supplies;	 Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs. 															2	
МОН	All Departments	Section	Conduct public health planning and policy development;	 Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios 															2	
МОН	All Departments	Section	Manage health sector reform project;	 Geographically based analysis of public and private health facility and service demand and supply;' Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels. 							1								2	
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records							1								2	
MNS	Police Department	HNCIB	Investigate crimes	 Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information; 											2					

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MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	 Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic; 							1				2			2		
MNS	Police Department	Commande r Operations	Conduct police dispatch activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 							1				2	2				
MNS	Police Department	Commande r Operations	Conduct drug intervention activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 							1				2			2		
MNS	Police Department	Commande r Operations	Monitor and track released felons	 Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities 											2			2		
MNS	Police Department	Commande r Operations	preventative	 Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management. 							1				2					
MNS	Police Department	Commande r Operations	Conduct gang suppression activities	 Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use. 							1				2					
MNS	Police Department	Commande r Operations	Conduct national traffic management	 Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports 							1				2					
MNS	Police Department	Commande r Operations	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 							1				2					

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MNS	Police Department	Commande r Operations	Support joint emergency response	 Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response 							1				1	1	2		1
MNS	Police Department	Police Informatio n Technolog y Unit	Conduct facility and asset management	 Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement 	2	2	2	2	2	2					2				
MNS	Police Department	Police Informatio n Technolog y Unit	Develop, manage and operate crime information system	 Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geosptial analysis of CIMS records 							1				2				1
Regional	CCCCC	Sections	Conduct climate modeling;	 Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time. 							1				1		2		1
Regional	CCCCC	Sections	Conduct CARIWIG Project;	 Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods 							1				1				1

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Regional	CCCCC	Sections	Manage SIDS DOCK Program;	 Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time. 							1								
Regional	cccc	Sections	Manage Pilot Program for Climate Resilience:	 Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for climate-smart, sustainable development. 							1			1		2		1	
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	 Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; Provide visualization tools to communicate issues and alternative plans to decision makers and the public; Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; Provide tools and methods for the effective inventory, management and utilization of standing forests; Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends; 							1			1		2		1	

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	 Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the various groups currently maintaining meteorological and hydrological data and projections 																
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Hazards and Risks	 Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments; 							1				1		2		1	
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	 Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data; 													2			
Regional	cccc	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	 Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data; 													2			
Regional	cccc	Sections	Caribbean regional environmental change observing	 Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks; 													2			

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			network - Land Cover and Land Use																	
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	 Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning 													2			
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	 Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using water resource data; 													2		1	
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 													2			
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Socio- Economic Status	 Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services; 											1		2		1	

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	 Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities. 							1				1		2		1	
Regional	cccc	Sections	Conduct EU GCCA project	 Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing 							1				1		2		1	
Regional	CCCCC	Sections	Coordinate 2011-2015 Caribbean regional resilience development implementatio n plan;	 Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness. 							1				1		2			
Regional	CCCCC	Sections	Coordinate 2012-2013 Caribbean risk management program;	Provide GIS and NSDI as an enabling environment for climate smart government and development;							1				1				1	
Regional	CCCCC	Sections	Coordinate 2012-2014 Australian Caribbean Coral Reef Collaboration;	 Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; Monitor and assess reef health and trends over time; Provide a geographic basis for reef protection and regulatory enforcement; Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments. 																

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Regional	CCCCC	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	 Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and place-based manner. 													2			
Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	 Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations 																
Regional	CATHALAC	Sections	Provide education and training	 Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities 																
Regional	CATHALAC	Sections	Provide specialized services	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring. 							1				1				1	
Regional	CATHALAC	Sections	Compile, manage and publish geographic information	 Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats 																
Regional	CATHALAC	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 													2			
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and	 Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources 																

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			information;																
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 						1				1					
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	 Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 						1				1		2		1	

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 							1						2			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify built environment resources at risk	 Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding; Identify electrical, water, telephone and other critical infrastructure within high risk areas. 													2			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	 Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas. 							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	• Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted.							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify populations at risk	Identify population concentrations within high risk areas													2			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	• Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged.													2			

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	 Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network. 							1				1		2		1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	 Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; 							1				1		2		1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;							1				1		2		1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	 Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency 							1				1		2		1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.							1				1		2		1

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	Calculate potential loss of life and injury based on exposure and vulnerability assessments.							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	 Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery. 							1				1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	 Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility. 							1				1		2		1	

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues.							1			1		2		1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post- disaster payout.	Calculate hazard scenario and correlate to insurance provisions							1			1		2		1	
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	 Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data 							1			1				1	
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies 							1			1				1	

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Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor socioeconomic trends; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends. 							1				1				1
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory. 							1				1				1

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ADMIN_L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Facility & Service Inventory	Facility & Service	Facility & Service	Design	racinty Constitution Mgmt	Facility O&M Faculty Admin & Finance	Surface Transport	Transit	Air Transport	Water Transport	Community Law Enforcement	Emergency Response	Disaster Mgmt	National Security	Public Health	Social Welfare
Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	 Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 																
Utilities	Belize Electric Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 																
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 																

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ADMIN_L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Facility & Service Inventory	Facility & Service A seesement	Facility & Service	Facility Construction	Facility O&M	Finance	Surface Transport	Transit	Air Transport	Water Transport Community Law	Enforcement	Emergency Response	Disaster Mgmt	National Security	Public Health	Social Welfare
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor socioeconomic trends and their impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 							1				1				1	
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory. 							1									

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Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network operations and maintenance	 Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 															
Utilities	Belize Water Supply Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 															
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	 Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 						1				1		2			
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 															

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Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	 Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize 							1				1				1	
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	 Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software 							1				1				1	
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	 Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting 																
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association. 							1									
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	 Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time. 							1				1					

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ADMIN_L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Facility & Service Inventory	Facility & Service	Facility & Service	Facility Construction	Facility O&M	Facility Admin & Finance	Surface Transport	Transit	Air Transport	Water Transport	Enforcement	Emergency Response	Disaster Mgmt	National Security	Public Health	Social Welfare
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members. 							1				1					
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	 Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues. 																
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	 Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.). 																

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NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	 Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting 															
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	 Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI 															
NGO's	Friends for Conservation and Development	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	 Map and record inventory of ecological resources of the National Park and surrounding biogeographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park; 											1				
NGO's	Friends for Conservation and Development	Sections	Conduct environmental education and awareness;	 Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted. 															
NGO's	Friends for Conservation and Development	Sections	Conduct community support programs;	 Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories. 															

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NGO's	Friends for Conservation and Development	Sections	Conduct environmental monitoring and research;	 Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making. 																
NGO's	Friends for Conservation and Development	Sections	Development and promotion of policy recommendati ons;	 Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public. 																
NGO's	Friends for Conservation and Development	Sections	Conduct bi- national cooperation;	 Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution. 																
NGO's	Friends for Conservation and Development	Sections	Conduct cave management;	 Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs 																
NGO's	Programme for Belize	Sections	Placeholder																	
NGO's	Belize Audubon Society	Sections	Placeholder																	
NGO's	Red Cross of Belize	Sections	Placeholder																	
Academic & Research	University of Belize	Environme ntal Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 							1									

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ADMIN_L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Facility & Service Inventory	Facility & Service Assessment	Facility & Service Design	Facility Construction Mgmt	Facility O&M	Finance	Surface Transport	Transit	Air Transport	Water Transport	Enforcement	Emergency Response	Disaster Mgmt	National Security	Public Health	Social Welfare
Academic & Research	University of Belize	Environme ntal Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	 Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 																
Academic & Research	University of Belize	Environme ntal Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 																
Academic & Research	University of Belize	Environme ntal Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;																
Academic & Research	University of Belize	Environme ntal Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	 Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public. 																

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ADMIN_L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Facility & Service Inventory	Facility & Service Assessment	Facility & Service Design	Facility Construction Mgmt	Facility O&M	Facility Admin & Finance	Surface Transport	Transit	Air Transport	Water Transport	Enforcement	Emergency Response	Disaster Mgmt	National Security	Public Health	Social Welfare
Academic & Research	University of Belize	Environme ntal Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	 Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations. 							1									
Academic & Research	University of Belize	Environme ntal Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 							1									
Academic & Research	University of Belize	Environme ntal Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 					2		1									

APPENDIX B3 – BUSINESS AREA GROUPINGS (NATURAL/CULTURAL MGMT – EDUCATION – ECONOMIC DEVELOPMENT – INFORMATION – POLITICAL - BUSINESS)

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biouversity & Conservation	Public Awareness	Primary & Secondary	Public Sector	Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Civil Society	
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history	1								1	1		1						1
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Construction Permits	 Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history 	1								1	1		1						1
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	Review planning context of other initiatives Identify potential existing hazards and those that may develop due to climate change	1							1	1	1		1						1
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies	1								1	1		1						1

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MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	 Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies 	1									1		1							1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	 Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas 	2		2			2						1							
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Land Use Planning Task Force	 Provide planning analysis in support of Municipal Development Project Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context Assess municipal development plans relative to projected climate change impacts and vulnerabilities Assess cumulative societal implications of combined municipal development plans 	1									1		1							1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	Manage inventory of all National Estate lands Assess land value for leasing purposes Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases	1									1		1							
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	 Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales 	1									1		1							
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information												1							
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries												1							

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MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	 Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time 												2							
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files												1							
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system	1							1		1		2				1			1
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	 Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request 	1							1		1		2				1			1
MNRA	Lands and Surveys Department	Land Information Center	Develop and Disseminate GIS Data	 Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs 	1							1		1		2				1			1
MNRA	Lands and Surveys Department	Land Information Center	Publish Environmental Statistics	 Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards 	2												2			1			1
MNRA	Lands and Surveys Department	Land Information Center	Support Data Custodianship On Behalf of Other Organizations	 Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog 	1							1		1		2				1			
MNRA	Lands and Surveys Department	Land Information Center	Support Capacity Building	 Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies 	1							1		1		2				1			

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MNRA	Lands and Surveys Department	Land Information Center	Provide Ad Hoc Technical Services	 Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use 	1							1		1		2				1		
MNRA	Lands and Surveys Department	Land Information Center	Facilitate the Belize NSDI	 Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders 	1							1		1		2				1		1
MNRA	Central Administrati on	IT Department	Prepare and implement IT Strategy.	Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing MNRA use of information technology												2						
MNRA	Central Administrati on	IT Department	Conduct system and database administration.	Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks												2						
MNRA	Central Administrati on	IT Department	Provide general IT support.	Provide specialized IT support for GIS users												2						
MNRA	Central Administrati on	IT Department	Support application development and maintenance.	Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program												2						
MNRA	Central Administrati on	IT Department	Develop and maintain MNRA website.	Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness												2				1		1

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MNRA	Central Administrati on	IT Department	Maintain BNSDI geographic portal.	 Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now. 												2				1			1
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	 Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas 				2						1		1							1
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	 Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time 				2						1		1							1
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize				2						1									1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Implement NIWRA Master Plan.	 Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Estabish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects 	2	2								1		1				1			1

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MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Process Water Abstraction Licenses.	 Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources 	1									1		1						1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Collect and Manage Hydrological Data.	Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring	2							1		1		2				1		1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Special Projects.	 Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors 	2							1		1		2				1		1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Groundwater Resource Assessment	 Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends 			2					1		1		2				1		1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Water Resource Outreach	 Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments 			2					1		1		2				1		1

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MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	 Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information 		2						1		1		2				1			1
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee execution and implementation of the Solid Waste Management Project	Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize	1							1		1		1				1			1
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	 Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets 										1						1			1
MNRA	Natural Resources	Belize Solid Waste Management Authority	Conduct public relations and outreach activities.	Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur																			
MNRA	Natural Resources	Belize Solid Waste Management Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management scenarios, waste to energy schemes, recycling efforts, and other potential future innovations. 																			

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MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	 Inventory of the location and characteristics of farm properties, farmers, and production statistics; Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; Crop production forecasting; Land capability and suitability mapping; Local and export market analysis; Access to markets and export infrastructure analysis; Farm feasibility assessment and planning; Market location price monitoring and product sources; Production and forecasting tracking; Climate change agriculture risk and vulnerability assessment and mitigation planning; Disaster damage assessment and recovery planning; Provide trade associations with access to government geospatial resources to support their planning and operations; Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time. 	2	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics	2										1		1							1
MNRA	Agriculture Department	Aquaculture and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	2												1							1
MNRA	Agriculture Department	Cooperatives	Promote and support agricultural cooperatives	 Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time. 	2										1		1							1

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MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	 Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize. 	2							1		1		1				1		1
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	 Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files 	1							1		2		1				1		1
MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	 Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers 	2							1		1		1				1		2
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	 Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time. 	2									1		1						2

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MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	2							1		1		1				1			2
MNRA	Agriculture Department	Central Farm	Promote and Support Agro- Processing in Belize	 Record and track the location and characteristics of farmers that are involved in agro-processing; Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; Based on the above, assess needs and develop program responses that are suitable for each geographic area; Track school locations and their participation in school feeding program; Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time. 	1							1		1		1				1			2
MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	 Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time. 	2							1		1		1				1			2
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	 Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time. 	2							1		1		1				1			2
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	 Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time. 	2							1		1		1				1			2
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	 Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time. 	2									1		1				1			1

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MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	 Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business 	2									1		1				1		1
MoWT	Works Department	Section	Support transportation planning	 Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications. 	1							1		1		1				1		1
MoWT	Works Department	Section	Manage materials lab.	Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers	1							1		1		2						1
MoWT	Works Department	Section	Oversee road design and construction.	 Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.); 	1									1		1				1		1
MoWT	Works Department	Section	Maintain roads infrastructure.	 Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time. 										1								1

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MoWT	Works Department	Section	Maintain other civil infrastructure	 Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance. 	1							1		1		1				1		1
MoWT	Works Department	Section	Manage road safety	 Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS. 																		
MoWT	Works Department	Section	Administer driver and vehicle licensing registration	 Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time. 																		
MoWT	Transport Department	Section	Conduct transit planning.	Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling.										1		1				1		1
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	 Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security 										1		1				1		1
MoWT	Transport Department	Section	Conduct traffic enforcement.	 Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures. 																		

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MoWT	All Departments	All Sections	Participate in emergency planning and response.	 Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures. 	1								1		1				1		1
MLLGRD	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 											1				2		
MLLGRD	Village Councils	Section	Develop and administer municipal development plans and land use zoning	 Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements. 	1							1	1		1				1		1
MLLGRD	Village Councils	Section	Issue development permits	Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time.	1							1	1		1				1		1
MLLGRD	Village Councils	Section	License and inspect petrol stations and garages	 Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time 	1							1	1		1				1		1
MLLGRD	Village Councils	Section	Maintain streets and street lighting	Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities.									1		1						1

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MLLGRD	Village Councils	Section	Facilitate utility coordination	 Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching 	1							1		1		1				1			1
MLLGRD	Village Councils	Section	Facilitate and support community services coordination	Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services								1				1							
MLLGRD	Village Councils	Section	Maintain storm drainage system	 Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities. 	1									1		1							1
MLLGRD	Village Councils	Section	Manage refuse	 Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material. 	1							1		1		1				1			1
MLLGRD	Village Councils	Section	Issue littering tickets	 Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education. 	1							1											
MLLGRD	Village Councils	Section	Manage parks and recreation areas	Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning	1							1		1		1				1			1
MLLGRD	Village Councils	Section	Manage public slaughterhouse facilities	 Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities 										1		1							1

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MLLGRD	Village Councils	Section	License, rent and inspect market facilities	Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets.										1		1							2
MLLGRD	Village Councils	Section	Manage local cemetery	Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas																			1
MLLGRD	Village Councils	Section	Manage local property taxation	 Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time 																			1
MLLGRD	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	 Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications; 												1				1			1
MLLGRD	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 																			1
MLLGRD	Village Councils	Section	Manage public water closets and latrines	 Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones 																			
MLLGRD	Village Councils	Section	License billboards and banners	 Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues. 																			

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MLLGRD	Belize City Council	Section	Manage local public health	 Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.) 										1									1
MLLGRD	Belize City Council	Section	Manage local tourism	 Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities 											2								1
MLLGRD	Belize City Council	Section	Manage city traffic and licensing	 Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.); 																			
MLLGRD	Belize City Council	Section	Manage public works	 Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); Provide foundation information for street furniture and pavement management; Provide foundation information of storm drainage system management; Provide foundation information for park management; Provide foundation information for municipal building maintenance and space planning; Provide foundation information for municipal vehicle fleet management; Provide asset register as the basis for municipal asset financial management; Provide geographically-based asset register to support preventive and asneeded maintenance planning and response; Provide linkage to maintenance management system to track maintenance activities over time; Track maintenance performance indicators; 										1									

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MLLGRD	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 	1							1		1		1				1			1
MLLGRD	Belize City Council	Section	Manage environmental sanitation	Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations												1							1
MLLGRD	Belize City Council	Section	Manage Municipal facility security	 Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface 																			
MLLGRD	Belize City Council	Section	Conduct disaster planning and response	 Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities. 	1							1		1		1				1			1

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MLLGRD	Belize City Council	Section	Conduct property valuation	 Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies 												1				1			1
MLLGRD	Belize City Council	Section	Collect and monitor city revenues	 Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections 																			1
MLLGRD	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council information infrastructure	1							1		1		1				2			1
MLLGRD	NEMO	Section	Hazard and vulnerability assessment	 Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment 	1							1		1		1				1			1
MLLGRD	NEMO	Section	Disaster contingency planning	Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter	1							1		1		1				1			1
MLLGRD	NEMO	Section	Disaster response	Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status	1							1		1		1				1			1
MLLGRD	NEMO	Section	Disaster recovery	 Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.) 	1							1		1		1				1			1

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MLLGRD	NEMO	Section	Education, Communication and Warning	 Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1							2	1		1				1		1
MLLGRD	NEMO	Section	Medical and Relief Measures	 Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans 											1						1
MLLGRD	NEMO	Section	Housing and Shelter	 Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 									1		1				1		1
MLLGRD	NEMO	Section	Search, Rescue and Initial Clearance	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 								1	1		1				1		1
MLLGRD	NEMO	Section	Collection, Control and Distribution of Food and Material	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Identify precise locations of food and material storage facilities and enterprises; Track and manage field staff activities during response and recovery operations; Record activities and assess effectiveness for post-disaster refinement of 									1		1				1		1

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				contingency plans																		
MLLGRD	NEMO	Section	Assessment and Evaluation of Damage	 Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses; Manage and track damage repair and mitigation activities 												1				1		1
MLLGRD	NEMO	Section	Foreign Assistance disaster management	 Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies 										2		1				1		1
MLLGRD	NEMO	Section	Transport disaster management	 Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 												1				1		1
MLLGRD	NEMO	Section	Environment and Utilities disaster management	 Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 																		
MLLGRD	National Meteorologic al Office	Section	Conduct weather monitoring	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs 	1							1		1		1		2		1		1

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MLLGRD	National Meteorologic al Office	Section	Analyze and report weather information and forecasts	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring 	1							1		1		1		2		1			1
MLLGRD	National Meteorologic al Office	Section	Analyze weather and prepare agrometeorology reports for the agricultural sector.	 Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context. 	2									1		1		2					1
MLLGRD	National Meteorologic al Office	Section	Participate in emergency preparedness and response	 Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios 	1							1		1		1		2		1			1
MLLGRD	National Meteorologic al Office	Section	Provide data on as-needed basis	Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly	1							1		1		1		2		1			1

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MHUD	Central Building Authority	Section	Intake, review and approve building permits	 Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting 	1									1		1				1			1
MHUD	Central Building Authority	Section	Conduct building/site inspections;	 Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time 																			
MHUD	Central Building Authority	Section	Carry out soil testing;	 Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts 	1							1				1							
MHUD	Central Building Authority	Section	Carry out concrete testing.	Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time																			
MESTPU	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information	1				2					1		1				1			1
MESTPU	Geology and Petroleum Department	Section	Administer petroleum operating concessions	Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets	1				2														
MESTPU	Geology and Petroleum Department	Section	Review environmental impact assessments	 Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference. 	1			2						1		1							1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MESTPU	Energy Unit	Section	Develop and support national renewable energy development	Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country	1				2						2	1				1			1
MESTPU	Energy Unit	Section	Promote and support energy efficiency initiatives	 Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and outreach programs over time. 	1										2	1				1			1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	 Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner 	2										2	1				1			1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area	2										2	1				1			1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	 Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities 	2										2	1				1		1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts	2										2	1				1		1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands											2	1				1		1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests	2										2	1				1		1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat	2										2	1				1		1
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Project Development Process	Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects performance over time											2	1				1		1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Administration	CAN SOCIETY
MESTPU	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	Promote the use of geographic information science, systems and thinking in support of better planning and decision making in Belize Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector	1							2	2	1		2				1		1
MESTPU	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner	1							1		1		1				1		1
MESTPU	Public Utilities Commission	Section	Review and approve Public Utility rates.	 Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes 	1											1				1		1
MESTPU	Public Utilities Commission	Section	Monitor Public Utility Performance	 Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities 										1		1				1		1
MFFSD	Department of Forestry	Section	Protected Areas Management Program;	 Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students 	2							1		1		1				1		

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum brouversny & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Administration Civil Society	
MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	 Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format. 	2							1			2	1				1		1
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	 Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory 	2							1			2	1				1		1
MFFSD	Department of Forestry	Section	Law Enforcement Program;	 Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders. 	2							1		1		1				1		1
MFFSD	Department of Forestry	Section	Wildlife Program;	 Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings. 	2					2		1										
MFFSD	Department of Forestry	Section	National and International Partnership Program;	 Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above. 	2					2		1					2					
MFFSD	Department of Forestry	Section	Manage National Herbarium.	 Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of plant can be found 	1					2		1	1									

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MFFSD	Department of Environment	Section	Develop and manage environmental policies	 Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts 	2							1		[1				1		1

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MFFSD	Department of Environment	Section	Administer environmental impact assessments	 Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environment and issues impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance 	2							1	1		1				1			1

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MFFSD	Department of Environment	Section	Conduct environmental monitoring and enforcement	 Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education 	2								1									1
MFFSD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 	2						2											

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MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public 	2							2	2			1				1		1
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	 Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets 																		

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MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provide a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of historic storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of topographic and bathymetric information; Provide a mapped database of sea bottom types; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a ccess to fish catch and fisheries trend information; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 	2							1		1		1				1			1
MFFSD	Department of Fisheries	Section	Manage marine protected areas	Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities				2		2		1		1									1
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment				2		2		1		1									1

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MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	 Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government. 				2		2		1		1		1				1		1
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	 Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government. 	2					2		1										
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	 Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics 	2			2						1								1

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MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	 Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multi-stakeholder processes to calibrate interventions over time. 	2								1		1		1				1			1
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	 Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area; 	1							2	2		1		1				1			1
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	 Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture 	1			2			2		1		1		2				1			1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	CIVII SOCIETY
MTCCA	Ministry	Section	Oversee portfolio governance	 Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time 	1							1		1		2				1	2	1
MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	 Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making. 	1							1			2	1				1	2	1
MTCCA	Ministry	Section	Oversee tourism planning and development	 Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time. 	1							1			2	1				1		1
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 	1							1			2	1				1		1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture Historicana	Archaeological	water Kesources	Fishing & Fisheries	Mining and Quarrying	BIODIVEESITY &	Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MTCCA	Belize Tourism Board	Section	Manage tourism data	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment. 	1								1		1	2	1				1			2
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other 	1								1		1	2	1				1			2
MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists. 	1								1		1	2	1				1			2
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments. 	1								1		1	2	1				1			2
MTCCA	National Institute for Culture and History	Institute of Archeology	Maintain inventory of archeological sites;	Maintain inventory of archeological sites	2	2							1		1		1				1			
MTCCA	National Institute for Culture and History	Institute of Archeology	Conduct archeological research and education;	Conduct archeological research and education;	1	2						1	1	2	1		1				1			

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MTCCA	National Institute for Culture and History	Institute of Archeology	Manage archeological parks and reserves.	Manage archeological parks and reserves.	2	2						2	1		1		1				1			1
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours	2	2						2	1		1		1				1			1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Bioarversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;	1	2						1	2			1						
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives	2	2					1	1										
MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for ransport master plan and associated priority projects. 	1							1		2		1				1		1
MFED	All Departments	Section	Bridge construction and refurbishment	 Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects. 	1							1		2		1				1		1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Road and highway construction and refurbishment	 Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities; 	1							1		2		1				1			1
MFED	All Departments	Section	Improve road safety	 Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. 								1		2									
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	 Assess drainage facility capacity and vulnerability to major storm events; Provide basemap and geophysical data to support drainage facility engineering design; Provide geographically based project tracking system; Produce drainage asset inventory to support maintenance and financial asset management activities; 										2									
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies;										2									
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	 Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects 										2									
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	 Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning. 	1									2		1				1			1
MFED	All Departments	Section	Construction and refurbishment of community facility buildings	 Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting. 	1									2		1				1			1
MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	 Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects. 										2									1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects. 	2										2									
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	 Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities; 	2										2									
MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	 Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities 	2										2									1
MFED	All Departments	Section	Construction and upgrading of water supply network	 Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities; 	2										2									1
MFED	All Departments	Section	Improve rural water and sanitation governance	 Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards. 	2										2									1
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	 Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 											2									1
MFED	All Departments	Section	Institutional capacity building for water system governance	Incorporate GIS management and technical capacity building in to the water system governance program											2		1							
MFED	All Departments	Section	Development of solar energy generation demonstration project	Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project;	1								1		2									

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	rubne sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Civil Society	
MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	 Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 	1							1		2		1				1		1
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects.										2		1				1		1
MFED	All Departments	Section	Plan, design and implement agriculture services program	 Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact 	2									2		1				1		1
MFED	All Departments	Section	Promote and support the development of integrated farming systems	 Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context. 	2									2		1				1		1
MFED	All Departments	Section	Upgrade research and extension facilities	Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector	2									2		1				1		1
MFED	All Departments	Section	Conduct farmer training and capacity building activities	Support farmer training and extension service capacity building	2									2		1				1		1
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	 Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy. 	2									2		1				1		1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Covernance & Public	Administration	•
MFED	All Departments	Section	Conduct community project for improvement of agriculture production for poor families	 Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time. 	2									2		1				1		1
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time. 	2									2		1				1		1
MFED	All Departments	Section	Support the expansion of rice seed production	 Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes. 	2							1		2								1
MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 	2							1		2								1
MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time.	2							1		2		1				1		2

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	 Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/ 	2							1		2		1				1			1
MFED	All Departments	Section	Conduct national cattle testing and certification program	 Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export. 	2							1		2		1				1			1
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	 Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations 	1							1		2		1				1			1
MFED	All Departments	Section	Support targeted lending	 Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes. 										2		1							1
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	Record location and characteristics of Coalition members; Monitor and assess program member performance										2									2
MFED	All Departments	Section	Support financial services for poor farmers and rural communities	 Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area; Track and assess utilization of financial services over time. 	1							1		2		1							
MFED	All Departments	Section	Administer small scale enterprise grants	 Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises 	1							1		2		1							
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	 Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities 	1							1		2		1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	3conomic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	 Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate 	1							1		2	H								1
MFED	All Departments	Section	Improvement of land management capacity	 Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities; 										2									1
MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 										2		1							
MFED	All Departments	Section	Strengthen protected areas management	 Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time 	2							1		2		1				1			
MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	 Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues. 	1							1		2		2				1			1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Manage marine fisheries	 Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time. 	2								2								1
MFED	All Departments	Section	Manage pollutant release and transfer registration	 Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time. 	1								2								1
MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	 Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system. 								2	2								
MFED	All Departments	Section	Control and prevention of HIV/AIDS	 Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread; 									2		1						

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Improvement of children's health and nutrition	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes. 									2		1						
MFED	All Departments	Section	Improve health conditions among the poorest populations	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 								1	2		1				1		
MFED	All Departments	Section	Develop plans for the achievement of target MDG's	 Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	1							1	2		1				1		1
MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	 Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes. 									2		1						
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination									2								1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and	Archaeological Water Recources	Tierra Commens	Fishing & Fisheries	Mining and Quarrying	Petroleum Biouiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
MFED	All Departments	Section	Computerization of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 											2									
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 	1								1		2		1				1			1
MFED	All Departments	Section	Enhance rural development program activities	 Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises. 	1								1		2		1				1			1
MFED	All Departments	Section	Develop and manage disaster risk management plan	 Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time. 									1		2		1				1			1
MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 											2		1							
MFED	All Departments	Section	Support fire safety	 Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants. 											2		1							
MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures, guidelines and standards.	• Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;	1								1				1			2				1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society
MFED	Central Information Technology Organization	Section	Design and development of e-solutions and government-wide applications	 CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community 	1							1				1			2			1
MFED	Central Information Technology Organization	Section	Provide data center and internet services	• Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.	1							1				1			2			1
MFED	Central Information Technology Organization	Section	Provide information security services	 Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons 	1							1				1			2			1
MFED	Central Information Technology Organization	Section	Develop and implement E- Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies	1							1				1			2			1
MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	 Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation 	1							2				1			2			1
MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs	1							1				1			2			1
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	 Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize 	1							1				1	2					1

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MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	 Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators 	1								1				1	2			1		1
MFED	Statistical Institute Belize	Section	Conduct census taking	 Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow 	1								1				1	2			1		1
MFED	Statistical Institute Belize	Section	Census publishing and distribution	 Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems. 	1								1				1	2			1		1
MFED	Statistical Institute Belize	Section	Conduct between-census population estimation	Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change	1								1				1	2			1		1
MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	 Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level; 	1								1				1	2			1		1
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	 Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems. 	1								1		1		1	2			1		1
MFED	Statistical Institute Belize	Section	Develop special products	 Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public; 	1								1		1		1	2			1		1

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MFED	Statistical Institute Belize	Section	Conduct original surveys		1								1		1			2			1			1
MFED	Statistical Institute Belize	Section	Compile economic statistics	Provide tools for location-based field collection Utilize location-specific business and revenue information to prepare neighborhood and community level economic statistics	1								1					2			1			1
MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	 Provide tools for location-based field data collection; Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; Test effectiveness of various geostatistical visualizations for communicating issues and concepts Test tools and methods for real-time analysis of information from sensor networks 	1								1				1	2			1			1
MFED	Social Investment Fund	Section	Identify potential projects	 Test new geostatistical tools application to existing raw data Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time. 	1								1		2		1				1			1
MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	 Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members; 	1								1		2		1				1			1
MFED	Social Investment Fund	Section	Carry out project appraisals	 Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically. 	1								1		2		1				1			1
MFED	Social Investment Fund	Section	Facilitate project approval process	 Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions. 	1								1		2		1				1			1

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MFED	Social Investment Fund	Section	Manage project bidding process	 Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference; 	1							1		2		1				1			1
MFED	Social Investment Fund	Section	Supervise project implementation	 Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF 	1							1		2		1				1			1
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects	1							1		2		1				1			1
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations	1							1		2		1				1			1
МОН	All Departments	Section	Provide medical laboratory services;	 Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers. 								1				1							
МОН	All Departments	Section	Manage medical stores;	 Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks. 								1		1		1							
МОН	All Departments	Section	Provide public dental services;	 Provide map of all facilities where public dental services are offered; Track and monitor mobile clinic locations and history; Track and monitor urban and rural school dental visits and history; Utilize location-aware social media for connecting with dental patient community; Assess the location effectiveness of existing dental health facilities and services and site new programs; Analyze dental service delivery facilities relative to population census information; Produce statistical reports and maps concerning dental health at the community level; Track and analyze dental service delivery by locations over time. 								1		1		1							

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МОН	All Departments	Section	Support environmental health;	 Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues and trends over time; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time 								1		1		1						
МОН	All Departments	Section	Monitor and assess chronic and communicable disease;	 Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time. 								1		1		1						
МОН	All Departments	Section	Manage health education and participation bureau program;	 Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis country-wide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues 								1		1		1						

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МОН	All Departments	Section	Manage maternal and child health program;	Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time.							1	1		1						
МОН	All Departments	Section	Manage mental health program;	 Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time. 							1	1		1						
МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	 Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize. 	1						1	1		1						

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МОН	All Departments	Section	Manage pharmaceutical services and supplies;	 Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs. 										1		1							1
МОН	All Departments	Section	Conduct public health planning and policy development;	 Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios 								1		1		1							1
МОН	All Departments	Section	Manage health sector reform project;	 Geographically based analysis of public and private health facility and service demand and supply; Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels. 								1		1		1							1
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records								1		1		1							1
MNS	Police Department	HNCIB	Investigate crimes	 Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information; 																			
MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	 Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic; 																			1
MNS	Police Department	Commander Operations	Conduct police dispatch activities	Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans.																			

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MNS	Police Department	Commander Operations	Conduct drug intervention activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 										1									
MNS	Police Department	Commander Operations	Monitor and track released felons	 Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities 										1									
MNS	Police Department	Commander Operations	Carry out preventative patrols	 Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management. 										1		1							1
MNS	Police Department	Commander Operations	Conduct gang suppression activities	 Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use. 																			
MNS	Police Department	Commander Operations	Conduct national traffic management	 Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports 																			
MNS	Police Department	Commander Operations	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 												1							
MNS	Police Department	Commander Operations	Support joint emergency response	Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response								1				1							1

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MNS	Police Department	Police Information Technology Unit	Conduct facility and asset management	Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement																	
MNS	Police Department	Police Information Technology Unit	Develop, manage and operate crime information system	 Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geosptial analysis of CIMS records 	1							1	1		1						1
Regional	cccc	Sections	Conduct climate modeling;	 Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time. 	1							1	1		1						1
Regional	CCCCC	Sections	Conduct CARIWIG Project;	 Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods 	1							1	1		1						1

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Regional	CCCCC	Sections	Manage SIDS DOCK Program;	 Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time. 	1								1		1						1
Regional	CCCCC	Sections	Manage Pilot Program for Climate Resilience:	 Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for climate-smart, sustainable development. 	1							1	1		1						1
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	 Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; Provide visualization tools to communicate issues and alternative plans to decision makers and the public; Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; Provide tools and methods for the effective inventory, management and utilization of standing forests; Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends; 	1							1	1		1						1

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	 Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the various groups currently maintaining meteorological and hydrological data and projections 	1											1		2					
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Hazards and Risks	 Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments; 	1							1		1		1							1
Regional	cccc	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	 Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data; 	1					2						1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data;	1					2						1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Land Cover and Land Use	 Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks; 	1											1							

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	 Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning 	1												1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	 Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using water resource data; 	1								1		1		1						:	1
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 	1												1							
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Socio- Economic Status	 Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services; 	1										1	2	1						1	2
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	 Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities. 	1								1		1		1						:	1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HIStoric and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Regional	cccc	Sections	Conduct EU GCCA project	Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing	1							1		2		1							1
Regional	cccc	Sections	Coordinate 2011- 2015 Caribbean regional resilience development implementation plan;	 Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness. 								1		2		2							1
Regional	CCCCC	Sections	Coordinate 2012- 2013 Caribbean risk management program;	Provide GIS and NSDI as an enabling environment for climate smart government and development;	1							1		1		1					2		1
Regional	CCCCC	Sections	Coordinate 2012- 2014 Australian Caribbean Coral Reef Collaboration;	 Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; Monitor and assess reef health and trends over time; Provide a geographic basis for reef protection and regulatory enforcement; Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments. 	1					2				1		1							
Regional	CCCCC	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	 Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and placebased manner. 	1			2		2				2		1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biomyersity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Administration Civil Society	
Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations												2	2					
Regional	CATHALA C	Sections	Provide education and training	 Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities 							2	1	2									
Regional	CATHALA C	Sections	Provide specialized services	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring. 	1							1		1		2	2			1		1
Regional	CATHALA C	Sections	Compile, manage and publish geographic information	 Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats 												2	2					
Regional	CATHALA C	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 								1				1						
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and information;	 Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources 	2							1				1						

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biomversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 	2							1		1		1							1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	 Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model. 												1							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 	1							1		1		1							1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 	1											1							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify built environment resources at risk	 Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding; Identify electrical, water, telephone and other critical infrastructure within high risk areas. 	1											1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Brouversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	v
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	 Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas. 	1									1		1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	 Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted. 	1									1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify populations at risk	Identify population concentrations within high risk areas	1											1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	 Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged. 	1											1						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	 Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network. 	1									1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures;	1									1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;	1									1		1						1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTOTIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Brouversity & Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Administration Civil Society	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	 Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency 	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	Calculate potential loss of life and injury based on exposure and vulnerability assessments.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	 Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery. 	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	 Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility. 	1								1		1						1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biouiversity & Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues.	1								1		1						1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post- disaster payout.	Calculate hazard scenario and correlate to insurance provisions	1								1		1						1
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data	1							1	1		2				1		1
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies	1							1	1		2				1		1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Brouversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor socioeconomic trends; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends. 	1									1		1						1
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory. 	1									1		1						1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public	Administration	Civil Society	
Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	 Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 																			
Utilities	Belize Electric Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 																			
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 												1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTOTIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor socioeconomic trends and their impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 	1							1		1		1				1			1
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory. 	1									1		1							1

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	Historic and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Bioarversity &	Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network operations and maintenance	 Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 																			
Utilities	Belize Water Supply Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 																			
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	 Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1											1							1
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 												1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	 Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize 	1							1		1		1				1			2
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	 Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software 	1							1		1		1				1			2
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting								1											2
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association. 												1							2
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	 Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time. 	1									1		1							2

			LION		Na	tural d	& Cult	ural R	Resour	ce Mgmt		ucation Research		and Devel	nomic Social lopment Finance			natior ency	1	Go	olitical d vernme Affairs	nt	Business & Industry
ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum BIOMVETSITY & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members. 	1									1		1							2
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	 Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues. 								1											2
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	 Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.). 	1					2		1				1						2	

			NOL		Natu	ıral & (Cultu	ıral R	lesour	ce Mg	gmt		ication esearc		and Deve	onomic I Social Plopment Finance]	Inform Age	nation ency	l	Go	olitical o vernme Affairs	ent 1	Business & Industry
ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	Biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	 Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting 	1						2						1							
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	 Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI 	1						2		1											
NGO's	Friends for Conservation and Development	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	 Map and record inventory of ecological resources of the National Park and surrounding bio-geographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park; 	1						2		1		1								2	
NGO's	Friends for Conservation and Development	Sections	Conduct environmental education and awareness;	 Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted. 	1								1				1							
NGO's	Friends for Conservation and Development	Sections	Conduct community support programs;	Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories.	1							2	1				1							

			ION		Natural &	& Cult	tural I	Resour	ce M	gmt		ication esearc		and Deve	onomic Social lopment Finance			nation ency	l	Go	olitical d vernme Affairs	nt B	Business & ndustry
ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture HISTOPIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum	biodiversity & Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Governance & Public Administration	Civil Society	
NGO's	Friends for Conservation and Development	Sections	Conduct environmental monitoring and research;	 Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making. 	1					2		1				1							
NGO's	Friends for Conservation and Development	Sections	Development and promotion of policy recommendations ;	 Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public. 	1					2		1				1						2	
NGO's	Friends for Conservation and Development	Sections	Conduct bi- national cooperation;	 Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution. 	1							1				1							
NGO's	Friends for Conservation and Development	Sections	Conduct cave management;	 Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs 	1							1				1							
NGO's	Programme for Belize	Sections	Placeholder																				
NGO's	Belize Audubon Society	Sections	Placeholder																				
NGO's	Red Cross of Belize	Sections	Placeholder																				
Academic & Research	University of Belize	Environmental Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 	1					2		1		1		2	2						

			NOL		Na	tural &	c Cult	ural F	Resour	ce Mgn	nt		ication esearcl		and Devel	nomic Social opment Sinance	1	Inform Agei			Gov	litical & ernme Affairs	nt	Business & Industry
ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTOFIC and Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Bioanversity &	Conservation	Public Awareness	Primary & Secondary	Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs	Administration	Civil Society	
Academic & Research	University of Belize	Environmental Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	 Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	1			2			2	2	1				1							
Academic & Research	University of Belize	Environmental Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	1						2	2	1											
Academic & Research	University of Belize	Environmental Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;	1												2							
Academic & Research	University of Belize	Environmental Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	 Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public. 	1		2								1		1							

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ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Agriculture, Forestry & Aquaculture	HISTORIC AND Archaeological	Water Resources	Fishing & Fisheries	Mining and Quarrying	Petroleum Biouversity & Conservation	Public Awareness	Primary & Secondary Higher Education	Public Sector Investment	Economic Development	Mapping Agency	Statistics Agency	National Weather	eGovernment	Political Affairs Governance & Public Administration	Civil Society	
Academic & Research	University of Belize	Environmental Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	 Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations. 	1					2		1	1		1						1
Academic & Research	University of Belize	Environmental Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	1							1	1		1						1
Academic & Research	University of Belize	Environmental Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	1							1	1		1						1

APPENDIX C1 – DATA REQUIREMENTS (BASEMAP-AREAS-ENVIRONMENT)

								I	BASEN	MAP							AREA	S							E	ENVIR	RONMI	ENT					
ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history	1	1	1	1		1	1			1	1	1	1	1	1		1	1	1	1	1	1	1				1		1
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Construction Permits	Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history	1	1		1		1	1			1		1	1	1	1		1	1	1	1	1	1		1				1	
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	Review planning context of other initiatives Idenfity potential existing hazards and those that may develop due to climate change	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas	1	1	1	1	1	1				1	1	1	1		1	1		1	1	1	1	1	1	1			1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Land Use Planning Task Force	Provide planning analysis in support of Municipal Development Project Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context Assess municipal development plans relative to projected climate change impacts and vulnerabilities Assess cumulative societal implications of combined municipal development plans	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	Manage inventory of all National Estate lands Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases	1	1	1	1		1	1			1	1	1	1	1	1	1			1	1	1	1	1		1	1	1		1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales	1	1	1	1		1	1			1	1	1	1	1	1	1			1	1	1	1	1		1	1	1		1
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information	1	1		1						1																			
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries				1		1				1		1	1	1	1												1		1
MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time	1	1	1	1		1	1		1	1																			
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files	1	1	1	1		1				1												1							
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system	1																												
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request	1	1	1	1		1	1		1																				

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin boundaries Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geomorphology	Marine Abiotic	Seismology
MNRA	Lands and Surveys Department	Land Informati on Center	Develop and Disseminate GIS Data	Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs	1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		1
MNRA	Lands and Surveys Department	Land Informati on Center	Publish Environmental Statistics	Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards					1							1	1	1	1	1	1	1	1	1	1	1					
MNRA	Lands and Surveys Department	Land Informati on Center	Support Data Custodianship On Behalf of Other Organizations	Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		1
MNRA	Lands and Surveys Department	Land Informati on Center	Support Capacity Building	Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		1
MNRA	Lands and Surveys Department	Land Informati on Center	Provide Ad Hoc Technical Services	Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use	1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		
MNRA	Lands and Surveys Department	Land Informati on Center	Facilitate the Belize NSDI	Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		1
MNRA	Central Administrati on	IT Departme nt	Prepare and implement IT Strategy.	Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing	1	1	1	1		1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1		1

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery		Remote Sensing Data Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
				MNRA use of information technology																											
MNRA	Central Administrati on	IT Departme nt	Conduct system and database administration.	Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks	1	1	1	1		1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Departme nt	Provide general IT support.	Provide specialized IT support for GIS users	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Departme nt	Support application development and maintenance.	Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Departme nt	Develop and maintain MNRA website.	Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Departme nt	Maintain BNSDI geographic portal.	Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now.	1	1	1	1		1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas	1	1	1	1		1				1		1	l	1				1	1		1				1	1	
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time	1	1	1	1		1 1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize						1		1			1			1					1								1

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity Surface Hydro	0.1.0	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Implement NIWRA Master Plan.	Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Establish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1		1	1			1		1		
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Process Water Abstraction Licenses.	Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources		1	1	1		1					1	1	1	1	1	1	1	1	1	1	1		I	1	1	1		1
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Collect and Manage Hydrological Data.	Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring			1	1	1							1	1		1	1	1			1	1		I	1	1	1		
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Conduct Special Projects.	Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors	1	1	1	1	1	1	1			1	1	1	1	1	1													
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Conduct Groundwater Resource Assessment	Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends			1														1	1		1	1		l	1	1	1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Climate	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Conduct Water Resource Outreach	Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments		1	1	1	1	1	1		1	1	1	1	1	1 1	1	1	1	1	1	1		1	1	1		
MNRA	Agriculture Department	Policy Coordinat ion Unit, NIWRA and Hydrolog y Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information		1	1	1	1	1	1		1	1	1	1	1	1 1	1	1	1	1	1	1		1	1	1		
MNRA	Natural Resources	Belize Solid Waste Managem ent Authority	Oversee execution and implementation of the Solid Waste Management Project	Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize		1		1		1			1		1	1	1	1 1	1	1	1	1	1	1		1	1	1		1
MNRA	Natural Resources	Belize Solid Waste Managem ent Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets						1							1	1	1		1		1			1		1		
MNRA	Natural Resources	Belize Solid Waste Managem ent Authority	Conduct public relations and outreach activities.	Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur															1											
MNRA	Natural Resources	Belize Solid Waste Managem ent Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management 		1				1							1		1		1									

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Lallu Ose & Lallu Covel	Biodiversity Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
				scenarios, waste to energy schemes, recycling efforts, and other potential future innovations.																												
MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	Inventory of the location and characteristics of farm properties, farmers, and production statistics; Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; Crop production forecasting; Land capability and suitability mapping; Local and export market analysis; Access to markets and export infrastructure analysis; Farm feasibility assessment and planning; Market location price monitoring and product sources; Production and forecasting tracking; Climate change agriculture risk and vulnerability assessment and mitigation planning; Disaster damage assessment and recovery planning; Provide trade associations with access to government geospatial resources to support their planning and operations; Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time.	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	ı	1 1	1		1		1		
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics										1						1			1	l								
MNRA	Agriculture Department	Aquacultu re and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time.	1	1	1	1	1	1				1		1	1	1		1	1		1 1	I	1 1	1		1		1		
MNRA	Agriculture Department	Cooperati ves	Promote and support agricultural cooperatives	Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time.		1		1	1					1		1	1	1		1	1		1	l	1	1		1		1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic
MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize.	1	1	1	1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files		1	1	1		1				1	1	1	1	1	1	1	1		1	1		1	1		1		1	
MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers		1	1	1	1	1				1	1	1	1	1	1	1	1			1		1			1		1	
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time.		1	1	1		1				1						1				1					1		1	
MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of		1	1	1		1				1		1	1	1	1	1	1		1	1	1	1	1		1		1	

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
				aquaculture promotion and support programs over time.																												
				Record and track the location and characteristics of farmers that																												
MNRA	Agriculture Department	Central Farm	Promote and Support Agro-Processing in Belize	are involved in agro-processing; • Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; • Based on the above, assess needs and develop program responses that are suitable for each geographic area; • Track school locations and their participation in school feeding program; • Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time.		1		1		1				1	1	1	1	1	1	1	1			1		1						
MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time.		1	1	1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1					
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time.	1	1	1	1		1				1	1	1	1	1	1	1	1		1	1	1	1	1	1		1		
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time.	1	1	1	1	1	1				1	1	1	1	1	1	1	1		1	1	1	1	1	1		1		
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time.	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MoWT	Works Department	Section	Support transportation planning	Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications.	1	1	1	1	1	1	1			1	1	1	1	1	1 1	1	1	1	1	1	1			1	1	1		1
MoWT	Works Department	Section	Manage materials lab.	Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers	1	1	1	1		1	1			1											1	1		1	1	1		
MoWT	Works Department	Section	Oversee road design and construction.	Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.);	1	1	1	1		1	1			1	1	1	1	1	1	1		1	1	1	1			1	1	1		1
MoWT	Works Department	Section	Maintain roads infrastructure.	 Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time. 														1							1							

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
MoWT	Works Department	Section	Maintain other civil infrastructure	Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance.	1	1		1		1				1												1						
MoWT	Works Department	Section	Manage road safety	Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS.	1	1		1			1																					
MoWT	Works Department	Section	Administer driver and vehicle licensing registration	Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time.						1				1																		
MoWT	Transport Department	Section	Conduct transit planning.	Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling.		1	1	1		1				1	1	1	1	1	1	1				1								
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security		1				1											1											
MoWT	Transport Department	Section	Conduct traffic enforcement.	Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures.	1	1											1															

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MoWT	All Departments	All Sections	Participate in emergency planning and response.	Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures.	1	1	1	1		1	1		1		1		1	1		1	1					1		ı		1	1	1 1
MLLGR D	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 		1											1															
MLLGR D	Village Councils	Section	Develop and administer municipal development plans and land use zoning	Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements.	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1 1
MLLGR D	Village Councils	Section	Issue development permits	Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time.		1	1	1		1			1	1		1	1		1					1	1	1		1	1	1	1	1
MLLGR D	Village Councils	Section	License and inspect petrol stations and garages	Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time		1		1		1	1			1		1			1				1	1	1	1	1	1		1	1	
MLLGR D	Village Councils	Section	Maintain streets and street lighting	Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities.		1		1					1	1																		
MLLGR D	Village Councils	Section	Facilitate utility coordination	Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching	1	1	1	1		1	1			1	1	1	1													1	1	

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Total Time 6. I and Communication	Land Use & Land Cover	Biodiversity Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
MLLGR D	Village Councils	Section	Facilitate and support community services coordination	Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services	1	1				1				1	1																	
MLLGR D	Village Councils	Section	Maintain storm drainage system	Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities.	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1	. 1	1	1 1			1		1		
MLLGR D	Village Councils	Section	Manage refuse	Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material.		1		1		1							1	1		1		1]	1								
MLLGR D	Village Councils	Section	Issue littering tickets	Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education.		1											1															
MLLGR D	Village Councils	Section	Manage parks and recreation areas	Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning	1	1	1	1		1	1			1			1						1	1	1			1		1		
MLLGR D	Village Councils	Section	Manage public slaughterhouse facilities	Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities		1				1				1		1																
MLLGR D	Village Councils	Section	License, rent and inspect market facilities	Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets.		1				1				1		1																
MLLGR D	Village Councils	Section	Manage local cemetery	Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas		1	1	1		1	1			1		1	1		1			1	. 1	1	1					1		
MLLGR D	Village Councils	Section	Manage local property taxation	Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time		1		1		1				1		1]	1	1					1		

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MLLGR D	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications;		1				1		1				1														
MLLGR D	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 		1				1														1						
MLLGR D	Village Councils	Section	Manage public water closets and latrines	Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones		1				1		1				1														
MLLGR D	Village Councils	Section	License billboards and banners	Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues.	1	1				1	1	1	1		1															
MLLGR D	Belize City Council	Section	Manage local public health	Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.)		1				1			1			1														
MLLGR D	Belize City Council	Section	Manage local tourism	Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities		1				1			1			1														
MLLGR D	Belize City Council	Section	Manage city traffic and licensing	Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.);	1	1																								

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
MLLGR D	Belize City Council	Section	Manage public works	Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); Provide foundation information for street furniture and pavement management; Provide foundation information of storm drainage system management; Provide foundation information for park management; Provide foundation information for municipal building maintenance and space planning; Provide foundation information for municipal vehicle fleet management; Provide asset register as the basis for municipal asset financial management; Provide geographically-based asset register to support preventive and as-needed maintenance planning and response; Provide linkage to maintenance management system to track maintenance activities over time; Track maintenance performance indicators;	1	1	1	1		1	1			1	1	1	1	1 1		1	1	1	1	1	1			1		1	
MLLGR D	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 	1	1	1	1	1	1	1		1	1	1	1	1	1 :	1	1	1	1	1	1	1	1	1	1	1	1	1
MLLGR D	Belize City Council	Section	Manage environmental sanitation	Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations	1	1				1			1	1			1	1			1		1		1						
MLLGR D	Belize City Council	Section	Manage Municipal facility security	Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface	1	1				1	1		1	1			1														

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MLLGR D	Belize City Council	Section	Conduct emergency planning and response	Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities.	1	1	1	1		1	1		1	1		1 1	. 1	1	1	1		1	1	1	1		1			1	1 1
MLLGR D	Belize City Council	Section	Conduct property valuation	Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies		1				1				1		1 1		1					1		1					1	
MLLGR D	Belize City Council	Section	Collect and monitor city revenues	Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections		1				1				1		1															
MLLGR D	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council	1	1	1	1		1	1		1	1	1	1 1	. 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MLLGR D	NEMO	Section	Hazard and vulnerability assessment	Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment	1	1	1	1	1	1			1	1	1	1 1	. 1	1	1	1	1	1	1	1	1		1	1		1	1 1
MLLGR D	NEMO	Section	Disaster contingency planning	Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter	1	1	1	1	1	1			1	1	1	1	. 1	1	1	1	1	1	1	1	1		1	1		1	1 1
MLLGR D	NEMO	Section	Emergency response	Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status	1	1	1	1	1	1			1	1	1	1 1	. 1	1	1	1	1	1	1	1	1		1	1		1	1 1

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MLLGR D	NEMO	Section	Disaster recovery	Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.)	1	1	1	1	:	1 1			1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1		1	1 1
MLLGR D	NEMO	Section	Education, Communication and Warning	Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans.	1	1	1	1		1			1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1		1	1 1
	NEMO	Section	Medical and Relief Measures	Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans	1	1		1		1			1								1					1		1			1	1
	NEMO	Section	Housing and Shelter	Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans.	1	1		1		1			1	1							1					1		1			1	1
	NEMO	Section	Search, Rescue and Initial Clearance	Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans.	1	1		1		1			1	1			1				1	1				1		1			1	1
	NEMO	Section	Collection, Control and Distribution of Food and Material	Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Identify precise locations of food and material storage facilities and enterprises; Track and manage field staff activities during response and recovery operations; Record activities and assess effectiveness for post-disaster refinement of contingency plans	1	1		1		1			1	1			1				1					1		1			1	1
	NEMO	Section	Assessment and Evaluation of Damage	Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses;	1	1		1		1 1			1	1			1			1	1			1		1		1				1 1

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				Manage and track damage repair and mitigation activities																											
	NEMO	Section	Foreign Assistance disaster management	Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies		1	1	1		1			1	1		1	1				1		1		l	1	1		1		1
	NEMO	Section	Transport disaster management	Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery		1	1	1		1			1	1		1	1				1		1		I	1	1	1	1		1
	NEMO	Section	Environment and Utilities disaster management	Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery		1	1	1	1	1			1	1		1	1		1		1	1	1	1	l	1	1	1	1		1
MLLGR D	National Meteorologic al Office	Section	Conduct weather monitoring	Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs		1	1	1	1											1	1				ı	1			1	1	
MLLGR D	National Meteorologic al Office	Section	Analyze and report weather information and forecasts	Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring		1	1	1	1											1	1				I	1			1		
MLLGR D	National Meteorologic al Office	Section	Analyze weather and prepare agrometeorology reports for the agricultural sector.	Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context.		1	1	1	1					1							1		1		l	1	1		1		

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MLLGR D	National Meteorologic al Office	Section	Participate in emergency preparedness and response	Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios		1	1	1	1	1			1	1			1			1			1		1		1	1		1	1 1
MLLGR D	National Meteorologic al Office	Section	Provide data on as- needed basis	Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly		1	1	1					1				1			1			1		1		1			1	1
MHUD	Central Building Authority	Section	Intake, review and approve building permits	Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting	1	1	1	1		1			1	1		1	1 1	1				1	1	1	1	1	1	1		1	1 1
MHUD	Central Building Authority	Section	Conduct building/site inspections;	Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time	1	1		1		1			1	1		1	1	1					1		1		1			1	
MHUD	Central Building Authority	Section	Carry out soil testing;	Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts	1																							1	1	1	
MHUD	Central Building Authority	Section	Carry out concrete testing.	Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time	1					1																					
MESTP U	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information	1		1	1	1	1			1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1

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MESTP U	Geology and Petroleum Department	Section	Administer petroleum operating concessions	Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets				1		1				1	1		1						1	1		1	Ī			1	1		
MESTP U	Geology and Petroleum Department	Section	Review environmental impact assessments	Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference.	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MESTP U	Energy Unit	Section	Develop and support national renewable energy development	Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country	1	1	1	1	1	1			1	1		1	1	1	1		1		1	1	1	1	1	1	1	1	1		1
MESTP U	Energy Unit	Section	Promote and support energy efficiency initiatives	Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and		1		1		1											1			1		1		1			1		
MESTP U	Energy Unit	Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner	1	1	1	1		1				1		1	1	1	1		1		1	1	1	1					1		
	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area		1		1		1				1		1	1	1		1													

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	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities	1	1	1	1	1	1				1		1	1	1			1			1		1						
	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts	1	1	1	1	1	1				1		1	1		1		1		1	1	1	1			1	1	1	
	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands		1	1	1	1	1				1		1	1															
	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests			1	1	1							1	1		1					1	1	1			1		1	
	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat			1	1	1							1	1		1					1	1	1			1		1	
	Energy Unit	Section	Promote and support clean energy production initiatives - Project Development Process	Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects	1	1	1	1	1	1				1	1	1	1	1	1	1	1		1	1	1	1		1	1		1	
MESTP U	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	in Belize • Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MESTP U	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner	1	1			1	1			1	1		1	1			1	1			1		1		1	1	1	1	
MESTP U	Public Utilities Commission	Section	Review and approve Public Utility rates.	Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes		1		1		1				1		1	1	1														
MESTP U	Public Utilities Commission	Section	Monitor Public Utility Performance	Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities		1		1		1				1		1	1	1														

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MFFSD	Department of Forestry	Section	Protected Areas Management Program;	Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students		1	1	1	1	1			1		1	1	1				1	1	1	1	1	1	1	1	1		
MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format.		1	1	1	1	1			1	1	1		1				1	1	1	1	1	1	1	1	1		
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory	1	1	1	1					1	1	1	1						1							1		
MFFSD	Department of Forestry	Section	Law Enforcement Program;	Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders.		1	1	1	1	1			1	1	1	1	1				1	1	1	1					1		
MFFSD	Department of Forestry	Section	Wildlife Program;	Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings.	1	1	1	1		1			1	1	1	1	1		1			1	1	1		1	1	1	1		
MFFSD	Department of Forestry	Section	National and International Partnership Program;	Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above.	1	1	1	1		1			1	1	1	1	1		1			1	1	1		1					
MFFSD	Department of Forestry	Section	Manage National Herbarium.	Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of	1	1	1	1	1										1		1	1	1	1	1	1	1	1	1		

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				plant can be found																											
MFFSD	Department of Environment	Section	Develop and manage environmental policies	Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts	1	1	1	1	1	1	1		1	1	1	1 1	1	1	1	1 1	1	1 1	. 1	1	1	1	1	1	1		1
MFFSD	Department of Environment	Section	Administer environmental impact assessments	Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environment and issues impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance	1	1	1	1	1	1	1		1	1	1	1 1		1	1	1	1	1	1	1 1	. 1	1		1	1		1

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MFFSD	Department of Environment	Section	Conduct environmental monitoring and enforcement	 Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education 	1	1	1	1	1	1			1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	
MFFSD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 	1	1	1	1	1	1				1			1		1	1		1	1	1	1	1	1	1		1	
MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain georeferenced bibliographic information; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; 		1	1	1	1	1						1	1		1	1	1	1	1	1	1	1	1	1	1	1	

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				Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public																												
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets		1	1	1						1	1	1 1		1	1	1				1			1		1	1	1	

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MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provided a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of historic storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of topographic and bathymetric information; Provide a mapped database of tides, waves and currents; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a ccess to fish catch and fisheries trend information; Provide a mapped database of previous research activities; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 	1	1	1	1	1	1		1	1	1	1	1		1	1	1		1	1	1			1	1	1	1	1
MFFSD	Department of Fisheries	Section	Manage marine protected areas	Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities	1	1		1	1					1		1		1						1			1			1	1
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment	1	1		1	1					1		1		1						1			1			1	1

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MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government.	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1		1		1		1	1	1	1	I 1	. 1	l
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government.	1	1	1	1	1	1		1	1		1	1 1		1	1	1				1			1		1	. 1	ı
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics	1	1	1	1	1	1		1	1		1	1 1		1	1				1	1			1			1	l

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MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multi-stakeholder processes to calibrate interventions over time.	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1	1	1	1	1
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area;	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1	1	1	1	
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1 1		1			1	1	
MTCCA	Ministry	Section	Oversee portfolio governance	Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1	1	1		1

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MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making.		1	1	1		1					1	1			1	1	1		1	1	1 1		1			1	1	
MTCCA	Ministry	Section	Oversee tourism planning and development	Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time.		1	1	1		1					1	1			1	1	1		1	1	1 1		1			1	1	
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 	1	1	1	1		1			1	1	1	1	1	1	1	1	1	1	1	1	1 1		1 1	1		1 1	1	1
MTCCA	Belize Tourism Board	Section	Manage tourism data	Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment.		1	1	1		1				1	1	1	1			1			1	1	1 1		1					
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other	1	1				1										1												

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MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists.	1	1	1	1		1	1			1		1					1	1	1	1		1			1	1
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments.	1	1	1	1		1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1			1	1
MTCCA	National Institute for Culture and History	Institute of Archeolog	Maintain inventory of archeological sites;	Maintain inventory of archeological sites	1	1	1	1		1	1	1	1	1	1	1	1	1			1	1	1	1		1	1	1	1	
MTCCA	National Institute for Culture and History	Institute of Archeolog	Conduct archeological research and education;	Conduct archeological research and education;	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MTCCA	National Institute for Culture and History	Institute of Archeolog	Manage archeological parks and reserves.	Manage archeological parks and reserves.	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;	1	1	1	1		1			1	1	1	1	1	1	1		1	1	1	1	1	1			1	
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives	1	1		1		1				1	1	1	1	1	1	1	1	1	1	1	1	1			1	
MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for transport master plan and associated priority projects.	1	1	1	1		1		1	1	1	1	1 1	1	1	1		1	1	1	1		1	1	1	1	1
MFED	All Departments	Section	Bridge construction and refurbishment	Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects.	1	1	1																	1						
MFED	All Departments	Section	Road and highway construction and refurbishment	Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities;	1	1	1	1		1		1	1	1	1	1 1	1	1	1		1	1	1	1		1	1	1	1	1

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MFED	All Departments	Section	Improve road safety	Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. Assess drainage facility capacity and vulnerability to major	1	1		1	l	1										1													
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	storm events; • Provide basemap and geophysical data to support drainage facility engineering design; • Provide geographically based project tracking system; • Produce drainabe asset inventory to support maintenance and financial asset management activities;	1		1	1	1 1	1 1														1		1			1		1		
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies;	1	1	1	1	1 1	1 1				1		1	1		1	1	1		1	1	1	1			1	1	1		,
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects		1			1	1 1						1								1		1					1		
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning.	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	All Departments	Section	Construction and refurbishment of community facility buildings	Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting.	1	1	1	1		1				1		1	1							1		1			1		1		1
MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects.	1	1	1	1	l	1				1		1	1							1		1			1		1		
MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects.	1	1	1	1	l	1	1			1	1	1	1	1	1		1		1	1		1			1		1		
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities;	1	1	1	1	1	1	1			1	1	1	1	1	1		1		1	1		1			1		1		

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MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities	1	1	1	1		1	1			1	1	1	1	1	1		1		1	1	1			1		1		
MFED	All Departments	Section	Construction and upgrading of water supply network	Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities;	1	1	1	1		1				1	1	1	1	1	1					1	1			1		1		
MFED	All Departments	Section	Improve rural water and sanitation governance	Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards.	1	1	1	1		1				1	1	1	1	1	1	1	1			1	1					1		
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects.	1	1	1	1		1				1	1	1	1	1	1	1		1		1						1		
MFED	All Departments	Section	Institutional capacity building for water system governance	Incorporate GIS management and technical capacity building in to the water system governance program	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1		1	1	1 1	1		1	1	1		
MFED	All Departments	Section	Development of solar energy generation demonstration project	Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project;	1	1	1	1		1				1		1	1				1		1	1	1					1		
MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects.		1	1	1	1	1				1		1	1	1	1	1	1	1	1									
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects.	1	1	1	1		1				1		1	1	1		1				1	1					1		
MFED	All Departments	Section	Plan, design and implement agriculture services program	Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact	1	1	1	1	1	1				1		1	1	1	1	1	1		1	1	1 1	1		1		1		

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MFED	All Departments	Section	Promote and support the development of integrated farming systems	Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context.	1	1	1	1		1				1		1	1 1	1	1	1		1	1	1	1	1		1		1	
MFED	All Departments	Section	Upgrade research and extension facilities	Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector	1	1	1	1		1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	
MFED	All Departments	Section	Conduct farmer training and capacity building activities	-		1								1		1	1 1			1			1		1	1		1		1	
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	Support farmer training and extension service capacity building Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy.		1	1	1	1	1				1		1	1 1						1		1			1		1	
MFED	All Departments	Section	Conduct community project for improvement of agriculture production for poor families	Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time.		1		1	1	1				1		1	1 1		1	1		1	1	1	1	1		1		1	
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time.	1	1	1	1		1				1		1	1 1		1	1			1		1	1		1		1	
MFED	All Departments	Section	Support the expansion of rice seed production	Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes.	1	1	1	1		1				1		1	1 1		1	1			1		1	1		1		1	
MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time.	1	1	1	1		1				1		1	1 1		1	1			1		1	1		1		1	

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MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time.	1	1	1	1		1				1		1	1	1			1			1		1	1		1		1	
MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/	1	1	1	1		1				1		1	1	1			1			1		1	1		1		1	
MFED	All Departments	Section	Conduct national cattle testing and certification program	Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export.	1	1	1	1		1				1		1	1	1		ļ	1			1		1	1		1		1	
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations	1	1	1	1	1	1				1	1	1	1	1	1	ļ	1 1	l	1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Support targeted lending	Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes.		1		1		1			1	1			1							1		1			1		1	
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	Record location and characteristics of Coalition members; Monitor and assess program member performance		1		1		1							1							1		1						
MFED	All Departments	Section	Support financial services for poor farmers and rural communities	Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area;		1		1		1							1							1		1						
MFED	All Departments	Section	Administer small scale enterprise grants	Track and assess utilization of financial services over time. Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises	1	1	1	1		1				1	1	1	1	1	1	l	1		1	1	1	1	1	1	1	1	1	
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities	1	1	1	1		1				1				1			1			1		1	1		1		1	

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MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate	1	1	1	1		1			1		1	1	. 1	1			1	1	1	1					1	
MFED	All Departments	Section	Improvement of land management capacity	Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities;	1	1	1	1	1	1			1		1	1	1	1	1		1	1	1	1	1		1		1	
MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 	1	1	1	1		1			1		1	1		1	1	1		1		1	1	1	1	1	1	
MFED	All Departments	Section	Strengthen protected areas management	Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time	1	1	1	1	1	1		1	1		1	1	1		1		1	1	1	1		1	1		1	
MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues.			1	1	1	1					1	1	1		1					1		1	1		1	1 1
MFED	All Departments	Section	Manage marine fisheries	Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time.					1																					1
MFED	All Departments	Section	Manage pollutant release and transfer registration	Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time.	1	1			1	1						1	1			1	1	1	1	1	1	1				

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MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system.	1	1		1		1				1	1	1	1	1					1	1	1	1					1		
MFED	All Departments	Section	Control and prevention of HIV/AIDS	Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread;	1	1				1							1			1													
MFED	All Departments	Section	Improvement of children's health and nutrition	Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes.	1	1		1		1						1	1	1						1		1							
MFED	All Departments	Section	Improve health conditions among the poorest populations	Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes.	1	1		1		1						1	1	1						1		1							
MFED	All Departments	Section	Develop plans for the achievement of target MDG's	Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes.	1	1		1		1						1	1	1						1		1							

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MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes.	1	1		1		1		1		1	1	1	1			1		1	1	1	1	1	1			1	
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination	1	1				1				1	1	1			1												
MFED	All Departments	Section	Computerization of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 	1	1				1						1															
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 	1	1		1	1	1		1	. 1	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1	1
MFED	All Departments	Section	Enhance rural development program activities	 Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises. 	1	1	1	1		1		1	. 1	1	. 1	1	1	1		1		1	1	1	1	1	1	1	1	1	
MFED	All Departments	Section	Develop and manage disaster risk management plan	Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time.	1	1	1	1	1	1		1	. 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1
MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 	1	1		1		1		1				1			1				1		1					1	
MFED	All Departments	Section	Support fire safety	Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants.		1				1			1										1							1	

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MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures, guidelines and standards.	• Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Design and development of e- solutions and government-wide applications	CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Provide data center and internet services	• Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Provide information security services	Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Develop and implement E-Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation	1	1	1	1		1	1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize	1	1	1	1		1			1	1	1 1	1	1	1	1	1	1	1	1	1	1	1					
MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators	1	1		1	1	1					1			1													
MFED	Statistical Institute Belize	Section	Conduct census taking	Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow	1	1		1		1					1	l		1													

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
MFED	Statistical Institute Belize	Section	Census publishing and distribution	Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems.	1	1		1		1							1			1												
MFED	Statistical Institute Belize	Section	Conduct between- census population estimation	Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change	1	1		1	1	1							1							1								
MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level;		1									1	1	1	1	1	1				1								
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems.		1	1	1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Develop special products	Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public;	1	1	1	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Conduct original surveys	Provide tools for location-based field collection	1	1		1		1	1		1			1	1			1											1	
MFED	Statistical Institute	Section	Compile economic statistics	Utilize location-specific business and revenue information to		1				1					1		1							1								
MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	prepare neighborhood and community level economic statistics • Provide tools for location-based field data collection; • Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; • Test effectiveness of various geostatistical visualizations for communicating issues and concepts • Test tools and methods for real-time analysis of information from sensor networks • Test new geostatistical tools application to existing raw data	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Identify potential projects	Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time.	1	1	1	1		1				1	1	1	1	1	1	1				1		1		1				

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MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members;	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				
MFED	Social Investment Fund	Section	Carry out project appraisals	Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically.	1	1	1	1		1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Facilitate project approval process	Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions.		1	1	1		1				1		1	1		1	1	1		1	1	1	1	1	1			1	
MFED	Social Investment Fund	Section	Manage project bidding process	Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference;	1	1	1	1		1				1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Supervise project implementation	Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF		1		1		1					1	1	1			1				1								
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects		1		1		1										1				1								
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations		1				1							1															
МОН	All Departments	Section	Provide medical laboratory services;	Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers.	1	1				1			1				1			1				1								
МОН	All Departments	Section	Manage medical stores;	Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks.		1				1										1												

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
МОН	All Departments	Section	Provide public dental services;	Provide map of all facilities where public dental services are offered; Track and monitor mobile clinic locations and history; Track and monitor urban and rural school dental visits and history; Utilize location-aware social media for connecting with dental patient community; Assess the location effectiveness of existing dental health facilities and services and site new programs; Analyze dental service delivery facilities relative to population census information; Produce statistical reports and maps concerning dental health at the community level; Track and analyze dental service delivery by locations over time.		1				1										1												
МОН	All Departments	Section	Support environmental health;	Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time		1				1					1	1	1	1		1	1	1		1	1	1	1			1		
МОН	All Departments	Section	Monitor and assess chronic and communicable disease;	Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time.	1	1				1					1		1			1				1	1	1				1		
МОН	All Departments	Section	Manage health education and participation bureau program;	Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis country-wide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues																												

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
МОН	All Departments	Section	Manage maternal and child health program;	Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time.	1	1				1				1	1	1		1												
МОН	All Departments	Section	Manage mental health program;	Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time.	1	1				1				1	1			1				1								
МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize.	1	1				1				1	1			1				1								
МОН	All Departments	Section	Manage pharmaceutical services and supplies;	Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs.	1	1				1				1	1			1				1								

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
МОН	All Departments	Section	Conduct public health planning and policy development;	Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios	1	1				1					1		1	1		1				1								
МОН	All Departments	Section	Manage health sector reform project;	Geographically based analysis of public and private health facility and service demand and supply; Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels.	1	1				1					1	1	1	1		1				1		1	1	1			1	
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records	1	1				1				1	1	1	1	1		1	1			1								
MNS	Police Department	HNCIB	Investigate crimes	Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information;	1	1				1					1	1	1	1		1				1								
MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic;		1				1					1	1	1	1		1				1								
MNS	Police Department	Command er Operation s	Conduct police dispatch activities	Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans.	1	1				1			1	1	1	1	1	1	1	1				1								
MNS	Police Department	Command er Operation s	Conduct drug intervention activities	Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans.	1	1			1	1			1	1	1	1	1	1	1	1				1								
MNS	Police Department	Command er Operation s	Monitor and track released felons	Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities	1	1				1					1		1			1												
MNS	Police Department	Command er Operation s	Carry out preventative patrols	Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management.		1				1							1	1		1												
MNS	Police Department	Command er Operation s	Conduct gang suppression activities	Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use.	1	1				1					1		1	1		1												

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MNS	Police Department	Command er Operation s	Conduct national traffic management	Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports	1	1		1		1					1		1														
MNS	Police Department	Command er Operation s	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 		1		1		1					1		1	1					1								
MNS	Police Department	Command er Operation s	Support joint emergency response	Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response	1	1	1	1		1	1		1		1		1	1		1			1		1		1		1	ı	1
MNS	Police Department	Police Informati on Technolo gy Unit	Conduct facility and asset management	 Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement 		1		1		1			1				1	1													
MNS	Police Department	Police Informati on Technolo gy Unit	Develop, manage and operate crime information system	Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geosptial analysis of CIMS records	1	1	1	1		1			1		1		1	1	1	1			1		1		1		1	1	1
Regional	CCCCC	Sections	Conduct climate modeling;	Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time.		1	1		1										1	1			1		1		1		1	1	
Regional	CCCCC	Sections	Conduct CARIWIG Project;	Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	

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Regional	cccc	Sections	Manage SIDS DOCK Program;	Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time.	1	1	1	1	1	1			1	1	1	1	1	1	1 1	1	1	1	1	1	1		1	1	1	1	
Regional	CCCCC	Sections	Manage Pilot Program for Climate Resilience:	Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for	1	1	1	1	1	1	1		1	1	1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1 1
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	climate-smart, sustainable development. • Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; • Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; • Provide visualization tools to communicate issues and alternative plans to decision makers and the public; • Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; • Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; • Provide tools and methods for the effective inventory, management and utilization of standing forests; • Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends;	1	1	1	1	1	1	1		1	1	1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1	1
Regional	cccc	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the		1	1			1			1			1	1		1 1	1			1		1	1	1	1	1	1	

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				various groups currently maintaining meteorological and hydrological data and projections														T	Ī											
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Hazards and Risks	Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments;	1	1	1	1	1	1		1		1	1	1		1	1			1		1		1	1		1	
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data;	1	1	1	1	1	1		1		1	1	1		1 1	1		1	1	1	1		1	1		1	
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data;		1	1	1	1									1	1			1	1	1		1	1	1	1	1
Regional	cccc	Sections	Caribbean regional environmental change observing network - Land Cover and Land Use	Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks;		1	1	1	1						1				1			1								
Regional	cccc	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning		1	1	1	1	1			1	1	1	1		1	1			1		1	1		1		1	
Regional	cccc	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the	1	1	1	1	1	1				1	1	1			1			1		1	1			1	1	

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
				various groups currently involved in managing, monitoring or using water resource data;																												
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 	1	1	1	1	1	1					1	1	1	1			1			1		1						
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Socio-Economic Status	Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services;	1	1	1	1		1											1			1		1						
Regional	cccc	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities.	1	1	1	1	1	1			1		1	1	1	1	1	1	1		1	1	1	1		1			1	
Regional	CCCCC	Sections	Conduct EU GCCA project	Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	

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Regional	cccc	Sections	Coordinate 2011-2015 Caribbean regional resilience development implementation plan;	Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness.	1	1	1	1		1	1		1	1	1	1 :	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1		1
Regional	CCCCC	Sections	Coordinate 2012-2013 Caribbean risk	Provide GIS and NSDI as an enabling environment for climate	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1		1
Regional	cccc	Sections	management program; Coordinate 2012-2014 Australian Caribbean Coral Reef Collaboration;	smart government and development; • Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; • Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; • Monitor and assess reef health and trends over time; • Provide a geographic basis for reef protection and regulatory enforcement; • Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments.	1	1	1	1	1	1			1		1	1	I	1	1	1				1			1		1		
Regional	CCCCC	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and place-based manner.	1	1	1	1	1	1			1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1	1	1
Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1		1
Regional	CATHALA C	Sections	Provide education and training	Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1		1
Regional	CATHALA C	Sections	Provide specialized services	Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring.	1	1	1	1	1	1	1		1	1	1	1	1 1	1	1	1	1	1	1	1	1	1	1	1 1	1		1

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Regional	CATHALA C	Sections	Compile, manage and publish geographic information	Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats	1	1	1	1	1	1	1		1	1	1	1	1 1	. 1	1	1	1	1	1	1	1	1	1	1	1	1	1
Regional	CATHALA C	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 	1	1	1	1	1	1	1		1	1	1	1	1 1	. 1	1	1	1	1	1	1	1	1	1	1	1	1	1
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and information;	 Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources 	1	1	1	1	1	1				1	1	1	1 1	. 1	1	1			1		1	1	1	1	1	1	
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 	1	1	1	1	1	1			1	1	1	1	1	. 1	1	1		1	1	1	1	1	1	1	1	1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model.		1	1	1	1											1			1							1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 		1	1	1	1														1				1			1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 		1	1	1		1				1			1			1			1		1			1		1	
Regional	Caribbean Catastrophe Risk Insurance	Sections	Calculate risk and establish policy - Identify built environment resources	Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding;		1	1	1		1				1			1			1			1		1			1		1	

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes Geographic Reference	System	Cadastral	Activity Areas	Planning Areas	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geomorphology	Marine Abiotic	Seismology
	Facility		at risk	Identify electrical, water, telephone and other critical infrastructure within high risk areas.																											
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas.		1	1	1		1				1		1]			1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted.		1	1	1		1				1		1				1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance	Sections	Calculate risk and establish policy - Identify populations at risk			1	1	1	1	1										1					1		1				
Regional	Facility Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	Identify population concentrations within high risk areas Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged.		1	1	1	1	1				1						1			1		1		1				
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network.		1	1	1	1	1				1		1				1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures;		1	1	1	1	1				1		1	l			1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;		1	1	1	1	1				1]				1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency		1	1	1	1	1										1					1		1				
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.		1	1	1	1	1				1		1				1			1		1			1	1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.		1	1	1	1	1				1		1				1			1		1			1	1		

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.		1	1	1	1	1				1		1				1			1		1			1		1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	Calculate potential loss of life and injury based on exposure and vulnerability assessments.		1	1	1	1	1										1					1		1					
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.						1				1																		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery.						1																						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility.						1																						
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues.		1	1			1					1		1			1			1		1		1			1		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post-disaster payout.	Calculate hazard scenario and correlate to insurance provisions		1	1		1	1				1	1		1			1		1	1	1	1		1					
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data		1		1	1				1																			
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies	1	1	1	1	1	1	1		1	1	1	1 1	. 1	1	1	1	1	1	1	1	1	1	1	1	1	1		1

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity Surface Hydro	Cub Cunfood Hudao	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor socioeconomic trends; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends. 	1	1	1	1	1	1	1		1		1	1	1						1	1		1			1		
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory.	1	1	1	1		1			1		1		1			1		1	1	1 1		1	1	1	1		

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Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference.	1	1	1	1		1	1			1		1	1															
Utilities	Belize Electric Ltd.	Sections	Customer care	Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time	1					1				1			1															
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data	1	1	1	1		1				1	1	1 1	1	1	1	1		1	1	1	1		1	1	1	1		

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Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor socioeconomic trends and their impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 	1	1	1	1	1	1				1	1	1	1 :	1 1	1	1		1	1	1	1	1	1	1		1	
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory.	1	1	1	1		1				1											1	1	1	1		1	

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Stratoturos	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network operations and maintenance	 Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 	1	1	1	1		1				1	1			1							1	ı	1					
Utilities	Belize Water Supply Ltd.	Sections	Customer care	Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time	1	1		1		1				1																		
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans.	1	1	1	1		1			1	1		1		1			1				1	I	1			1		
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data	1	1	1	1		1			1	1	1	1	1	1	1	1	1		1	1	1 1	l	1 1	1	1	1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data		Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic Seismology
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software		1		1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Professi onal Associat ions	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association.		1		1	1	1				1		1	1	1	1	1	1	1	1	1	1	1	1	1			1	
Professi onal Associat ions	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time.		1		1		1				1		1	1	1														
Professi onal Associat ions	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members.	1	1	1	1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Professi onal Associat ions	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues.	1	1	1	1		1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.).	1	1	1	1	1	1				1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1
NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting	1	1	1	1	1	1														1	1	1		1	1	1	1		
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
NGO's	Friends for Conservation and Development	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	Map and record inventory of ecological resources of the National Park and surrounding bio-geographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park;	1	1	1	1	1	1			1	1	1	1	1		1		1		1	1	1	1	1	1	1	1	1		
NGO's	Friends for Conservation and Development	Sections	Conduct environmental education and awareness;	Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted.	1	1	1	1	1	1			1	1	1	1	1		1		1		1	1	1	1	1	1	1	1	1		
NGO's	Friends for Conservation and Development	Sections	Conduct community support programs;	Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories.	1	1	1	1		1			1	1	1	1	1		1		1		1	1	1	1	1	1	1	1	1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes Geographic Reference	System	Cadastral	Activity Areas	Planning Areas	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Ose & Land Cover Riodiversity	Surface Hydro	Sub-Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
NGO's	Friends for Conservation and Development	Sections	Conduct environmental monitoring and research;	Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making.	1	1	1	1	1	1					1	1 1		1		1			1 1	1	1						
NGO's	Friends for Conservation and Development	Sections	Development and promotion of policy recommendations;	Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public.	1	1	1	1	1	1			1	1	1	1 1		1		1		1	1 1	1	1	1	1	1	1		
NGO's	Friends for Conservation and Development	Sections	Conduct bi-national cooperation;	Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution.	1	1	1	1	1	1			1	1	1	1 1		1		1		1	1 1	1	1	1	1	1	1		
NGO's	Friends for Conservation and Development	Sections	Conduct cave management;	Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs			1	1							1			1		1		1	1 1	1	1			1	1		
Academi c & Research	University of Belize	Environm ental Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 	1	1	1	1	1	1			1	1	1	1 1		1	1	1			1 1	1		1	1	1	1		
Academi c & Research	University of Belize	Environm ental Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations.	1	1	1	1	1				1		1	1		1	1	1			1			1			1		

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ADMIN _L1	ADMIN_L2	ADMIN_ L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Geodesy	Places	Elevation	Imagery	Remote Sensing Data	Structures	Planimetric Features	Grids and Indexes	Geographic Reference System	Cadastral	Activity Areas	Planning Areas	Pol/Admin Boundaries	Service Areas	Special Mgmt Areas	Statistical Areas	Climate	Waste	Cultural & Historical	Land Use & Land Cover	Biodiversity Surface Hydro	Surface Hydro	Marine Hydro	Soils	Geology	Geomorphology	Marine Abiotic	Seismology
Academi c & Research	University of Belize	Environm ental Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	1	1	1	1	1	1					1		1		1		1			1	1		1			1		
Academi c & Research	University of Belize	Environm ental Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;	1	1	1	1	1	1					1		1		1		1			1	1		1			1		
Academi c & Research	University of Belize	Environm ental Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public.	1	1	1	1	1	1			1	1	1	1	1				1			1	1	1		1	1	1		
Academi c & Research	University of Belize	Environm ental Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations.	1	1	1	1	1	1			1	1	1	1	1	1	1					1	1		1			1		
Academi c & Research	University of Belize	Environm ental Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community;	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1 1	1	. 1	1	1	1		1

APPENDIX C2 – DATA REQUIREMENTS (UTILITIES-TRANSPORTATION-COMMUNITY FACILITIES)

							UTII	LITIE	S		TRA	ANSPO	RTAT	TION	CO	MMU	NITY F	ACILI'	ΓIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	 Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history 	1	1	1	1	1	1	1				1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Construction Permits	 Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history 	1	1	1	1	1	1	1	1			1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	Review planning context of other initiatives Idenfity potential existing hazards and those that may develop due to climate change	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	 Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies 	1	1	1	1	1	1	1	1		1	1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies	1	1	1	1	1	1	1	1			1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	 Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas 	1	1	1	1		1	1	1	1		1	1	1	1	1
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Land Use Planning Task Force	 Provide planning analysis in support of Municipal Development Project Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context Assess municipal development plans relative to projected climate change impacts and vulnerabilities Assess cumulative societal implications of combined municipal development plans 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	 Manage inventory of all National Estate lands Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases 	1	1	1	1		1	1	1							

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	 Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales 	1	1	1	1		1	1	1							
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	 Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information 															
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	 Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries 	1	1	1	1			1	1							
MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	 Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time 															
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	 Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files 							1								
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system															
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	 Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request 															
MNRA	Lands and Surveys Department	Land Information Center	Develop and Disseminate GIS Data	 Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Lands and Surveys Department	Land Information Center	Publish Environmental Statistics	 Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards 					1										
MNRA	Lands and Surveys Department	Land Information Center	Support Data Custodianship On Behalf of Other Organizations	 Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Lands and Surveys Department	Land Information Center	Support Capacity Building	 Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Lands and Surveys Department	Land Information Center	Provide Ad Hoc Technical Services	 Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Lands and Surveys Department	Land Information Center	Facilitate the Belize NSDI	 Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Prepare and implement IT Strategy.	 Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing MNRA use of information technology 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Conduct system and database administration.	 Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Provide general IT support.	Provide specialized IT support for GIS users	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Support application development and maintenance.	 Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Develop and maintain MNRA website.	Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNRA	Central Administrati on	IT Department	Maintain BNSDI geographic portal.	 Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	 Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas 							1	1							

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	 Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time 	1	1				1	1	1			1	1	1	1	1
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	 Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize 															
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Implement NIWRA Master Plan.	 Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Establish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects 	1	1	1	1	1		1				1	1	1	1	1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Process Water Abstraction Licenses.	 Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources 		1			1		1								
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Collect and Manage Hydrological Data.	 Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring 				1											
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Special Projects.	 Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors 					1						1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transmort	Tarci Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Groundwater Resource Assessment	 Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends 																
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Water Resource Outreach	 Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments 		1					1					1	1	1	1	1
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	 Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information 		1					1									
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee execution and implementation of the Solid Waste Management Project	 Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize 					1		1					1	1	1	1	1
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	 Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets 					1		1									
MNRA	Natural Resources	Belize Solid Waste Management Authority	Conduct public relations and outreach activities.	 Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur 					1							1	1	1	1	1
MNRA	Natural Resources	Belize Solid Waste Management Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management scenarios, waste to energy schemes, recycling efforts, and other potential future innovations. 					1		1					1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	 Inventory of the location and characteristics of farm properties, farmers, and production statistics; Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; Crop production forecasting; Land capability and suitability mapping; Local and export market analysis; Access to markets and export infrastructure analysis; Farm feasibility assessment and planning; Market location price monitoring and product sources; Production and forecasting tracking; Climate change agriculture risk and vulnerability assessment and mitigation planning; Disaster damage assessment and recovery planning; Provide trade associations with access to government geospatial resources to support their planning and operations; Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time. 	1	1					1								
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics															
MNRA	Agriculture Department	Aquaculture and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	1	1				1	1	1							1
MNRA	Agriculture Department	Cooperatives	Promote and support agricultural cooperatives	 Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time. 							1				1				1
MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	 Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize. 	1	1				1	1	1	1	1	1	1	1		1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	 Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files 	1	1				1	1	1	1	1	1				1
MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	 Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers 							1								1
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	 Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time. 															
MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	1	1				1	1	1	1	1	1				1
MNRA	Agriculture Department	Central Farm	Promote and Support Agro-Processing in Belize	 Record and track the location and characteristics of farmers that are involved in agro-processing; Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; Based on the above, assess needs and develop program responses that are suitable for each geographic area; Track school locations and their participation in school feeding program; Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time. 	1	1				1	1	1	1	1	1		1		1
MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	 Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time. 															

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	 Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time. 	1	1				1	1	1	1	1	1				1
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	 Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time. 	1	1				1	1	1	1	1	1				1
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	 Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time. 	1	1				1	1	1	1	1	1	1			1
MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	 Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business 	1	1				1	1	1	1	1	1	1			1
MoWT	Works Department	Section	Support transportation planning	 Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications. 	1	1			1	1	1	1	1	1	1	1	1	1	1
MoWT	Works Department	Section	Manage materials lab.	 Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers 															
MoWT	Works Department	Section	Oversee road design and construction.	 Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.); 	1	1	1	1		1	1	1		1					

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MoWT	Works Department	Section	Maintain roads infrastructure.	 Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time. 	1	1	1	1		1	1								
MoWT	Works Department	Section	Maintain other civil infrastructure	 Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance. 				1			1				1				
MoWT	Works Department	Section	Manage road safety	 Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS. 							1								
MoWT	Works Department	Section	Administer driver and vehicle licensing registration	 Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time. 							1								
MoWT	Transport Department	Section	Conduct transit planning.	 Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling. 															
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	 Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security 							1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MoWT	Transport Department	Section	Conduct traffic enforcement.	 Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures. 							1				1	1	1	1	1
MoWT	All Departments	All Sections	Participate in emergency planning and response.	 Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MLLGRD	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 											1				
MLLGRD	Village Councils	Section	Develop and administer municipal development plans and land use zoning	 Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MLLGRD	Village Councils	Section	Issue development permits	 Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time. 	1	1	1	1	1	1	1								
MLLGRD	Village Councils	Section	License and inspect petrol stations and garages	 Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time 	1	1	1	1		1	1								1
MLLGRD	Village Councils	Section	Maintain streets and street lighting	 Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities. 	1						1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MLLGRD	Village Councils	Section	Facilitate utility coordination	 Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching 	1	1	1	1	1	1	1								
MLLGRD	Village Councils	Section	Facilitate and support community services coordination	 Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services 					1						1	1	1	1	1
MLLGRD	Village Councils	Section	Maintain storm drainage system	 Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities. 	1	1	1	1		1	1								
MLLGRD	Village Councils	Section	Manage refuse	 Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material. 					1		1				1	1	1	1	1
MLLGRD	Village Councils	Section	Issue littering tickets	 Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education. 					1		1								
MLLGRD	Village Councils	Section	Manage parks and recreation areas	 Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning 	1	1	1	1			1	1	1		1	1	1	1	1
MLLGRD	Village Councils	Section	Manage public slaughterhouse facilities	 Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities 		1	1	1	1		1				1				1
MLLGRD	Village Councils	Section	License, rent and inspect market facilities	 Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets. 		1	1	1			1				1				1
MLLGRD	Village Councils	Section	Manage local cemetery	 Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas 							1								
MLLGRD	Village Councils	Section	Manage local property taxation	 Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time 	1	1	1	1			1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MLLGRD	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	 Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications; 							1				1				1
MLLGRD	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 							1	1	1						
MLLGRD	Village Councils	Section	Manage public water closets and latrines	 Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones 		1	1				1								
MLLGRD	Village Councils	Section	License billboards and banners	 Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues. 							1				1				
MLLGRD	Belize City Council	Section	Manage local public health	 Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.) 					1		1								
MLLGRD	Belize City Council	Section	Manage local tourism	 Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities 												1			
MLLGRD	Belize City Council	Section	Manage city traffic and licensing	 Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.); 							1		1						

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MLLGRD	Belize City Council	Section	Manage public works	 Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); Provide foundation information for street furniture and pavement management; Provide foundation information of storm drainage system management; Provide foundation information for park management; Provide foundation information for municipal building maintenance and space planning; Provide foundation information for municipal vehicle fleet management; Provide asset register as the basis for municipal asset financial management; Provide geographically-based asset register to support preventive and as-needed maintenance planning and response; Provide linkage to maintenance management system to track maintenance activities over time; Track maintenance performance indicators; 	1	1	1	1		1	1	1	1		1	1	1	1	1
MLLGRD	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MLLGRD	Belize City Council	Section	Manage environmental sanitation	 Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations 				1	1		1								
MLLGRD	Belize City Council	Section	Manage Municipal facility security	 Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface 							1				1				
MLLGRD	Belize City Council	Section	Conduct emergency planning and response	 Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MLLGRD	Belize City Council	Section	Conduct property valuation	 Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies 	1	1	1	1			1								
MLLGRD	Belize City Council	Section	Collect and monitor city revenues	 Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections 							1		1		1	1			1
MLLGRD	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council information infrastructure	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MLLGRD	NEMO	Section	Hazard and vulnerability assessment	 Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MLLGRD	NEMO	Section	Disaster contingency planning	 Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MLLGRD	NEMO	Section	Emergency response	 Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MLLGRD	NEMO	Section	Disaster recovery	 Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.) 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MLLGRD	NEMO	Section	Education, Communication and Warning	 Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
	NEMO	Section	Medical and Relief Measures	 Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Housing and Shelter	 Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Search, Rescue and Initial Clearance	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Collection, Control and Distribution of Food and Material	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Identify precise locations of food and material storage facilities and enterprises; Track and manage field staff activities during response and recovery operations; Record activities and assess effectiveness for post-disaster refinement of contingency plans 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Assessment and Evaluation of Damage	 Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses; Manage and track damage repair and mitigation activities 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Foreign Assistance disaster management	 Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Transport disaster management	 Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	NEMO	Section	Environment and Utilities disaster management	 Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MLLGRD	National Meteorologi cal Office	Section	Conduct weather monitoring	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs 							1								
MLLGRD	National Meteorologi cal Office	Section	Analyze and report weather information and forecasts	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring 							1				1	1			1
MLLGRD	National Meteorologi cal Office	Section	Analyze weather and prepare agrometeorology reports for the agricultural sector.	 Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context. 							1								
MLLGRD	National Meteorologi cal Office	Section	Participate in emergency preparedness and response	 Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios 							1								
MLLGRD	National Meteorologi cal Office	Section	Provide data on as- needed basis	 Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly 							1								
MHUD	Central Building Authority	Section	Intake, review and approve building permits	 Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting 	1	1	1	1		1	1								
MHUD	Central Building Authority	Section	Conduct building/site inspections;	 Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time 	1	1	1	1			1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MHUD	Central Building Authority	Section	Carry out soil testing;	 Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts 							1								
MHUD	Central Building Authority	Section	Carry out concrete testing.	 Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time 							1								
MESTPU	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	 Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information 							1								
MESTPU	Geology and Petroleum Department	Section	Administer petroleum operating concessions	 Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets 							1								
MESTPU	Geology and Petroleum Department	Section	Review environmental impact assessments	 Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference. 	1	1	1	1		1	1				1	1	1	1	1
MESTPU	Energy Unit	Section	Develop and support national renewable energy development	 Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country 	1						1								
MESTPU	Energy Unit	Section	Promote and support energy efficiency initiatives	 Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and outreach programs over time. 	1						1								
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	 Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner 	1						1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	 Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area 	1						1								
	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	 Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities 	1						1				1	1	1	1	1
	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts	1														
	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands	1														
	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests	1														
	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat	1														
	Energy Unit	Section	Promote and support clean energy production initiatives - Project Development Process	Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects performance over time	1						1								
MESTPU	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	 Promote the use of geographic information science, systems and thinking in support of better planning and decision making in Belize Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MESTPU	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	 Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner 	1						1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MESTPU	Public Utilities Commission	Section	Review and approve Public Utility rates.	 Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes 	1						1								
MESTPU	Public Utilities Commission	Section	Monitor Public Utility Performance	 Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities 	1						1								
MFFSD	Department of Forestry	Section	Protected Areas Management Program;	 Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students 							1				1	1			1
MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	 Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format. 							1				1	1			
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	 Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory 															
MFFSD	Department of Forestry	Section	Law Enforcement Program;	 Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders. 															
MFFSD	Department of Forestry	Section	Wildlife Program;	 Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings. 															
MFFSD	Department of Forestry	Section	National and International Partnership Program;	 Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above. 															

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFFSD	Department of Forestry	Section	Manage National Herbarium.	 Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of plant can be found 															
MFFSD	Department of Environment	Section	Develop and manage environmental policies	 Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFFSD	Department of Environment	Section	Administer environmental impact assessments	 Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide information and tools to support EIA training; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environment and issues impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFFSD	Department of Environment	Section	Conduct environmental monitoring and enforcement	 Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education 	1						1				1	1			1
MFFSD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 															
MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain georeferenced bibliographic information; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public 					1		1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	 Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets 							1	1			1	1	1		1
MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provide a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of fistoric storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of topographic and bathymetric information; Provide a mapped database of sea bottom types; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a ceess to fish catch and fisheries trend information; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 	1				1	1	1	1			1	1	1	1	1
MFFSD	Department of Fisheries	Section	Manage marine protected areas	 Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities 															
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	 Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment 															

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	 Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government. 			1	1	1		1	1				1			1
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	 Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government. 								1				1			1
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics												1			1
MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	 Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multistakeholder processes to calibrate interventions over time. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

							UTII	LITIE	ES		TR	ANSPO	ORTA'	ΓΙΟΝ	CO	MMUN	NITY F	ACILI	ΓIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	 Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area; 	1	1	1	1	1	1	1	1	1		1	1	1	1	1
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	 Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture 							1								
MTCCA	Ministry	Section	Oversee portfolio governance	 Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	 Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MTCCA	Ministry	Section	Oversee tourism planning and development	 Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

							UTII	LITIE	S		TRA	ANSPO	RTAT	ION	CO	MMU	NITY F	ACILIT	ΓIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MTCCA	Belize Tourism Board	Section	Manage tourism data	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment. 							1				1	1			1
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other 												1			1
MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists. 	1						1	1	1	1		1			1
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MTCCA	National Institute for Culture and History	Institute of Archeology	Maintain inventory of archeological sites;	Maintain inventory of archeological sites							1								
MTCCA	National Institute for Culture and History	Institute of Archeology	Conduct archeological research and education;	Conduct archeological research and education;	1	1	1	1			1				1	1	1		1
MTCCA	National Institute for Culture and History	Institute of Archeology	Manage archeological parks and reserves.	Manage archeological parks and reserves.	1	1	1	1			1				1	1	1		1
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours	1	1	1	1			1				1	1	1		1
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;															
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives							1				1	1	1	1	1
MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for transport master plan and associated priority projects. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Bridge construction and refurbishment	 Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects. 							1								
MFED	All Departments	Section	Road and highway construction and refurbishment	 Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities; 	1	1	1	1		1	1								
MFED	All Departments	Section	Improve road safety	 Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. 							1								
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	 Assess drainage facility capacity and vulnerability to major storm events; Provide basemap and geophysical data to support drainage facility engineering design; Provide geographically based project tracking system; Produce drainabe asset inventory to support maintenance and financial asset management activities; 				1											
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	 Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies; 	1	1	1	1		1	1								
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	 Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects 							1								
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	 Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Construction and refurbishment of community facility buildings	 Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting. 	1	1	1	1		1	1				1	1	1	1	1
MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	 Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects. 							1			1					
MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects. 	1	1	1	1		1	1								
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	 Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities; 	1	1	1	1		1	1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	 Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities 	1	1	1	1		1	1								
MFED	All Departments	Section	Construction and upgrading of water supply network	 Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities; 	1	1	1	1		1	1								
MFED	All Departments	Section	Improve rural water and sanitation governance	 Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards. 	1	1	1	1	1	1	1								
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	 Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 			1				1								
MFED	All Departments	Section	Institutional capacity building for water system governance	Incorporate GIS management and technical capacity building in to the water system governance program	1	1	1	1		1	1								
MFED	All Departments	Section	Development of solar energy generation demonstration project	• Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project;	1														
MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	 Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 		1	1	1			1								
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	 Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects. 	1						1								
MFED	All Departments	Section	Plan, design and implement agriculture services program	 Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact 							1								
MFED	All Departments	Section	Promote and support the development of integrated farming systems	 Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context. 							1								
MFED	All Departments	Section	Upgrade research and extension facilities	• Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Conduct farmer training and capacity	Support farmer training and extension service capacity building							1				1				1

							UTII	LITIE	S		TR	ANSPO	RTAT	ION	CO	MMU	NITY F	ACILIT	TIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
			building activities																
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	 Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy. 				1											
MFED	All Departments	Section	Conduct community project for improvement of agriculture production for poor families	 Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time. 							1				1				1
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time. 							1				1				1
MFED	All Departments	Section	Support the expansion of rice seed production	 Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes. 							1				1				1
MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 							1				1				1
MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 							1				1				1
MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	 Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/ 							1				1				1
MFED	All Departments	Section	Conduct national cattle testing and certification program	 Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export. 							1				1				1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	 Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Support targeted lending	 Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes. 							1								
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	 Record location and characteristics of Coalition members; Monitor and assess program member performance 	1	1					1				1				1
MFED	All Departments	Section	Support financial services for poor farmers and rural communities	 Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area; Track and assess utilization of financial services over time. 	1	1					1				1				1
MFED	All Departments	Section	Administer small scale enterprise grants	 Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises 	1	1	1	1		1	1	1	1		1				1
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	 Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities 							1								
MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	 Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Improvement of land management capacity	 Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities; 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 	1	1	1	1	1	1	1								
MFED	All Departments	Section	Strengthen protected areas management	 Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time 							1				1	1	1	1	1

							UTI	LITII	ES		TRA	ANSPO	RTAT	ION	CO	MMUN	NITY F	ACILI	TIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	 Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues. 															
MFED	All Departments	Section	Manage marine fisheries	 Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time. 															
MFED	All Departments	Section	Manage pollutant release and transfer registration	 Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time. 			1	1			1	1			1	1	1	1	1
MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	 Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system. 	1	1	1	1		1	1		1		1		1		
MFED	All Departments	Section	Control and prevention of HIV/AIDS	 Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread; 							1				1				
MFED	All Departments	Section	Improvement of children's health and nutrition	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes. 	1	1	1	1		1	1	1	1		1		1		

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Improve health conditions among the poorest populations	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	1	1	1	1	1	1	1	1	1		1		1		
MFED	All Departments	Section	Develop plans for the achievement of target MDG's	 Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	1	1	1	1		1	1	1	1		1		1		
MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	 Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes. 	1	1	1	1		1	1	1	1		1		1		1
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination							1	1	1	1					
MFED	All Departments	Section	Computerization of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 							1				1				
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	All Departments	Section	Enhance rural development program activities	 Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises. 	1	1	1	1		1	1	1	1		1	1	1	1	1
MFED	All Departments	Section	Develop and manage disaster risk management plan	 Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

							UTII	LITIES			TRA	ANSPO	RTAT	ION	CO	MMU	NITY F.	ACILI	TIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 							1				1	1	1	1	1
MFED	All Departments	Section	Support fire safety	 Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants. 		1					1				1				
MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures, guidelines and standards.	• Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Design and development of e-solutions and government-wide applications	 CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Provide data center and internet services	• Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Provide information security services	 Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Develop and implement E-Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	 Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	 Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	 Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	 Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators 	1	1	1	1		1	1	1	1		1	1			1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	Statistical Institute Belize	Section	Conduct census taking	 Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow 	1	1	1	1		1	1	1	1		1	1			1
MFED	Statistical Institute Belize	Section	Census publishing and distribution	 Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems. 	1	1	1	1		1	1	1	1		1	1			1
MFED	Statistical Institute Belize	Section	Conduct between- census population estimation	Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change							1								
MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	 Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level; 															
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	 Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Develop special products	 Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public; 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Conduct original surveys	Provide tools for location-based field collection							1	1	1	1	1	1	1	1	1
MFED	Statistical Institute Belize	Section	Compile economic statistics	Utilize location-specific business and revenue information to prepare neighborhood and community level economic statistics							1				1	1			1
MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	 Provide tools for location-based field data collection; Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; Test effectiveness of various geostatistical visualizations for communicating issues and concepts Test tools and methods for real-time analysis of information from sensor networks Test new geostatistical tools application to existing raw data 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Identify potential projects	 Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time. 							1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	 Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members; 		1	1	1	1	1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Carry out project appraisals	 Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Facilitate project approval process	 Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Manage project bidding process	 Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference; 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MFED	Social Investment Fund	Section	Supervise project implementation	 Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF 							1								
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects	1	1	1	1		1	1	1				1	1	1	1
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations															
МОН	All Departments	Section	Provide medical laboratory services;	 Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers. 							1				1				
МОН	All Departments	Section	Manage medical stores;	 Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks. 							1				1				1
МОН	All Departments	Section	Provide public dental services;	 Provide map of all facilities where public dental services are offered; Track and monitor mobile clinic locations and history; Track and monitor urban and rural school dental visits and history; Utilize location-aware social media for connecting with dental patient community; Assess the location effectiveness of existing dental health facilities and services and site new programs; Analyze dental service delivery facilities relative to population census information; Produce statistical reports and maps concerning dental health at the community level; Track and analyze dental service delivery by locations over time. 							1				1				1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
МОН	All Departments	Section	Support environmental health;	 Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues and trends over time; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time 	1	1	1	1		1	1				1		1		
мон	All Departments	Section	Monitor and assess chronic and communicable disease;	 Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time. 		1	1	1			1	1	1	1	1	1	1	1	1
мон	All Departments	Section	Manage health education and participation bureau program;	 Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis country-wide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues 															
МОН	All Departments	Section	Manage maternal and child health program;	 Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time. 							1						1		
МОН	All Departments	Section	Manage mental health program;	 Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time. 							1						1		

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	 Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize. 							1						1		
МОН	All Departments	Section	Manage pharmaceutical services and supplies;	 Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs. 							1						1		1
МОН	All Departments	Section	Conduct public health planning and policy development;	 Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios 	1	1	1	1		1	1				1		1		
МОН	All Departments	Section	Manage health sector reform project;	 Geographically based analysis of public and private health facility and service demand and supply; Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels. 	1	1	1	1		1	1				1		1	1	1
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records							1				1		1		
MNS	Police Department	HNCIB	Investigate crimes	 Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information; 							1				1				
MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	 Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic; 							1	1	1	1	1	1	1	1	1
MNS	Police Department	Commander Operations	Conduct police dispatch activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 							1	1	1	1	1	1	1	1	1
MNS	Police Department	Commander Operations	Conduct drug intervention activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 							1	1	1	1	1	1	1	1	1
MNS	Police Department	Commander Operations	Monitor and track released felons	 Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities 							1				1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
MNS	Police Department	Commander Operations	Carry out preventative patrols	 Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management. 							1				1	1	1	1	1
MNS	Police Department	Commander Operations	Conduct gang suppression activities	 Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use. 							1				1	1	1	1	1
MNS	Police Department	Commander Operations	Conduct national traffic management	 Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports 							1				1				
MNS	Police Department	Commander Operations	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 							1								
MNS	Police Department	Commander Operations	Support joint emergency response	 Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
MNS	Police Department	Police Information Technology Unit	Conduct facility and asset management	 Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement 							1				1				
MNS	Police Department	Police Information Technology Unit	Develop, manage and operate crime information system	 Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geospatial analysis of CIMS records 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	CCCCC	Sections	Conduct climate modeling;	 Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time. 															
Regional	CCCCC	Sections	Conduct CARIWIG Project;	 Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	cccc	Sections	Manage SIDS DOCK Program;	 Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time. 	1					1	1				1	1	1	1	1
Regional	CCCCC	Sections	Manage Pilot Program for Climate Resilience:	 Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for climate-smart, sustainable development. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	 Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; Provide visualization tools to communicate issues and alternative plans to decision makers and the public; Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; Provide tools and methods for the effective inventory, management and utilization of standing forests; Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends; 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	 Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the various groups currently maintaining meteorological and hydrological data and projections 											1	1			1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	cccc	Sections	Caribbean regional environmental change observing network - Hazards and Risks	 Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments; 	1	1	1	1		1	1				1	1	1	1	1
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	 Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data; 															
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	 Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data; 															
Regional	cccc	Sections	Caribbean regional environmental change observing network - Land Cover and Land Use	 Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks; 							1								
Regional	cccc	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	 Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning 							1								
Regional	cccc	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	 Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using water resource data; 		1					1								
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 	1						1								
Regional	cccc	Sections	Caribbean regional environmental change observing network - Socio-Economic Status	 Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services; 							1								1

							UTII	LITIE	S		TRA	ANSPO	RTAT	ION	CC	MMUN	NITY F	ACILIT	TIES
ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	cccc	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	 Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	cccc	Sections	Conduct EU GCCA project	 Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing 	1	1	1	1		1	1				1	1	1	1	1
Regional	CCCCC	Sections	Coordinate 2011-2015 Caribbean regional resilience development implementation plan;	 Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CCCCC	Sections	Coordinate 2012-2013 Caribbean risk management program;	Provide GIS and NSDI as an enabling environment for climate smart government and development;	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CCCCC	Sections	Coordinate 2012-2014 Australian Caribbean Coral Reef Collaboration;	 Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; Monitor and assess reef health and trends over time; Provide a geographic basis for reef protection and regulatory enforcement; Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments. 															
Regional	CCCCC	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	 Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and place-based manner. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	 Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CATHALA C	Sections	Provide education and training	 Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	CATHALA C	Sections	Provide specialized services	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CATHALA C	Sections	Compile, manage and publish geographic information	 Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	CATHALA C	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and information;	 Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources 	1	1	1	1		1	1				1	1			1
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 	1	1	1	1		1	1				1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	 Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 				1			1				1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify built environment resources at risk	 Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding; Identify electrical, water, telephone and other critical infrastructure within high risk areas. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	 Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	 Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted. 	1	1	1	1		1	1	1	1	1		1			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify populations at risk	• Identify population concentrations within high risk areas															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	 Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	 Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	• Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures;	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	• Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;	1	1	1	1		1	1	1	1	1		1			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	 Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.	1	1	1	1		1	1	1	1	1		1			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	 Calculate potential loss of life and injury based on exposure and vulnerability assessments. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	 Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery. 											1		1	1	
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	 Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility. 												1			
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	 Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues. 															
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post-disaster payout.	Calculate hazard scenario and correlate to insurance provisions	1	1	1	1		1	1	1		1	1	1	1	1	1
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	 Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data 							1								
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends. 	1						1				1	1	1	1	1
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory. 	1	1	1	1		1	1				1	1	1	1	1
Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	 Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 	1														
Utilities	Belize Electric Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators 	1										1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
				over time															
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 	1	1	1	1		1	1				1	1	1	1	1
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor long term climate trends and assess impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 	1	1	1	1		1	1				1	1	1	1	1
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory.	1	1	1	1		1	1								

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network operations and maintenance	 Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 		1	1								1	1	1	1	1
Utilities	Belize Water Supply Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 		1	1								1	1	1	1	1
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	 Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 		1	1				1				1	1	1	1	1
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	 Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data 	1	1	1	1		1	1				1	1	1	1	1
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	 Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	 Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	 Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Profession al Associatio ns	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Profession al Associatio ns	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	 Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time. 							1								
Profession al Associatio ns	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Profession al Associatio ns	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	 Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues. 	1	1	1	1		1	1	1	1	1	1	1	1	1	1
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	 Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.). 							1					1			
NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	 Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting 															
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	 Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
NGO's	Friends for Conservatio n and Developmen t	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	 Map and record inventory of ecological resources of the National Park and surrounding bio-geographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park; 	1	1				1	1		1		1	1	1	1	1
NGO's	Friends for Conservatio n and Developmen	Sections	Conduct environmental education and awareness;	 Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted. 	1	1				1	1		1		1	1	1	1	1
NGO's	Friends for Conservatio n and Developmen t	Sections	Conduct community support programs;	Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories.	1	1				1	1		1		1	1	1	1	1
NGO's	Friends for Conservatio n and Developmen t	Sections	Conduct environmental monitoring and research;	 Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making. 															
NGO's	Friends for Conservatio n and Developmen t	Sections	Development and promotion of policy recommendations;	 Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public. 	1	1				1	1		1		1	1	1	1	1
NGO's	Friends for Conservatio n and Developmen t	Sections	Conduct bi-national cooperation;	 Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution. 	1	1				1	1		1		1	1	1	1	1
NGO's	Friends for Conservatio n and Developmen t	Sections	Conduct cave management;	 Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs 															
Academic & Research	University of Belize	Environmental Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 															

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
Academic & Research	University of Belize	Environmental Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	 Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 															
Academic & Research	University of Belize	Environmental Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 															
Academic & Research	University of Belize	Environmental Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;															
Academic & Research	University of Belize	Environmental Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	 Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public. 		1									1	1	1	1	1
Academic & Research	University of Belize	Environmental Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	 Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations. 															
Academic & Research	University of Belize	Environmental Research Institute	Conduct National Training Program for Protected Areas Management	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	1	1	1	1		1	1	1	1	1	1	1	1	1	1

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ADMIN_ L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	Electical	Potable Water	Sanitary Sewer	Storm Water	Waste Management	Telecommunications	Road Network	Water Transport	Transit	Air Transport	Government	Tourism and Recreation	Health and Education	Cultural and Religious	Commerce and Industry
			(NTPPAM)																

APPENDIX D – APPLICATION AREA GROUPINGS

ADMIN L1	ADMIN_L2	ADMIN_L3	MAJOR FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Land Subdivision Applications	Log land subdivision applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed subdivision (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current hazards and those that may develop due to climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending land subdivision applications Illustrate historical land subdivision history	2	2	2			2	2		,	2	2			2		
MNRA	Lands and Surveys Department	Physical Planning Unit	Process Seabed and Public Coastal Areas Use/Construction Permits	Log seabed and public coastal area use/construction permit applications geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of proposed seabed and public coastal area use/construction applications (current and planned) Conduct semi-automated review for planning and regulatory compliance Determine potential current and future hazards from climate change Provide geographic linkage to land subdivision case files Produce map showing status of all pending seabed and public coastal area use/construction permit applications Illustrate historical seabed and public coastal area use/construction permit history	2	2	2			2				2	2			2		
MNRA	Lands and Surveys Department	Physical Planning Unit	Provide planning advisory support to other initiatives	 Review planning context of other initiatives Identify potential existing hazards and those that may develop due to climate change 	2					2	2	2								
MNRA	Lands and Surveys Department	Physical Planning Unit	Review Environmental Impact Assessments	Log environmental impact studies geographically Review land tenure, administrative jurisdiction, environmental, and infrastructure context of environmental impact studies (relative to current and planned conditions) Conduct semi-automated review for environmental compliance Determine potential current and future hazards from climate change Provide geographic linkage to environmental impact study case files Produce map showing status of all pending environmental impact studies Provide historical record of all historical environmental impact studies	2	2				2	2	2			2			2		
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Environmental Appraisal Committee (NEAC)	Provide environmental assessment tracking database Support NEAC review of individual and cumulative environmental impact assessments Provide historical record of all historical environmental impact studies	2					2		2								
MNRA	Lands and Surveys Department	Physical Planning Unit	Support National Protected Areas Committee (NPAC)	 Monitor development and encroaching land use in and around national protected areas Notify proposed development or land use initiatives of potential issues relative to proximal national protected areas 	2					2		2								

					General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	sset Management	lavigation, Routing ind Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
ADMIN_L1 MNRA	Lands and Surveys Department	Physical Planning Unit	MAJOR_FUNCTION Support National Land Use Planning Task Force	• Provide planning analysis in support of Municipal Development Project • Assess land use plans relative to land tenure, administrative jurisdiction, environmental, infrastructure and social context • Assess municipal development plans relative to projected climate change impacts and vulnerabilities • Assess cumulative societal implications of combined municipal development plans	2	2	<u> </u>	A G	D D	2 2	2 V c	M M	As	Navi	S M	<u>Ú</u>	<u> </u>	Ϊ́	ŏ	ō
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Leases	 Manage inventory of all National Estate lands Assess land value for leasing purposes Log and track all National Estate land lease applications and leases Assess land tenure, environmental, infrastructure context of land lease applications Provide historical visualization of National Estate land leases 	2	2				2										
MNRA	Lands and Surveys Department	National Estate Section	Administer National Estate Land Purchase	 Manage inventory of all National Estate lands Log and track all National Estate land sales Assess land tenure, environmental, infrastructure context of land sale applications Provide historical visualization of National Estate land sales 	2	2				2					2					
MNRA	Lands and Surveys Department	Land Registry Section	Process and Record Property Titles and Related Transactions	Manage comprehensive inventory of plot boundaries and land titles for both Declared and Undeclared lands Link all property transaction case files to geographic location Provide online access to land ownership information	2	2				2					2					
MNRA	Lands and Surveys Department	Valuation Section	Conduct Property Valuation	 Provide access to property and property improvement information Provide access to environmental, social and infrastructure conditions that may affect property use and value Provide access to comparable property sales information Provide access to information concerning private lands to be acquired for public purposes Provide access to administrative jurisdiction boundaries 	2													2		
MNRA	Lands and Surveys Department	Survey and Mapping Section	Authenticate Plans for Both National and Private Lands	 Log, store and manage land survey project data Maintain geographically-linked database of all licensed land surveyors Provide tools for capturing and managing field survey information Provide means to visualize historical land survey activities over time 	2										2			2		
MNRA	Lands and Surveys Department	Survey and Mapping Section	Support Land Registry Cadastral Updating for Grants and Leases	Manage comprehensive land registry database for all grants and leases Provide tools for capture of land survey data Provide access to imagery and basemap information to support land survey efforts Geographically link land survey activity case files		2									2			2		
MNRA	Lands and Surveys Department	Survey and Mapping Section	Manage National Geodetic Control Network	Manage national geodetic network data Provide national survey services through CORS/RTK system		2												2		
MNRA	Lands and Surveys Department	Survey and Mapping Section	Provide Survey and Mapping Products and Services to Other Agencies and the Public	 Provide GIS and survey services to other agencies and the public Manage survey project data Produce and disseminate survey related information upon request 	2	2												2		

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNRA	Lands and Surveys Department	Land Information Center	Develop and Disseminate GIS Data	 Provide tools for capture, management, analysis, display and dissemination of geospatial data Scan and geo-register paper maps Conduct field data collection (gps coordinates, photos, tabular data, etc.) Acquire and manage satellite imagery and aerial photography Apply analytical processes to created derived data from original sources Log and manage geospatial data and service requests Publish geospatial data online for viewing or downloading Manage secure access to and use of geospatial data Develop geostatistical analysis map and report outputs 		2												2		
MNRA	Lands and Surveys Department	Land Information Center	Publish Environmental Statistics	Provide access to broad range of environmental and other relevant data Provide tools for geostatistical analysis, map visualization and statistical report and graphic generation Provide online access to environmental statistics and dashboards	2	2										2				
MNRA	Lands and Surveys Department	Land Information Center	Support Data Custodianship On Behalf of Other Organizations	 Provide GIS services in support of other agencies Log and track geospatial service activities Manage geospatial data repository information for others Manage online map data and application services delivery Manage metadata catalog 		2	2													
MNRA	Lands and Surveys Department	Land Information Center	Support Capacity Building	 Provide access to broad range of data for peers from other agencies, student and intern use Provide access to geospatial infrastructure, tools and professionals to support training efforts Provide technical support to peers from other agencies 	2															2
MNRA	Lands and Surveys Department	Land Information Center	Provide Ad Hoc Technical Services	 Provide infrastructure for the provision of geospatial services Establish and maintain technical staff skillsets in step with new developments Log and track service requests Provide access to broad range of data from across government to support service requests Provide software tools to support broad range of analytical and visualization capabilities Provide products and services online Develop and disseminate standardized products Develop derived data through the manipulation and analysis of original source information Raise awareness through the creation of specialized products for high visibility subjects Develop standard products and services for public use 	2	2														

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNRA	Lands and Surveys Department	Land Information Center	Facilitate the Belize NSDI	Establish and manage common GeoPortal node Develop and maintain common geospatial metadata catalog Maintain data repository Facilitate working groups for development and management of common standards Facilitate the development of common data sharing agreements Facilitate coordination of commonly needed geospatial data sets with custodians and user stakeholders Develop and manage BNSDI policies Coordinate project formulation support activities with Ministry of Finance and other project stakeholders	2	2														
MNRA	Central Administration	IT Department	Prepare and implement IT Strategy.	Include geospatial component in any Enterprise-wide system requirements analysis Integrate geospatial capabilities as a core technology within the MNRA's information architecture strategy Integrate geospatial data modeling within the MNRA enterprise data model Include access to BNSDI data as opportunity for optimizing MNRA use of information technology																
MNRA	Central Administration	IT Department	Conduct system and database administration.	Administer geospatial system and database Maintain specialized geospatial system equipment Manage impacts of geospatial data on the organization's networks																
MNRA	Central Administration	IT Department	Provide general IT support.	Provide specialized IT support for GIS users																
MNRA	Central Administration	IT Department	Support application development and maintenance.	Consider geospatial capability as an integral component of application software development where this can help to meet user requirements Incorporate GIS licensing and maintenance within enterprise configuration management program																
MNRA	Central Administration	IT Department	Develop and maintain MNRA website.	Maintain links to BNSDI website and GeoPortal Utilize MNRA website to raise geospatial awareness	2	2	2													
MNRA	Central Administration	IT Department	Maintain BNSDI geographic portal.	 Establish, build and maintain MNRA GeoPortal as a model system Link and coordinate MNRA GeoPortal with other BNSDI nodes Support other agencies to publish their data online through MNRA if they are not prepared to administer own GeoPortal now. 	2	2	2													
MNRA	Natural Resources	Mining Section	Conduct Mineral Resource Assessments	 Log, record and track the locations of all mineral resource assessments Provide geographic interface for accessing mineral resource assessment data and documents Access geologic information from other stakeholders Prepare national mineral resource assessment atlas 						2										

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Vavigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Seocoding	Online Training
MNRA	Natural Resources	Mining Section	Issue Mining and Mineral Extraction Permits	Log and track all mining and mineral extraction permit applications Prepare national atlas of all established mining and mineral extraction permits Provide map interface for accessing digital mining and mineral extraction permit case files Provide tools for capture of site visit information Provide access to environmental, social, jurisdictional and other information that is needed to assess the viability of mining and mineral extraction permit applications Provide a historical visualization of mining and mineral extraction activities in Belize over time	00	2	- 5	O		d			4	2 8	2		<u> </u>	L.		
MNRA	Natural Resources	Mining Section	Monitor Mining and Mineral Extraction Operations	Monitor mining and mineral extraction permit reporting over time Prepare mineral extraction map and statistical reports and dashboards for use by policy and decision makers Provide historical record of mining and mineral extraction activities in Belize		2										2		2		
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Implement NIWRA Master Plan.	 Conduct and record a comprehensive inventory and assessment of water resources and associated infrastructure in Belize Maintain water rights, allocations and relevant jurisdictions database Establish inventory of all permitted emissions and sources of water pollution Establish inventory of all water abstraction and related use permits Establish and manage suitable hydrologic monitoring network Estabish direct data sharing linkages with National Meterologic Office Conduct and record a comprehensive inventory and assessment of current and projected demand for water resources Assess potential affects of climate change on water resources Prepare spatial masterplan for the development and sustainable management of water resources Identify and formulate water resource development projects 	2	2									2	2				
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Process Water Abstraction Licenses.	Define watershed boundaries at multiple levels Provide access to Person and Business registries for authentication purposes Log and manage water abstraction license applications Monitor and analyze water abstraction licenses and operational reports by groundwater basin, watershed and stream Provide access to relevant environmental, social, health, hazard and infrastructure information contextual to a water abstraction license application Provide map interface linkage for accessing water abstraction license case files Monitor and assess climate and precipitation trends and impacts on water resources	2	2				2					2					
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Collect and Manage Hydrological Data.	Conduct a geographic assessment of current hydrologic monitoring network and identify requirements and gaps for additional stations, and upgrading of key stations to automated reading and data transmission Provide access to topographic, hydrographic, soils, land use/land cover and other information needed to understand behaviours of the hydrological systems Collect, manage and model hydrologic data Establish real-time linkage to National Meteorological Office weather data stations for active monitoring	2	2														

ADMIN L1	ADMIN 12	ADMIN 12	MA IOD EVINCTION	CIECCIDATIVAL A CIEVATIVA	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Seocoding	Online Training
ADMIN_L1 MNRA	ADMIN_L2 Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	MAJOR_FUNCTION Conduct Special Projects.	GEOSPATIAL ACTIVITY Utilize GIS maps and visualizations to communicate land degradation issues to the public in clear and compelling ways Conduct analyses in support of policy formulation and refinement processes Utilize geospatial data and methods for original and applied research Utilize geospatial data and analysis to support water resource and related development planning, design, operations, monitoring and evaluation Provide a map interface for the access of water resource information, plans and license information by geographic area or location Utilize GIS to conduct special services for government and other sectors	2	2	<u>σ</u>	04) Δ ≥	⊒ ∢ ∫	:> ४	Δ≥	▼	<u>Z 10</u>	Ø≥	<u> </u>	<u> </u>	<u>.</u>	8	0
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Groundwater Resource Assessment	 Develop geohydrologic model for Belize Monitor groundwater levels, quantity and quality Conduct groundwater modeling and assessment Conduct groundwater assessments by geohydrologic basin Publish maps and statistical reports regarding groundwater conditions and trends 	2	2														
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Conduct Water Resource Outreach	Publish compelling map and statistical reporting graph to raise awareness of water issues to policy makers and the public Conduct population demographic analysis to customize outreach to particular socioeconomic communities in specific environments	2	2														
MNRA	Agriculture Department	Policy Coordination Unit, NIWRA and Hydrology Unit	Obtain, compile, store and disseminate data concerning the water resources of Belize;	Provide and manage a central clearinghouse for access to water resource data throughout Belize Access and utilize data from other BNSDI stakeholders that is useful for water resource matters (topography, weather and climate, land use and land cover, etc.) Provide tools for others to access data, maps and statistical information	2	2														
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee execution and implementation of the Solid Waste Management Project	 Conduct community specific waste analysis and characterization Conduct siting analysis for solid waste transfer stations Conduct regional siting analysis for solid waste landfill facilities Conduct regional solid waste transport and access analysis Assess future community growth and solid waste trends Conduct solid waste facility site planning and design Conduct environmental impact assessments for planned solid waste facilities Conduct ongoing monitoring and evaluation of solid waste management facilities and operations Maintain complete inventory of solid waste facilities across Belize 	2					2		2	2							
MNRA	Natural Resources	Belize Solid Waste Management Authority	Oversee and Monitor the Operations of the Transfer Stations and Regional Sanitary Landfill.	Collection, compile and analyze transfer station and landfill operations data Produce transfer station and landfill operations current situation and trend statistics Re-calibrate waste stream analysis according to meaured trends over time Provide new insights to solid waste policies, plans and operational procedures as needed to improve the waste management program over time Provide inventory of all waste management facilities and assets	2								2			2				

					General Data View, Query & Report	ta Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
ADMIN_L1 MNRA	ADMIN_L2 Natural Resources	Belize Solid Waste Management Authority	MAJOR_FUNCTION Conduct public relations and outreach activities.	GEOSPATIAL ACTIVITY Compile and assess community-specific surveys regarding solid waste issues Utilize population census information with community based surveys to understand different attitudes and issues regarding solid waste Link outreach programs to specific communities, schools and other channels Develop map visualizations and geostatistical charts and graphs to illustrate solid waste issues and where they occur	2	Data	2	Ge	De	En	Vu As	De	As	Na and	S _P	<u> </u>	Ge Inf	2	9 B	O
MNRA	Natural Resources	Belize Solid Waste Management Authority	Conduct institutional strengthening and working with local municipalities to optimize their waste collection routes	 Provide geospatial analysis for nation-wide policy and planning analysis; Provide tools and data for solid waste collection and hauling route optimization; Provide waste management considerations and land allocation inputs to municipal land use planning; Provide tools for fleet tracking and monitoring; Conduct waste stream tracking and monitoring; Develop and manage solid waste fixed assets; Conduct real-time monitoring of waste movements at transfer station and landfill locations; Record the location and characteristics of significant informal dump sites to support evaluation and cleanup; Provide foundation of information to support siting and feasibility assessment for alternative waste management scenarios, waste to energy schemes, recycling efforts, and other potential future innovations. 	2							2	2	2				2		2
MNRA	Agriculture Department	Industries Section	Participate in and support agricultural industry associations	 Inventory of the location and characteristics of farm properties, farmers, and production statistics; Inventory of the location and characteristics of processing plants and other agriculture related infrastructure; Crop production forecasting; Land capability and suitability mapping; Local and export market analysis; Access to markets and export infrastructure analysis; Farm feasibility assessment and planning; Market location price monitoring and product sources; Production and forecasting tracking; Climate change agriculture risk and vulnerability assessment and mitigation planning; Disaster damage assessment and recovery planning; Provide trade associations with access to government geospatial resources to support their planning and operations; Monitor and evaluate the status and effectiveness of government agricultural policies and intervention actions over time. 	2							2				2		2		
MNRA	Agriculture Department		Testing for livestock disease as part of trade agreements	Record and monitor livestock disease testing Prepare livestock disease monitoring maps and statistics	2															

ADMIN_L1	ADMIN L2	ADMIN L3	MAJOR FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Seocoding	Online Training
MNRA	Agriculture Department	Aquaculture and Inland Fisheries	Support the promotion and development of aquaculture and inland fisheries	 Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time. 	2	2	,											2		
MNRA	Agriculture Department	Cooperatives	Promote and support agricultural cooperatives	 Cooperative office locations and boundaries of areas of interest; Market analysis and projections; Training in the use of ICT and GIS to support Cooperative business; Use of cell phones and other mobile devices for Cooperative community crowd sourcing of various information; Special geospatial analysis projects (e.g. analysis of pesticide use in Papaya fields adjacent to declining honey bee production area); Web based training and information dissemination; Monitoring and assessment of Cooperative policies and programs over time. 	2												2			2
MNRA	Agriculture Department	Marketing	Promote and support agricultural market development	 Analyze farm locations relative to markets where commodities are being sold; Monitor weather forecasts and other information to strategize best times to bring products to market; Assess how climate change may affect some commodities in geographic locations around the Country so that remedial action can be taken; Move towards more real-time treatment of market price information (e.g. Trinidad example utilizing smart phones equipped with GPS; Add supermarket prices to the market price tracking; Build a GIS unit to accommodate the variety of geospatial analyses that can be conceived to support the marketing of agricultural products in Belize. 	2						2									
MNRA	Agriculture Department	Projects Execution Unit	Administer, monitor and support projects execution	 Provide project location and characteristics information throughout the lifecycle of the project; Provide access to contextual information that can assist in project formulation and feasibility assessment; Provide better coordination and alignment among projects from different sectors planned for the same area; Allow the government to monitor and geographically track all relevant projects across all sectors (essentially adding a geographic element to the existing Public Investment Strategy Programme (PSIP) managed by the Ministry of Finance and Economic Development); Provide map interface for access to agriculture projects case files 	2							2				2				

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNRA	Agriculture Department	Policy and Trade – Statistics	Develop and disseminate agricultural statistics and information	 Provide a geographically based, comprehensive national farms registry Conduct geographically linked farmer surveys Conduct geostatistical analysis of farms inventory data Produce a national agricultural census maps and statistics Prepare and publish national agriculture maps and statistical reports Assess farms vulnerability to climate change projections Access geographic data from other BNSDI stakeholders Monitor agricultural trends over time Perform food security analysis Assess trends and provide information and recommendations to policy makers 	2	2														
MNRA	Agriculture Department	Central Farm	Provide Mechanical and Land Preparation Services	 Geocode service requests, providing ability to track current and past projects geographically; Access agricultural census and farmer registries and associated information to help build awareness and market the tractor services; Access protected areas and other information to ensure requested work can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Keep track of tractor locations; Monitor and evaluate outcomes and cost effectiveness of tractor service program over time. 									2							
MNRA	Agriculture Department	Central Farm	Promotion and Support for Development of Sustainable Aquaculture Industry	Continue geocoding aquaculture farm locations to track their distribution on a map; Suitability analysis (soils, slope, water access, market and transport access, etc.); Access protected areas and other information to ensure proposed aquaculture can be carried out within regulatory directives; Access land ownership information to confirm service requestor is land owner; Monitor and evaluate outcomes and effectiveness of aquaculture promotion and support programs over time.	2	2				2		2								
MNRA	Agriculture Department	Central Farm	Promote and Support Agro-Processing in Belize	 Record and track the location and characteristics of farmers that are involved in agro-processing; Access environmental, infrastructure and other information that would support or hinder agro-processing development around each rural community; Based on the above, assess needs and develop program responses that are suitable for each geographic area; Track school locations and their participation in school feeding program; Monitor and evaluate outcomes and effectiveness of agro-processing promotion and support programs over time. 	2	2				2		2								

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNRA	Agriculture Department	Central Farm	Promote and Support Crop Development	 Record and track the location and characteristics of various farms, their crops and outputs nationally; Conduct agricultural crop suitability assessment (soils, rainfall, access to supplemental water supply, access to markets and transportation, outside of protected areas, etc.). Calibrate this over time with crop production information from farms producing certain crops within various ecotypes; Identify high potential areas for investment and make this information available to potential investors; Monitor and evaluate outcomes and effectiveness of crop promotion, development and support programs over time. 	2	2	v					2		- 10	, <u> </u>			2		
MNRA	Agriculture Department	Central Farm	Promote and Support Livestock Production	 Record and track livestock farmers; Record and track services to livestock farmers; Identify areas suitable for livestock development; Monitor livestock development and production; Monitor and evaluate outcomes and effectiveness of livestock development and support programs over time. 		2						2								
MNRA	Agriculture Department	Central Farm	Provide Extension Services to Small to Medium Sized Farmers	 Record and track all farms and farmers; Spatially enable the agricultural census for a complete geographically based picture of the agricultural sector across the Country; Track agricultural census extension services; Monitor agricultural output across all sectors; Monitor and evaluate outcomes and effectiveness of agricultural extension programs over time. 		2						2						2		
MNRA	Agriculture Department	Central Farm	Conduct Special Agriculture Research Studies	 Record and track all locations and characteristics of special studies; Agricultural study formulation and feasibility assessment; Monitor and evaluate outcomes and effectiveness of research programs over time. 		2						2								
MNRA	Agriculture Department	Central Farm	Provide Facilities and Infrastructure for Agricultural Research and Development	Provide geospatial computing infrastructure, facilities, data and technical support to support applied research activities in the agriculture sector Support student internships and international exchange program Conduct special studies in support of communities and business	2	2												2		2
MoWT	Works Department	Section	Support transportation planning	 Inventory and assessment of existing transportation infrastructure; Inventory and assessment of high priority trip origination and destination points and areas; Traffic modeling and monitoring; Transport optimum corridor selection based on cumulative social, environmental and engineering issues, opportunities and constraints, including consideration of potential future climate change issues; Roadway conceptual design; Cost, value engineering and feasibility assessment; Environmental impact assessment; Right of way acquisition assessment and planning; Stakeholder engagement and coordination; Public outreach and communications. 	2		2			2	2									
MoWT	Works Department	Section	Manage materials lab.	Link borehole, geotechnical and material lab test results to geographic locations Publish selected test results by geographic location for use by engineers		2									2					

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MoWT	Works Department	Section Section	Oversee road design and construction.	Basemap and inventory of existing conditions (topography, soils, slope, surficial geology, land use, land cover, land ownership, existing infrastructure and structures, protected areas, administrative boundaries, etc.); Planning and management of temporary traffic diversions and signage during construction; Asset takeoff and as-built inventory for roadway and associated appurtenances; Construction oversight status reporting; Management of as-built records for roads, georeferenced to location; Public awareness and outreach (maps for newspaper and television, etc.);	2	۵	2	04	N D	E	V	2	2	N	<i>(</i>) 2	ı	. O <u>=</u>	<u></u>	U	0
MoWT	Works Department	Section	Maintain roads infrastructure.	Maintain complete and up to date inventory of road assets nationwide; Provide geographic basis for understanding road network asset conditions and maintenance priorities; Spatial representation of preventive maintenance priorities and schedules; Monitor and track reactive maintenance activities to identify repeat visit areas that may need more proactive remedial treatment; Maintenance fleet management; Integrate MoWT roads with roads administered by others for a complete picture of the transportation network. This could also be used as the basis for a complete and accurate navigable road database to support car navigation; Link traffic violations and accidents to roadway conditions as a reference for future maintenance and enhancements; Maintain geo-referenced repository of roadway as-built records; Monitor and assess the effectiveness of road maintenance programs over time.		2						2	2		2					
MoWT	Works Department	Section	Maintain other civil infrastructure	 Complete inventory and assessment of inland waterways; Development of preventive inspection and maintenance schedules for inland waterways; Plan, track and monitor reactive maintenance activities to resolve inland waterway issues; Utilize geospatially enabled social media and crowd-sourcing to help identify existing and potential inland waterway issues; Complete inventory and assessment of government buildings; Development of preventive inspection and maintenance schedules for government buildings; Plan, track and monitor reactive maintenance activities to resolve inland government building issues; Utilize geospatially enabled social media and crowd-sourcing with government staff to help identify issues with government building maintenance. 		2							2							
MoWT	Works Department	Section	Manage road safety	 Complete inventory of street markings and signage; Tracking and analysis of traffic accidents and causative factors; Maintain common road linear referencing scheme; Provide common operational picture in support of the JICS. 		2							2							
MoWT	Works Department	Section	Administer driver and vehicle licensing registration	Validate which jurisdiction a person is in to determine the responsible agency for licensing. Track violation locations countrywide, including linkages to municipality-issued tickets; Geocode licensed drivers and vehicles to visualize distribution and level of transactions in various areas over time.	2														2	

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MoWT	Transport Department	Section	Conduct transit planning.	 Current transit situation assessment and modeling (existing and planned demand and supply); Assess the transit implications of existing and planned land use; Socioeconomic data and public transit rider profile assessment (current and projected); Existing roads and road conditions; Existing public and private transit routes and carrier information; Existing and planned terminals and stops; Multi-modal connections and flow modeling. 	2															
MoWT	Transport Department	Section	Manage and regulate public and private transit and operate terminals.	 Maintain accurate and up to date bus route information; Monitor ridership on each route and bus terminal throughput; Track and monitor public and private buses (location, ridership, compliance with speed limits, stops, schedule performance, etc.); Terminal asset management and security 		2	2													
MoWT	Transport Department	Section	Conduct traffic enforcement.	 Geocode violators and violation locations and provide the basis for analyzing and visualizing this information over time; Provide a means for enforcement officers to identify and communicate road safety and maintenance issues to the Department by geographic location; Monitor patrols and support computer aided dispatch; Allow traffic violation information to be retrieved by location on a map; Monitor traffic violations over time, assess patterns and determine need for remedial measures. 										2					2	
MoWT	All Departments	All Sections	Participate in emergency planning and response.	 Identify hazards and vulnerabilities of public works and transportation infrastructure (e.g. flooding and probable storm-related damages); Identify vulnerable populations, responder ingress/egress and population evacuation routes; Identify alternative routes for carrying relief supplies; Prepare and record transport component of emergency contingency plans; Inventory location and characteristics of MoWT equipment that can be used to support emergency response; Monitor and coordinate emergency response logistics; Plan and execute disaster recovery measures. 	2						2			2				2		
MLLGRD	Village Councils	Section	Manage local elections	 Maintain geocoded voter registration database and illustrate in mapped form that qualified voters reside within the appropriate jurisdiction; Provide access to population census information for comparison against voter turnout; Plan, implement and manage polling stations. 	2								2				2			

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MLLGRD	Village Councils	Section	Develop and administer municipal development plans and land use zoning	 Assess physical setting, environmental and natural assets, cultural and historical assets, inter-region transportation links Assess historical and cultural resources and conditions Assess past, current and projected future population characteristics, household cohorts; age and sex distribution, migration; ethnicity and education Inventory and assess local community facilities Inventory and assess local community infrastructure and utilities Existing land use and land cover Environmental hazards and vulnerabilities Develop and record land use plans and zoning Monitor changes in the urban and natural landscape; Conduct development proposal review and conditioning; Track building and infrastructure development; Monitor and evaluate plan effectiveness over time; Develop plan refinements and adaptation over time based on evolving conditions and requirements. 	2					2	2	2								
MLLGRD	Village Councils	Section	Issue development permits	Review development proposals relative to municipal development plans; Track and monitor development projects and building permits; Evaluate development trends and impacts over time.	2	2														
MLLGRD	Village Councils	Section	License and inspect petrol stations and garages	 Record and process petrol station license application submissions; Assess potential impacts on surrounding land uses; Schedule and monitor inspections; Track license compliance over time 	2	2														
MLLGRD	Village Councils	Section	Maintain streets and street lighting	 Maintain inventory of the location and characteristics of all street lights; Identify and plan areas for new street lights; Link preventive maintenance for light poles and bulbs to the geospatial information; Provide an smart phone application to allow the public to report street light issues; Plan and track street light maintenance activities. 	2	2	2					2	2					2		
MLLGRD	Village Councils	Section	Facilitate utility coordination	 Maintain inventory of the location and characteristics of all utilities and infrastructure (data provided by those utilities); Track utility and infrastructure projects planned, or under construction within the jurisdiction; Provide one-stop coordination for site clearance for underground trenching 	2	2						2	2							
MLLGRD	Village Councils	Section	Facilitate and support community services coordination	Maintain inventory of the location and characteristics of local community facilities and services; Identify gaps in community service provision and promote the appropriate government and non-government organizations to get involved; Maintain spatially enabled system for citizen reporting regarding community services	2	2	2						2			2				

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MLLGRD	Village Councils	Section	Maintain storm drainage system	 Maintain inventory of existing storm drainage systems; Identify areas susceptible to flooding; Prepare storm drainage improvement plans; Manage storm drainage improvement construction activities; Maintain storm drain system preventive maintenance schedule; Participate in preparation of emergency response plans; Participate in emergence response activities. 		2				2	2	2	2							
MLLGRD	Village Councils	Section	Manage refuse	 Maintain inventory of local waste stream; Manage garbage collection activities and contracts; Plan, build and maintain landfill facilities; Monitor and record random dumping incidents; Raise awareness regarding the reduction, reusing and recycling of waste material. 	2	2						2		2						
MLLGRD	Village Councils	Section	Issue littering tickets	 Maintain inventory of ticket issuance locations; Maintain inventory of observed illegal trash dumping; Provide social media platform for citizen reporting of illegal littering and trash dumping; Monitor littering and illegal trash dumping and identify neighborhood "hotspots" for focused awareness building and education. 		2												2	2	
MLLGRD	Village Councils	Section	Manage parks and recreation areas	Maintain inventory of existing park locations and facilities; Conduct place-based surveys regarding community attitudes about local park and recreation assets and programs; Plan and track park maintenance; Integrate park and recreation areas into local land use planning; Incorporate park and recreation concerns into new development review and conditioning		2	2					2								
MLLGRD	Village Councils	Section	Manage public slaughterhouse facilities	 Maintain inventory of existing public slaughterhouse facilities; Track, record and report slaughterhouse operational statistics and revenues; Conduct siting analysis for new facilities 	2	2						2								
MLLGRD	Village Councils	Section	License, rent and inspect market facilities	Maintain inventory of existing permanent and weekly markets; Manage market leases by location and specific space; Plan and carry out market inspections; Track market inspection infractions; Monitor market activities and make plans for market expansion and new markets.														2		
MLLGRD	Village Councils	Section	Manage local cemetery	 Maintain an inventory of cemetery locations and plots, name and family connections of the interred and related information; Plan and implement cemetery maintenance activities; Plan for cemetery extension and new cemetery areas 		2							2							
MLLGRD	Village Councils	Section	Manage local property taxation	 Maintain a geographically based inventory of all properties being taxed; Monitor status of property tax payments; Monitor property tax non-payment and plan follow-up; Track and report property tax revenue geographically over time 									2			2				

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MLLGRD	Village Councils	Section	Manage licensing of motor vehicles, liquor and trade	 Maintain a geographically based inventory of the registration addresses for all vehicle licenses (motorized and non-motorized); Maintain a geographically based inventory for all trade and liquor licenses; Plan and conduct trade establishment inspections; Track trade and liquor license renewals and payments; Publish trade license business locations on the web as a community resource; Provide trade license business location information for use in car navigation and other consumer and government applications; 		2													2	
MLLGRD	Village Councils	Section	Manage swing bridge operations	 Maintain a geographically based inventory of swing bridge locations; Maintain schedule for planned bridge swing operations and fees paid; Maintain record of ad hoc bridge swing requests and fees; Monitor and report swing bridge operational trends over time 		2														
MLLGRD	Village Councils	Section	Manage public water closets and latrines	 Maintain a geographically based inventory of public water closet and latrine facilities; Prepare and implement maintenance schedules for public water closet and latrine facilities Provide location-aware social media for public to comment on water closet and latrine facilities; Monitor trends and complaints as input to the planning for the expansion of existing latrine facilities and planning of new ones 		2							2							
MLLGRD	Village Councils	Section	License billboards and banners	 Maintain a geographically based inventory of billboard and banner locations; Issue and track billboard and banner licenses; Monitor and track billboard and banner license payments; Prepare and maintain plans for future billboard and banner locations; Provide location-aware social media for public to comment on billboard and banner issues. 		2							2							
MLLGRD	Belize City Council	Section	Manage local public health	 Provide map base for planning, conducting and tracking weed abatement inspections and infractions; Monitor weed abatement repeat offenses and patterns over time; Record and maintain locations and information for food vendors; Record and track food vendor inspection activities; Record locations and abatement activities related to environmental health hazards; Share information with other departments and organizations regarding mutually relevant subjects (pest vector control, solid waste, food poisoning cases, etc.) 	2	2												2	2	
MLLGRD	Belize City Council	Section	Manage local tourism	 Monitor and track crime incidents and patterns in and around tourism areas; Track and analyze tourist complaints; Develop online tourism support services, maps and guides; Develop and maintain tourism maps of Belize City; Utilize location-aware social media for engagement with the tourist community; Record and monitor tourism-oriented facilities and activities 		2	2							2					2	
MLLGRD	Belize City Council	Section	Manage city traffic and licensing	 Geocode driver licenses, vehicle registration and traffic tickets information to addresses or other discrete location reference, thus providing a basis for understanding the geographic distribution of drivers, vehicles and traffic/parking infractions; Record and maintain bus routes; Share integrated information with other partner agencies (Ministry of Works and Transport, Police Department, etc.); 		2													2	

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ADMIN_L1 MLLGRD	ADMIN_L2 Belize City Council	ADMIN_L3 Section	MAJOR_FUNCTION Manage public works	• Maintain accurate inventory and condition assessment for municipal assets (streets, parks, buildings, drainage system, bridges, etc.); • Provide foundation information for street furniture and pavement management; • Provide foundation information of storm drainage system management; • Provide foundation information for park management; • Provide foundation information for municipal building maintenance and space planning; • Provide foundation information for municipal vehicle fleet management; • Provide asset register as the basis for municipal asset financial management; • Provide geographically-based asset register to support preventive and as-needed maintenance planning and response; • Provide linkage to maintenance management system to track maintenance activities over time; • Track maintenance performance indicators;	Guc	2 2	Spē	Ged	Dev Mar	Env	Vul Ass	Dev	ASS	Navi	Spa	2	Gec	Field	Gec	luO
MLLGRD	Belize City Council	Section	Conduct city planning activities	 Access and utilize data from other organizations (population census, natural resources, land ownership, business locations, community facilities, utilities, etc.) Prepare general plans, including information and tools for: Population forecasting and future needs assessment; Natural hazard and vulnerability mapping (flood prone areas, storm surge, sea level rise); Alternative future scenario development and visualization; Land use requirement and siting assessment; Traffic analysis; Infrastructure requirement and siting assessment; Community facility and service requirements and siting analyses; Support community engagement and visualization of future plans and planning issues; Develop general plan and zoning map databases; Provide public online access to planning and zoning information; Monitor plan build-out and variations; Provide tools for plan revision and refinement based on changing conditions over time. 	2	2				2	2					2				
MLLGRD	Belize City Council	Section	Manage environmental sanitation	Use location-enabled mobile phone reporting of loose garbage or hotspot locations by the public, as well as any other environmental sanitation complaints; Track culvert blockages and cleaning activities; Track lot cleaning and weeding activities; Track derelict vehicle reports and removal activities; Monitor trash pickup routes, schedules and performance; Record and manage landfill assets and operations									2	2				2	2	
MLLGRD	Belize City Council	Section	Manage Municipal facility security	 Provide contextual base mapping for security planning; Tie all incidents and reports to geographic locations; Record and access building floor plans; Provide online secure access to security cameras from map interface 	2	2													2	

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MLLGRD	Belize City Council	Section	Conduct disaster planning and response	 Hazard and vulnerability assessment (flooding, storm surge, high winds, etc.); Resources at risk analysis (settlements, infrastructure, environmental resources, etc.); Record and describe the locations of emergency response assets; Identify emergency staging areas; Preparation and dissemination of emergency response contingency plans; Provide common operating picture for emergency response; Provide common operating picture for post-emergency damage assessment, recovery planning and activities. 							2									
MLLGRD	Belize City Council	Section	Conduct property valuation	 Maintain property boundary maps; Link valuation data to lot features in GIS; Plan and track property valuation activities; Develop and maintain inventory of trade establishments. Track trade licenses and associated information by location; Prepare and disseminate property valuation maps; Track property tax payments and delinquencies 	2	2														
MLLGRD	Belize City Council	Section	Collect and monitor city revenues	 Develop and manage a geographically based inventory of all properties, facilities, trade establishments and activities that pay fees to the City; Link fee data to locations and produce map-based revenue visualization and reporting information; Track and monitor fee-paying activities and facilities; Utilize location-based social media for monitoring public comments or complaints regarding fee-paying facilities and activities; Produce maps illustrating historical City revenue generation and trends; Produce maps illustrating future City revenue projections 		2	2						2							
MLLGRD	Belize City Council	Section	Manage city council information systems	Maintain GIS as an integral component of the City Council information infrastructure	2															
MLLGRD	NEMO	Section	Hazard and vulnerability assessment	Provide access to a broad variety of geospatial information from multiple custodians Identify the location, extent and potential severity of various natural hazard conditions (e.g. flooding, wind damage, storm surge, coastal erosion, etc.) Identify vulnerable populations, community and government facilities and infrastructure Conduct vulnerability assessment	2	2					2									
MLLGRD	NEMO	Section	Disaster contingency planning	Identification and assessment of vulnerable populations, facilities and infrastructure Conduct impact assessment based on plausible scenarios Prepare a geographically-based inventory of response equipment and people Identify and characterize staging areas and evacuation routes Prepare and maintain geographically based inventory of shelter	2	2					2									
MLLGRD	NEMO	Section	Disaster response	Provide a "common operating picture" based on data and inputs from all involved sectors Provide real-time monitoring of disaster impacts and near-term projections Support damage assessment Track the deployment of human, vehicle and equipment response assets Monitor disaster response status		2					2									

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MLLGRD	NEMO	Section	Disaster recovery	Conduct post-disaster damage assessment Conduct recovery planning and prioritization Coordinate and monitor recovery actions (social, community facilities, infrastructure, etc.)		2	Ţ,								<i>y</i> <u> </u>					
MLLGRD	NEMO	Section	Education, Communication and Warning	 Identify vulnerable communities for pre-disaster planning awareness and emergency alert early focus; Provide geographically based information concerning the location and nature of possible natural disasters; Early place-specific warning analysis based on current and near-term projected storm and associated impact modeling (e.g. national hazard atlas, with neighborhood specific maps for high vulnerability areas; Collaborate with urban planning, land administration, utilities, insurance companies and other relevant entities to ensure that hazards are taken into consideration in any future plans and mitigation measures; Include place-based community communications measures within contingency plans; Organize and monitor post-disaster communications and community outreach; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	2	2					2					2				2
MLLGRD	NEMO	Section	Medical and Relief Measures	 Record precise locations for medical and relief material; Record work and home locations for medical and relief personnel; Identify and manage medical and relief staging areas; Track flow of people and material during emergency response (smart phones, and tracking devices on major equipment); Record activities and assess effectiveness for post-disaster refinement of contingency plans 									2	2						
MLLGRD	NEMO	Section	Housing and Shelter	 Pre-identify specific neighborhoods and structures that are likely to be damaged in major events. Work this information into contingency and response plans; Record staging areas and facilities for temporary housing and shelter accommodation post disaster; Manage housing and shelter status information during response; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 		2					2							2		
MLLGRD	NEMO	Section	Search, Rescue and Initial Clearance	 Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; Track and manage field staff activities during response; Post event damage assessment and clearance planning; Track and monitor status of initial clearance activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 							2			2				2		

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ADMIN_L1 MLLGRD	ADMIN_L2 NEMO	ADMIN_L3 Section	MAJOR_FUNCTION Collection, Control and Distribution of Food and Material	• Pre-identify specific neighborhoods, structures and infrastructure that are likely to be damaged in major events. Work this information into contingency and response plans; • Identify precise locations of food and material storage facilities and enterprises; • Track and manage field staff activities during response and recovery operations; • Record activities and assess effectiveness for post-disaster refinement of contingency plans	ŏσ	2	<u> </u>	ğ ¥	S G S	я Я	2	Đ <u>O</u>	As	2	S. W.	Ш	ÖË	Ë	ğ	ō
MLLGRD	NEMO	Section	Assessment and Evaluation of Damage	 Pre-identify vulnerable populations, structures and infrastructure. Maintain accurate inventory and valuation of assets; Collaborate with insurance industry and government to develop financial mitigation and recovery measures; Conduct post-event damage assessment and losses; Manage and track damage repair and mitigation activities 							2									
MLLGRD	NEMO	Section	Foreign Assistance disaster management	 Identify hazardous conditions and ensure that settlement and infrastructure projects avoid these areas; Pre-identify vulnerable populations, structures and infrastructure. Establish disaster mitigation and post-event recovery assistance strategies 		2					2									
MLLGRD	NEMO	Section	Transport disaster management	 Pre-identify vulnerable populations, structures and infrastructure. Identify transportation routes that should remain viable for emergency response, evacuation and relief supply provision purposes; Consider natural disaster hazard conditions for the planning and design of new highways; Identify transportation infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery 		2					2									
MLLGRD	NEMO	Section	Environment and Utilities disaster management	Pre-identify vulnerable infrastructure and environmental resources. Consider natural disaster hazard conditions for the planning and design of new utilities; Identify utilities infrastructure that may be impacted by natural disaster events and develop mitigation plans for protection and recovery		2					2									
MLLGRD	National Meteorological Office	Section	Conduct weather monitoring	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring Link local GIS with regional weather model outputs 	2	2					2									

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MLLGRD	National Meteorological Office	Section	Analyze and report weather information and forecasts	 Develop and manage inventory of meteorological stations Provide map interface for accessing meteorological data Conduct geographic analysis to determine need and feasibility for more monitoring stations based on multiple stakeholder requirements Cooperate with other organizations in weather data collection (e.g. estimate of precipitation via cellular telephony signal analysis between towers) Provide geographic interface for recording and visualizing weather balloon readings Provide geospatial tools to support combination of radar, meteorological station, satellite and other related information for improved weather monitoring 		2														
MLLGRD	National Meteorological Office	Section	Analyze weather and prepare agrometeorology reports for the agricultural sector.	 Provide more geographically specific reports to farming communities; Customize reports according to specific clusters of farmlands, crop types, types of infrastructure, and other context. 		2														
MLLGRD	National Meteorological Office	Section	Participate in emergency preparedness and response	Provide geographically specific weather input to hurricane reporting Provide geographically specific forecasts and reporting for storm surge Provide geographically specific forecasts and reports for potential flooding Utilize locally available data to refine regional models, reports and forecasts Generated geographically specific scenarios to support hazard and vulnerability assessment scenarios for contingency planning purposes Generate geographically specific scenarios to support emergency preparedness drills Conduct downstream flooding and damage assessment for various levels of dam break scenarios	2	2					2									
MLLGRD	National Meteorological Office	Section	Provide data on as- needed basis	Provide geographic interface for access to community specific weather information and forecasts Provide online mechanism for outside entities to access and download selected Hydromet data and model output information for specific geographic regions Provide online web map services for data and analytical products that can be consumed by other mapping interfaces and websites directly	2	2														
MHUD	Central Building Authority	Section	Intake, review and approve building permits	Log building permit applications with geographic reference (explicit coordinates or verifiable street address or plot number) Support "one-stop-shop" for digital building permit submissions and initial review by multiple agencies Capture spatial footprint of proposed structure, and allow "status" to be adjusted as the building permit process moves forward to final occupancy permit or commissioning Utilize contextual data from multiple organizations to assess proposed building compliance Add climate change related potential hazards as an element for consideration in building permitting		2					2								2	
MHUD	Central Building Authority	Section	Conduct building/site inspections;	Utilize GIS to plan and track building inspection schedules Provide geographic interface for accessing building permit case files Produce building permit status maps and reports Conduct building history and trend maps and statistical information over time		2									2			2		

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MHUD	Central Building Authority	Section	Carry out soil testing;	 Log soil testing sites geographically Provide access to soil testing online through a map interface Utilize soil testing as input to soil mapping and geotechnical assessment efforts 											2				2	
MHUD	Central Building Authority	Section	Carry out concrete testing.	 Log concrete testing results geographically Provide access to concrete testing online through a map interface Maintain historical record of concrete tested sites and results over time 											2				2	
MESTPU	Geology and Petroleum Department	Section	Facilitate and oversee geologic and petroleum exploration studies	 Develop and maintain GIS-based digital archive of past geology mapping efforts Maintain location and borehole information for all exploration wells Maintain location and results of seismic line testing information Manage petroleum contracts boundaries Develop and maintain an archive of all historical petroleum exploration information Collect and make available topographic, bathymetric and bottom type information 						2		2			2					
MESTPU	Geology and Petroleum Department	Section	Administer petroleum operating concessions	 Tie operational reports to specific wells and contract areas Generate petroleum product maps and statistical reports for current status, historical trends and future projections Maintain inventory of petroleum production and transport assets 		2						2	2							
MESTPU	Geology and Petroleum Department	Section	Review environmental impact assessments	 Log all environmental impact assessments geographically Provide tools for accessing and analyzing geologic aspects of submitted environmental impact assessments Conduct seismicity analysis modeling for hazard and vulnerability assessment Provide access to wide variety of population, community facilities, infrastructure and jurisdiction information for contextual reference. 		2				2	2									
MESTPU	Energy Unit	Section	Develop and support national renewable energy development	Conduct analysis to determine renewable energy sources Assess the location and characteristics of energy demand Assess the location and characteristics of existing energy supply Perform siting analysis for proposed renewable energy projects Develop and maintain national inventory of renewable energy generation sites and facilities Monitor and assess performance of renewable energy facilities over time Prepare smart energy atlas and master plan for Belize representing a diversified, sustainable energy portfolio for the country	2					2	2	2	2							
MESTPU	Energy Unit	Section	Promote and support energy efficiency initiatives	 Track the locations and characteristics of existing energy efficiency case studies; Monitor energy consumption rates by neighborhood as the basis for targeted energy efficiency promotion and outreach efforts; Leverage above analysis by providing to the private sector to support their marketing of energy efficiency products and services; Track the effectiveness of energy efficiency awareness and outreach programs over time. 		2														

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MESTPU	Energy Unit	Section Section	Promote and support clean energy production initiatives - Public Utilities Commission Act	Accurate accounting of all public utility assets by location Monitoring of utility consumption by areas Monitoring of outages and complaints by areas Monitoring of utility bill payments by areas Utility capital improvement planning based on land use and development plans Monitoring preventive and ad hoc maintenance activities by area Access to accurate data from others (population census, community locations and statistics, buildings and topographic information, flooding areas and other environmental hazards, protected areas, land ownership, etc.) Maximize sustainable use of renewable energy sources Ensure electric utility generation, transmission and distribution facilities are designed and operated in an environmentally and financially sustainable manner	2	J	2			37		J	2	2.0	6) E		, 0 =	<u>.</u>	0	
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Electricity Act	 Accurate accounting of all electric utility assets Monitoring of electric consumption by areas Monitoring of outages and complaints by areas Monitoring of electric bill payments by areas Electricity network system control and data acquisition (SCADA) – geospatial as well as network schematic visualization Electrical supply capital improvement planning Monitoring preventive and ad hoc maintenance activities by area 	2								2							
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Environmental Protection Act	 Support planning for the sustainable use of renewable energy sources while protecting biodiversity and natural and cultural heritage Facility siting and routing in consideration of environmental factors Minimize environmental impacts from energy operational activities 	2					2		2								
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - National Integrated Water Resources Act	Maximize sustainable utilization of water resources for hydrolelectric and other purposes Plan and design electrical facilities to maximize sustainable usage of water resources while minimizing adverse impacts	2							2								
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Land Acquisition (Public Purpose) Laws	Plan electrical utility facility and route siting to minimize impact on privately owned lands	2							2								
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Forest Act	Plan, design and operate electrical utility facilities and routes to avoid conflicts with high economic and environmental value forests	2					2	2	2								
MESTPU	Energy Unit	Section	Promote and support clean energy production initiatives - Wildlife Protection Act	Plan, design and operate electrical utility facilities and routes to avoid impacts to endangered species, biodiversity and habitat	2					2										

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ADMIN_L1 MESTPU	ADMIN_L2 Energy Unit	ADMIN_L3 Section	Promote and support clean energy production initiatives - Project Development Process	GEOSPATIAL ACTIVITY Access broad range of relevant data to support project formulation, design and bidding Access broad range of contextual data to support bid evaluation Provide information to support project site-specific design Provide GIS linked asset inventory Link and monitor planned and reactive operations and maintenance activities to geographically located assets Monitor and evaluate individual and cumulative projects performance over time	2	۵	<u> </u>	0 4	QW	∃ ¥	: > V	2	2	2 8	ω×	ш	. <u>6</u>	Ü.	O	0
MESTPU	Science and Technology Unit	Section	Promote and support the development and application of science and technology in Belize	Promote the use of geographic information science, systems and thinking in support of better planning and decision making in Belize Promote and support open public access to selected government-produced data that can support civil society, government transparency, education uses, and development of new applications and services by the private sector	2															2
MESTPU	Public Utilities Commission	Section	Participate in Public Utility Strategic Planning.	Provide improved basis for understanding the geographic distribution of current and future energy demand and supply Utilize place-aware social media for two-way exchange of information with utility customer communities Develop diversified energy portfolio that optimizes available renewable energy resources and supply of energy to key demand sectors in the most effective manner	2		2													
MESTPU	Public Utilities Commission	Section	Review and approve Public Utility rates.	Utilize GIS to provide geographically linked public utility assets register Utilize GIS linked asset register for financial and maintenance management Improve customer satisfaction through streamlined and more reliable utility operations and timely response to customer requests and inquiries Minimize total cost of running utility by improving planning, design, operations, maintenance and administrative processes	2								2							
MESTPU	Public Utilities Commission	Section	Monitor Public Utility Performance	 Monitor the location and characteristics of customer complaints Monitor and assess trends in utility disruption and outage management Monitor water quality testing Monitor and assess preventive and ad hoc maintenance activities 			2													
MFFSD	Department of Forestry	Section	Protected Areas Management Program;	Maintain mapped inventory of all protected areas and the resources and infrastructure within them Develop conservation and landscape management plans for protected areas Monitor activities and performance of co-management agreements within protected areas Monitor changes in land use, land cover and infrastructure development within areas around protected areas that may impact them Conduct socioecomomic studies and surveys of populations related to protected areas, and develop education and outreach programs to encourage stewardship behavior Assess potential impacts to protected areas from climate change Provide online access to mapped information about protected areas for education, awareness and tourism purposes Provide access to protected area data services for use by research scientists and students	2	2					2									2

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MFFSD	Department of Forestry	Section	Forest Resources Planning and Management Program;	 Record and track forestry lease areas and associated planned production information; Monitor changes in forest land cover using aerial or satellite imagery and correlate this to planned production; Identify illegal logging; Support permit application review, monitoring and enforcement; Support development of national forest inventory; Provide access to reference information from other organizations (cadastral, environmental, population census, land use, mining and petroleum leases, etc.) to support assessment and monitoring activities; Manage Sustainable Forest Management plans in GIS format. 	2	2														
MFFSD	Department of Forestry	Section	Forest Revenue and Exploitation Control Program;	Monitor extraction and revenue by specific area; Monitor land cover change and correlate to planned extraction locations and rates to identify any illegal activity; Estimate potential sustainable forestry revenues based on national forest inventory	2															
MFFSD	Department of Forestry	Section	Law Enforcement Program;	 Provide Ministry staff with access to activities within forest areas that have been permitted by other organizations (mining, agriculture, settlement, etc.); Monitor land cover change relative to permitted extractions and other approved activities to help identify areas of potential offences; Utilize location-aware social media for reporting of potential offences by the public; Record and track infractions and associated enforcement actions; Share all of the above information among the relevant stakeholders; Build awareness of monitoring and enforcement actions to deter would-be offenders. 	2	2	2										2	2		
MFFSD	Department of Forestry	Section	Wildlife Program;	 Record and track wildlife by habitat; Utilize social media to identify potential wildlife infractions; Record locations and data concerning infractions including followup and status; Track hunting licenses and permitted takings. 	2													2		
MFFSD	Department of Forestry	Section	National and International Partnership Program;	 Record, monitor and report all features, habitats, species and activities related to various conventions and treaties; Access geospatial data of others that may relate to the above. 	2															
MFFSD	Department of Forestry	Section	Manage National Herbarium.	Provide a map interface indicating the location where each herbarium specimen was collected; Link geographic locations with database, imagery and scientific reference material for each specimen; Provide habitat maps indicating the range where each type of plant can be found	2	2									2					

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MFFSD	Department of Environment	Section	Develop and manage environmental policies	 Monitor the affects and impacts of existing legislation as related to environmental issues; Identify and analyze alternative policy and regulatory scenarios; Monitor, assess and align government agencies' plans, programmes and activities that affect the environment; Define and analyze alternative recommendation scenarios for national policies and standards to promote improvement in environmental quality to meet the conservation, social, economic, health and other goals of Belize; Assess and define environmental program priorities; Help to shape environmentally sustainable projects to be funded through international funding agencies; Provide geographically-enable method for coordinating among Department units (Project Evaluation & EIA Unit, Public Awareness and Information, and the Enforcement and Monitoring Unit); Support management and compliance with all International Environmental Conventions and Protocols for which Belize is a Party or is contemplating becoming a Party, including assessment of benefits and costs of commitments Track and monitor national and regional environmental issues as part of international cooperation efforts 						2		2				2				
MFFSD	Department of Environment	Section	Administer environmental impact assessments	 Record and track EIA locations; Support analysis of EIA's by the National Environmental Appraisal Committee (NEAC); Conduct initial assessment of project location and scope to help determine whether an EIA is required or not; Support the development of Environmental Compliance Plans (ECP's) for projects that have been granted environmental clearance by the NEAC; Monitor, assess and refine EIA criterial and regulations; Assess individual and cumulative environmental impact of development, industrial and all other activities that may have significant impact on the environment; Record, track and monitor permitted projects and activities; Provide public with information regarding EIA's and their significance as a planning tool and for safeguarding public safety and welfare; Provide geographically based information and visualizations to support public hearings; Provide information access to other agencies to support strengthening of intra and inter-ministerial cooperation and coordination; Provide environmental baseline and analytical tools to support environmental planning for key areas such as Coastal Zone, islands, and proposed tourism, residential and industrial sites; Record and track approved project locations; Record and track approved project locations; Record and track locations of companies or individuals involved in the preparation of EIA's in Belize; To conduct and coordinate investigations, studies, surveys and research on issues related to the state of the environmental clearance impacting ecosystems in Belize; Monitor projects that have been granted environmental clearance 	2	2				2			2							2

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MFFSD	Department of Environment	Section	Conduct environmental monitoring and enforcement	 Track locations of environmental permits and inspections; Route and track environmental inspection activities; Monitor, collect, and analyze effluent and other pollutants; Maintain a register of all wastes, discharges, emissions, deposits or other sources of emissions or substances that are of danger or potential danger to the environment; Undertake surveys and investigations into the causes, nature, extent, and prevention of pollution and generate reports of the investigations; Identify and monitor areas for pollution cleanup and resource recovery improvements; Georeference environmental complaints; Track violation tickets, stop orders and abatements notices by location; Conduct place-based surveys on environmental matters; Assess environmental hazards, vulnerabilities and resources at risk; Prepare and assess contingency scenarios for environmental emergency response; Conduct assessment of individual and cumulative development environmental impacts on land, sea and air; Record and monitor Environmental Compliance Plans (ECP's) for existing and new projects; Prepare environmental maps and geographic visualizations to support public awareness and education 	2										2			2		
MFFSD	Department of Environment	Section	Manage environmental projects	 Project area assessment and formulation; Project design; Project management and reporting; Project monitoring and evaluation. 																

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MFFSD	Department of Environment	Section	Conduct environmental awareness and outreach	 Support environmental education with access to current and historical environmental information and geographic visualizations of environmental issues; Provide public with access to environmental information in a form that can be easily understood by lay audience; Prepare environmental analyses to support state of environment reporting and symposia presentations; Generate environmental maps and graphics for the press and public awareness campaigns, presentations and speeches; Support EIA public hearings and consultations with environmental issue data visualizations; Maintain access to related data maintained by other organizations through the BNSDI; Maintain information regarding environmental conditions, trends and projections; Monitor and assess changes in the natural environmental systems and analyze drivers and pressures that are causing these changes; Monitor and assess the cumulative impact of permitted emissions; Continuously Review The Adequacy Of Existing Data Management Systems And Data Bases; Upkeep And Maintain The Department's Information System And Equipment; Provide supporting material for national activities relative to international environmental days of recognition (e.g. World Environment Day, Earth Day, Ozone Day, International Beach Clean-Up Day, etc.); Utilize geospatially enabled social media and other media to facilitate two-way exchange of information with the public concerning environmental issues and conditions; Track and monitor the locations and characteristics of community-based and civil society environmental planning, monitoring, enforcement and assessment activities; Support the preparation of annual state of the environment reporting and planning; Monitor, assess and track environmental complaints from the public 																
MFFSD	Department of Fisheries	Section	Conduct fisheries assessments;	 Conduct fish habitat and population studies Monitor fish catch statistics and trends by location over time Monitor fish habitat and population statistics over time Provide fisheries assessment data and recommendations to policy makers in maps and statistical graphics that me the issues and remedies understandable and compelling Maintain inventory of fisherman, fishing infrastructure, and fish markets 														2		

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Yulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MFFSD	Department of Fisheries	Section	Prepare marine reserve management plans;	 Provide a map representation of the general context for each marine reserve; Provide a mapped database of critical habitats; Provide a mapped database of existing marine and terrestrial ecosystem resources and services; Provide a mapped database of human settlements and infrastructure; Provided a mapped database of touristic facilities, resources and services; Provide a mapped database of commercial facilities and activities; Provide a mapped database of climatic conditions; Provide a mapped database of historic storm tracks and impacts; Provide a mapped database of geologic, soils and geophysical features; Provide a mapped database of topographic and bathymetric information; Provide a mapped database of tides, waves and currents; Provide a mapped database of sea bottom types; Provide a mapped database of plant and animal species observations; Provide a mapped database of previous research activities; Provide a mapped database of archeological sites; Conduct conservation issue, opportunity and constraint analysis; Conduct conservation suitability assessment; Identify and analyze alternative management scenarios; Delineate and record conservation use zones; 		2				2			2							
MFFSD	Department of Fisheries	Section	Manage marine protected areas	 Develop and manage marine protected areas boundary maps Prepare patrol and marine protected area surveillance plans Monitor human activities within and around marine protected areas Issue and track violation notices Utilize remote sensing techniques to detect illegal activities 		2								2				2	2	
	Department of Fisheries	Section	Participate in regional marine protection and fisheries initiatives	Develop and maintain portions of regional marine databases within Belize territorial waters Conduct special studies Develop and manage data in support of regional collaborative efforts (e.g. Mesoamerican Barrier Reef System (MBRS) study. Develop and disseminate methods and tools for use of GIS for marine protection and fisheries management Participate in regional marine ecosystem monitoring and assessment	2	2												2		

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MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal water quality and monitoring programmes	 Develop and maintain inventory of coastal and marine resources; Maintain inventory of protected area boundaries and assets; Develop baseline water quality information (chemical, biological, physical properties) and subsequent monitoring updates over time; Leverage the BNSDI to access relevant data from other agencies; Maintain inventory and monitoring of water quality drivers and pressures over time; Provide tools for the spatial and temporal analysis of water quality monitoring information over time; Provide hydrodynamic analysis tools to better understand the relationships between water quality causes and effects; Provide tools for the analysis and visualization of water quality issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal water using stakeholders and the government. 	2	2		2					2							
MFFSD	Coastal Zone Management Authority and Institute	Section	Conduct manatee research	 Develop and maintain inventory of manatee habitat; Develop baseline and maintain manatee population census information over time by location; Maintain inventory and monitoring of manatee habitat and population impact drivers and pressures over time; Conduct habitat and population trend analyses; Track tagged animals spatially to understand movement and migration patterns; Provide tools for the analysis and visualization of manatee habitat and population viability issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the public and the government. 				2						2						
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage sport fishing program	 Track fishing licenses by licensee address and district Provide mobile phone application for voluntary reporting of fish catch information Track commercial sport fishing boat activities Produce maps and charts illustrating sports fish activities and catch statistics 				2						2					2	

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MFFSD	Coastal Zone Management Authority and Institute	Section	Carry out coastal planning	 Develop and maintain inventory of coastal and marine resources and their state over time; Leverage the BNSDI to access relevant data from other agencies; Develop inventory and monitor the characteristics of socioeconomic drivers and pressures on coastal environmental resources and ecosystems over time; Monitor impacts of drivers and pressures on resource and ecosystem state over time; Provide tools for environmental impact forecasts and early warnings; Maintain inventory of protected area boundaries and assets; Support environmental system modeling to understand and forecast complex interactions between ecosystems and manmade and natural systems (e.g. climate change); Provide tools for the analysis and visualization of coastal environmental resource issues in ways that can be clearly understood by a lay audience; Provide analysis tools to model the implications of various intervention options, including the intersection, alignment and cumulative effects of interventions by multiple organizations (plans, policies, operations, enforcement, etc.); Establish location-aware social media channels for two way communication between the coastal stakeholders and the government Monitor and evaluate intervention program effectiveness over time and provide tools, information and multi-stakeholder processes to calibrate interventions over time. 	2	2	2	2		E E	. > 4	2	4	2 6	60 2		.0 =			0
MFFSD	Coastal Zone Management Authority and Institute	Section	Develop and support education and awareness programmes	 Provide the public with access to basic data and easy to understand analysis and visualization regarding coastal environmental issues; Provide easy to understand visualizations of coastal environmental issues to the local and international media; Establish location-aware social media channels for two way communication between the coastal stakeholders and the government; Utilize the BNSDI for streamlining data sharing among coastal stakeholder organizations; Develop web-based and smart phone applications that orient and sensitize coastal users to the nature and sensitivities that characterize each area; 	2	2	2													
MFFSD	Coastal Zone Management Authority and Institute	Section	Manage coastal data	Provide data repository for the development and management of coastal data Provide geoportal for exploring, locating and accessing coastal data and online data services Establish standards for coastal resource monitoring data Establish agreements for the sharing of coastal data among relevant stakeholders Establish credentials, authority and agreements for selective accessing of sensitive coastal data (endangered species locations, archeological sites, etc.) Provide online services, templates and tools for field data capture	2													2		
MTCCA	Ministry	Section	Oversee portfolio governance	Maintain access to all Ministry geospatial and related data Facilitate GIS data coordination across the Ministry Facilitate access to BNSDI data network on behalf of Ministry departments Monitor and evaluate Ministry department projects and outcomes over time	2							2								

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MTCCA	Ministry	Section	Represent tourism and aviation sectors in national planning and policy making	 Maintain geographically-based inventory of all tourism facilities, attractions and infrastructure; Maintain geographically-based inventory of all civil aviation facilities and infrastructure; Monitor tourism development issues and trends; Develop geographically based analysis of tourism development issues, opportunities and challenges and provide reporting and mapped visualizations to support policy and decision making. 	2	2														
MTCCA	Ministry	Section	Oversee tourism planning and development	Overview of existing tourism resources in the Country relative to projected or potential future demand; Overview of the infrastructure and program development of other sectors that could impact tourism development (transport, urban development, environmental resource management plans, public investment plans, etc.); Monitor tourism facility and infrastructure development; Monitor and evaluate tourism related revenue and tax generation over time.								2								
MTCCA	Belize Tourism Board	Section	Conduct planning for sustainable national tourism development	 Prepare location-based inventory of all touristic facilities, sites and attractions (cultural, nature-based, sun and beach, cruise, nautical, leisure and entertainment); Map historical and cultural routes; Assess tourism infrastructure capacity (transportation, water, energy, telecommunications, waste management, sewage, etc.); Plan, design and implement tourism oriented signage and wayfinding; Capture and manage tourism activities and revenues by location; Identify tourism development physical opportunities and constraints; Assess potential impacts of climate change on existing and potential tourism sites; Identify opportunities for tourism expansion plans in specific locations; Prepare and record tourism development plans for specific destinations; Conduct environmental impact assessments for tourism development plans; Promote and support private sector investment in tourism development at specific sites; Provide data and analysis tools for tourism development project formulation and finance; Monitor tourism development and revenues over time. 	2	2				2	2									
MTCCA	Belize Tourism Board	Section	Manage tourism data	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide analytical tools to project tourism site, infrastructure and program development based on alternative options and scenarios; Utilize geospatial tools to develop tourism development analyses and visualizations to keep leadership and investors informed of progress, trends and opportunities for investment. 	2															
MTCCA	Belize Tourism Industry Association	Section	Identify and monitor needs and priorities of the BTIA membership	Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide location-based register of members; Utilize spatially-enabled social media to establish two-way engagement with membership and illustrate issues and opinions geographically; Provide membership with information regarding urban, infrastructure and other	2	2														

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MTCCA	Belize Tourism Industry Association	Section	Promote sustainable tourism development	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide interactive map for the public to explore tourism destinations and facilities in Belize; Provide geo-enabled interactive map and schedule of cultural events and other activities that would be interesting to tourists. 	2															
MTCCA	Belize Tourism Industry Association	Section	Promote tourism development government policies, planning and investment	 Provide geographic basemap for recording, analyzing and visualizing current and historical tourism data; Provide geographic analysis and visualization tools to explain issues, trends or opportunities affecting touristic development in Belize; Provide a location-based inventory of all touristic and supporting infrastructure public sector investment projects and privately funded developments. 	2			2												
MTCCA	National Institute for Culture and History	Institute of Archeology	Maintain inventory of archeological sites;	Maintain inventory of archeological sites	2					2			2		2			2		
MTCCA	National Institute for Culture and History	Institute of Archeology	Conduct archeological research and education;	Conduct archeological research and education;	2	2		2				2						2		2
MTCCA	National Institute for Culture and History	Institute of Archeology	Manage archeological parks and reserves.	Manage archeological parks and reserves.	2	2							2					2		
MTCCA	National Institute for Culture and History	Museums of Belize and Houses of Culture	Develop and manage museum exhibitions and tours	Develop and manage museum exhibitions and tours	2	2														
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Conduct social and cultural research and publications;	Conduct social and cultural research and publications;	2	2		2												
MTCCA	National Institute for Culture and History	Institute for Social and Cultural Research	Promote social and cultural initiatives	Promote social and cultural initiatives	2	2														

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MFED	All Departments	Section	Planning and design of transportation network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing transportation infrastructure; Trip origination and destination assessment; Traffic modeling and capacity analysis; Identification and analysis of transport network construction and upgrade options; Identification, formulation and feasibility analysis for ransport master plan and associated priority projects. 						2	2	2								
MFED	All Departments	Section	Bridge construction and refurbishment	 Inventory and condition assessment of existing bridges; Identify bridge vulnerability to natural disasters and importance to emergency response activities; Identification, formulation and feasibility analysis for priority bridge construction and refurbishing projects. 						2	2	2								
MFED	All Departments	Section	Road and highway construction and refurbishment	 Provide basemap and geophysical data to support roadway and highway engineering design; Provide geographically based project tracking and management system; Produce transportation asset inventory to support maintenance and financial asset management activities; 						2	2	2								
MFED	All Departments	Section	Improve road safety	 Map and assess traffic accidents and other road safety related events; Analyze road safety issues, opportunities and constraints; Identify road safety intervention measures Prepare plan for road safety intervention actions; Track and manage road safety intervention actions; Monitor and evaluate road safety interventions and calibrate plans to optimize positive impacts and improvements over time. 							2	2							2	
MFED	All Departments	Section	Rehabilitation and construction of drainage facilities	 Assess drainage facility capacity and vulnerability to major storm events; Provide basemap and geophysical data to support drainage facility engineering design; Provide geographically based project tracking system; Produce drainage asset inventory to support maintenance and financial asset management activities; 	2						2	2								
MFED	All Departments	Section	Preparation of feasibility studies for roads and bridges	 Provide basemap, geophysical and environmental data to support road and bridge feasibility assessments; Provide geographically based bibliography for transportation studies; 	2										2					
MFED	All Departments	Section	Improve road and drainage conditions in selected communities as part of poverty alleviation program	 Provide access to population census socio-economic information to identify the most economically disadvantaged communities and neighborhoods; Utilize poverty information as another dimension for the prioritization of road and drainage capital investment projects 	2							2	2							
MFED	All Departments	Section	General improvement of municipal infrastructure and its management	Provide access to municipal infrastructure asset information; Provide access to land use and population data; Provide access to land ownership and tenure information; Identify natural hazards and associated vulnerability of municipal infrastructure Provide geospatial tools for municipal infrastructure assessment and planning.	2					2	2	2	2							

ADMIN L1	ADMIN L2	ADMIN L3	MAJOR FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Seocoding	Online Training
MFED	All Departments	Section Section	Construction and refurbishment of community facility buildings	Provide access to community facility asset information; Provide access to existing land use and population data; Provide access to land use plans and projections; Provide access to land ownership and tenure information; Provide geospatial tools for community facility assessment, planning and siting.	2	۵	<u> </u>	04		2	2	2	2	<u> </u>	<i>σ</i> ≥	-	. 0 =		0	8
MFED	All Departments	Section	Upgrade and rehabilitation of airstrip facilities	 Inventory and condition assessment of existing airstrips and helipads; Preparation of upgrade and rehabilitation plans for priority airstrips and helipads; Track and manage airstrip and helipad upgrade projects. 	2					2	2	2	2							
MFED	All Departments	Section	Planning and design of potable water network facilities and upgrades	 Accurate and up to date inventory and condition assessment of existing potable water infrastructure; Current and near term future water demand analysis; Water system modeling and capacity analysis; Identification and analysis of water network construction and upgrade options; Identification, formulation and feasibility analysis for potable water master plan and associated priority projects. 	2					2	2	2	2							
MFED	All Departments	Section	Design of potable water supply systems and upgrade projects	 Provide basemap and geophysical data to support potable water facility engineering design; Provide geographically based project tracking system; Produce potable water system asset inventory to support operations and maintenance and financial asset management activities; 	2					2	2	2	2							
MFED	All Departments	Section	Construction and upgrading of potable water production and storage facilities	 Provide access to water resource master plan information Provide basemap and geophysical data to support potable water production engineering design; Provide geographically based project tracking system; Produce potable water production system asset inventory to support operations and maintenance and financial asset management activities 	2					2	2	2	2							
MFED	All Departments	Section	Construction and upgrading of water supply network	 Provide basemap and contextual data to support water supply network engineering design; Provide geographically based project tracking system; Produce water supply network asset inventory to support maintenance and financial asset management activities; 	2					2	2	2	2							
MFED	All Departments	Section	Improve rural water and sanitation governance	 Inventory and assessment of rural water supplies, including quantity and quality of extracted water; Inventory and assessment of sanitation facilities; Provide access to rural building and population data; Establish a mapped basis indicating the location and jurisdiction of all local water boards. 	2					2	2	2	2							
MFED	All Departments	Section	Construction and upgrading of sanitary sewer system	 Accurate and up to date inventory and condition assessment of existing sanitary sewer infrastructure; Provide access to existing and planned land use information; Current and near term future sewer system demand analysis; Sewer system modeling and capacity analysis; Identification and analysis of sewer network construction and upgrade options; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 	2					2	2	2	2							

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MFED	All Departments	Section	Institutional capacity building for water system governance	Incorporate GIS management and technical capacity building in to the water system governance program	2	<u> </u>	<u> </u>	0 4) [2	2	2	2	2	Z 8	0 2		· 0 =			_ 0
MFED	All Departments	Section	Development of solar energy generation demonstration project	Conduct geospatial siting analysis for optimum location for solar energy generation demonstration project;	2					2	2	2	2							
MFED	All Departments	Section	Provision of electricity from renewable energy sources to rural and peri-urban areas	 Conduct geospatial analysis for high potential renewable energy sources (solar, hydro, biomass, wind, etc.); Identification of rural and peri-urban economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for sewer master plan and associated priority projects. 	2					2	2	2	2							
MFED	All Departments	Section	Extend electrical services to disadvantaged communities	 Identification of economically disadvantaged neighborhoods; Identification, formulation and feasibility analysis for electrical network extension projects. 	2					2	2	2	2							
MFED	All Departments	Section	Plan, design and implement agriculture services program	 Develop a geographically based inventory of the existing and potential demand for agricultural services; Develop a geographically based inventory of the existing and planned provision of agricultural services; Conduct a geographically based gap analysis between the demand for agricultural services and the existing and planned supply programs and activities; Prepare plan for the augmentation of agricultural services to fill gaps; Monitor and evaluate agricultural service provision and use findings to calibrate service provision programs for maximum positive impact 	2					2	2	2	2							
MFED	All Departments	Section	Promote and support the development of integrated farming systems	 Provide geographically based farm inventory; Assess potential and readiness for integrated farming system introduction; Prepare plan for outreach and capacity building program; Monitor program execution; Monitor and evaluate program outcomes over time, and calibrate plans and activities to reflect lessons learned and evolving context. 	2					2	2	2	2							
MFED	All Departments	Section	Upgrade research and extension facilities	Add GIS and utilization of the information resources of the BNSDI as a focal research and extension support function within the agricultural sector	2															2
MFED	All Departments	Section	Conduct farmer training and capacity building activities	Support farmer training and extension service capacity building	2															2
MFED	All Departments	Section	Prepare agriculture irrigation and drainage policy and national strategic plan	 Provide national inventory and assessment of farms; Identify irrigation and drainage issues; Prepare geographically based agriculture irrigation and drainage strategy. 	2	2														

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MFED	All Departments	Section Section	Conduct community project for improvement of agriculture production for poor families	Provide access to population census socio-economic data at the community and neighborhood levels; Identify target populations for improvement of agricultural production; Assess and record community level needs and priorities; Prepare and record community based agriculture production improvement mechanisms; Track and manage community based agriculture production improvement mechanisms; Monitor and evaluation the effectiveness of community based agriculture production improvement mechanisms; output Monitor and evaluation the effectiveness of community based agriculture production improvement activities and calibrate plans and activities to optimize positive impact over time.	2	Ü	- v	O	2				•	2 8	0) 2		, O <u>=</u>	L.	U	
MFED	All Departments	Section	Promote and provide training for better agriculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Identify target beneficiary communities for training, and define the technologies and methods that may be appropriate for each based on existing situation and context. Track training activities geographically; Monitor and evaluate program outcomes over time. 	2							2								
MFED	All Departments	Section	Support the expansion of rice seed production	 Provide access to geographically based agricultural census; Inventory and assess existing rice cultivation and identify areas for potential future expansion; Track seed distribution; Monitor and evaluate rice production over time and adjust program efforts to maximize positive outcomes. 	2	2														
MFED	All Departments	Section	Promote and provide training for better food processing technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census; Provide geographically based inventory of existing food processing plants including accounting of what technologies are being used currently; Identify target beneficiary stakeholders for training for food processing technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 	2							2	2							
MFED	All Departments	Section	Promote and provide training for better aquaculture technology and methods	 Provide access to population census socio-economic data at the community and neighborhood levels for rural areas; Provide access to geographically based agricultural census, inclusive of aquaculture sites; Identify target beneficiary stakeholders for training for aquaculture technologies and methods; Track training activities geographically; Monitor and evaluate program outcomes over time. 	2							2								
MFED	All Departments	Section	Conduct capacity building to improve agriculture disease management	 Provide geographically based agriculture disease and pest monitoring and assessment system; Establish mobile phone based agricultural extension service for disease diagnosis; Track disease incidence and spread; Develop and apply intervention strategies to stop disease spread; Monitor and evaluation system effectiveness over time and improve/refine systems based on lessons learned and new disease or pest challenges/ 	2	2												2	2	

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MFED	All Departments	Section	Conduct national cattle testing and certification program	 Provide access to geographically based agricultural census, inclusive of cattle farming sites; Prepare cattle testing and certification plan; Conduct and track cattle testing and certification activities; Track meat products from farm to fork or export. 	2									2						
MFED	All Departments	Section	Prepare master plan for the improvement of sustainable tourism	 Prepare inventory of existing high potential tourism resources and facilities Assess resource pressures and sustainability; Assess potential for diversification of overnight tourism product for emerging destinations 	2				2											
MFED	All Departments	Section	Support targeted lending	 Identify areas for targeted lending based on criteria (low-income housing, agriculture, industrial development,etc.); Conduct feasibility and lending risk analysis; Monitor and evaluation loan performance and development outcomes. 	2							2								
MFED	All Departments	Section	Support capacity building for Belize Coalition of Service Providers	 Record location and characteristics of Coalition members; Monitor and assess program member performance 	2															
MFED	All Departments	Section	Support financial services for poor farmers and rural communities	 Conduct population data analysis to identify target neighborhoods; Inventory and record access to existing financial services; Conduct geographically based analysis of financial service gaps; Prepare master plan for improvement of specific financial services within each target community, neighborhood or farming area; Track and assess utilization of financial services over time. 	2							2								
MFED	All Departments	Section	Administer small scale enterprise grants	 Identify target areas for small scale enterprise grants; Track the location and characteristics of grant applications; Conduct rapid feasibility analysis for small grant applications and advise candidates of areas for improvement; Track the location, characteristics and performance of grantee enterprises 	2							2								
MFED	All Departments	Section	Promote and support rural household employment in gardening and horticulture	 Identify target areas and populations; Prepare outreach and engagement program by area; Track and monitor program activities 	2							2								
MFED	All Departments	Section	Plan, design and support development of specialized economic development facilities	 Assess areas for special economic development (e.g. Maya House of Cacao and Chocolate Museum or National Enterprise Development Center) Conduct geographic siting analysis; Provide geographically based project tracking system; Monitor and evaluate 	2							2								
MFED	All Departments	Section	Improvement of land management capacity	 Inventory and characteristics of land ownership and tenure status for all lands in Belize Provide tools for the processing and tracking of land tenure transactions; Provide access to land tenure information by all agencies involved in land administration, management and infrastructure activities; 	2	2														

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MFED	All Departments	Section	Improvement of solid waste management capacity	 Prepare geographically based assessment of current and projected future waste stream processes; Conduct landfill siting analysis in consideration of waste generation, transport and environmental issues, opportunities and constraints; Monitor and evaluate landfill operations and impacts over time. 	2	2				2	2	2	2							
MFED	All Departments	Section	Strengthen protected areas management	 Provide mapped inventory of the location, boundaries and resources of each land or marine protected areas; Identify key threats to each protected area; Conduct protected area gap analysis (spatial, policy, legal, etc.) Prepare and implement protected area strengthening plan; Monitor effectiveness of protected area management programs over time 	2	2				2										
MFED	All Departments	Section	Strengthen capacity for climate change adaptation planning and reporting	 Provide access to relevant information from all sectors Conduct climate change hazard assessment; Conduct climate change vulnerability assessment for populations, infrastructure and resources at risk; Develop plans for climate change adaptation in all sectors; Monitor climate change variables and calibrate adaptation schemes according to observations and refined projections over time; Calculate and report on carbon emission reductions, climate change observations, planning and reporting to the UNFCC COP and other venues. 	2						2									
MFED	All Departments	Section	Manage marine fisheries	 Inventory and assessment of commercial and recreational fish stock within Belize territorial waters; Prepare fisheries forecasts under status quo; Define sustainable fisheries intervention options and assess the environmental and economic impacts of each; Develop and record sustainable fisheries program; Implement fisheries management programs, including definition of enforcement areas and actions to be taken; Record and manage fisheries program assets; Support public education programs with map and geographic visualizations regarding fisheries issues and responses; Monitor fisheries conditions and calibrate programs to maintain sustainability over time. 	2	2				2		2	2							
MFED	All Departments	Section	Manage pollutant release and transfer registration	 Register geographically and report permitted and accidental pollutant releases to land, sea and air; Track the transfer of hazardous chemicals; Assess potential hazards and vulnerabilities for pollutant and hazardous material storage, transfer, or accidental release; Prepare and record emergency response contingency plans for pollutant and hazardous material release; Support the management of cleanup and recovery efforts following accidental pollutant or hazardous material release; Monitor environmental and social cumulative impacts of permitted pollutant release over time. 	2	2								2				2	2	

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MFED	All Departments	Section	Enhancement of education policies, strategies and facilities	 Mapped inventory and assessment of schools and school facilities, assets, students and programs; Identification of education targets and gaps by school district; Identification of policies and strategies needed to improve the education sector nationally and specific foci within each district; Identification of requirements for new schools, or the extension or refurbishment of existing schools; Identification of community specific teacher training program requirements; Provide a geographically based school project tracking and management system; Provide a geographically based school facility space planning, maintenance and asset management system. 	2	2			2			2	2							
MFED	All Departments	Section	Control and prevention of HIV/AIDS	 Provide a geographically based inventory of current and past HIV/AIDS incidence; Identify exposed and vulnerable populations to HIV/AIDS spread; Develop geographically targeted programs to control and prevent HIV/AIDS spread; 	2						2	2								
MFED	All Departments	Section	Improvement of children's health and nutrition	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of child health and nutrition issues in target communities and neighborhoods; Develop and record child health and nutrition intervention strategies at the community and neighborhood levels; Support the development of community based programs to enhance child health and nutrition programs; Monitor and assess child health and nutrition program effectiveness over time and calibrate programs to maximize positive outcomes. 	2						2	2								
MFED	All Departments	Section	Improve health conditions among the poorest populations	 Provide access to population census data at the neighborhood level; Identify poorest and most vulnerable populations; Inventory and assess capacity of existing NGO's and community based organizations; Develop and record geographically based assessment of local health conditions; Develop and record health improvement strategies at the community and neighborhood levels; Support the development of community based programs to enhance community health initiatives; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	2						2	2								

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MFED	All Departments	Section	Develop plans for the achievement of target MDG's	 Provide access to multi-sector data that relates to MDG's; Conduct MDG assessment at the community and neighborhood levels to the extent this can be supported by available information; Develop community level requirements analysis for the achievement of target MDG's; Develop and record community level interventions for the achievement of target MDG's; Implement and track intervention program activities; Monitor and assess health program effectiveness over time and calibrate programs to maximize positive outcomes. 	2	_			2									_		
MFED	All Departments	Section	Support the development of social transformation and poverty alleviation projects	 Provide access to community level analysis of social and economic conditions and trends; Geocode neighborhood social and economic surveys; Support neighborhood level analysis of social and economic issues and opportunities; Develop and assess alternative program elements for addressing social and economic issues; Plan and implement social programs and track progress at the community and neighborhood levels; Monitor and assess social and economic program effectiveness over time and calibrate programs to maximize positive outcomes. 	2													2	2	
MFED	All Departments	Section	Conduct customs reform	Support the capture of trade data include recording for good the point of entry and shipping destination															2	
MFED	All Departments	Section	Computerization of Driver's Licensing system	 Support the standardization and integration of the nationwide system; Support geocoding of driver home address; Support linkage of driver license information to geocoded traffic ticket and accident reports; 															2	
MFED	All Departments	Section	Assessment and upgrade to the PSIP-MIS	 Provide a foundation for recording and tracking PSIP's by location; Provide access to geospatial information from all sectors to support better project formulation and appraisal; Assess PSIP geographic distribution and potential interrelationships, providing a basis for better project coordination and alignment; Provide tools for the reporting of project status, monitoring and evaluation according to the requirements of each donor or IFI; Provide geographic based tools for PSIP monitoring and evaluation, individually and cumulatively. 	2	2						2								
MFED	All Departments	Section	Enhance rural development program activities	Provide geographic based assessment of rural development issues, opportunities and constraints; Develop and maintain location-based inventory of rural small and medium sized micro-enterprises; Assess infrastructure requirements and gaps for rural small and medium sized micro-enterprises; Develop community and neighborhood specific plans for the enhancement of rural small and medium sized micro-enterprises.								2								

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MFED	All Departments	Section Section	Develop and manage disaster risk management plan	Assess natural disaster risks nationally; Identify vulnerable populations, infrastructure and resources at risk; Prepare disaster mitigation and emergency response contingency plans; Identify and record the locations and inventory of government owned and other potential disaster response assets; Support disaster response activities; Support disaster cleanup and recovery process; Support disaster resistant community planning and design; Monitor climate change trends, forecast impacts to disaster emergency preparedness and calibrate planning and emergency preparedness plans over time.		۵	<u> </u>	04		B	2	0.2	ď		0, 2	2	0 =	2	O	0
MFED	All Departments	Section	Support public safety and crime prevention	 Provide data and tools to support crime analysis and response support; Provide a basis for geocoding crime incidents; Provide geographic map basis for computer aided police dispatch; Provide vehicle tracking capability. 	2									2				2	2	
MFED	All Departments	Section	Support fire safety	 Conduct geographically based assessment of fire hazard and vulnerability; Provide geographic basis for the inventory and assessment of existing fire response facilities and assets; Assess the need for and siting of new fire stations; Assess the need for and siting of new fire hydrants. 	2							2	2							
MFED	Central Information Technology Organization	Section	Develop and oversee ICT plans, policies, procedures, guidelines and standards.	• Ensure that ICT policies, procedures, guidelines and standards reflect and support matters that are specific to geospatial data and application services and the objectives of the BNSDI;																
MFED	Central Information Technology Organization	Section	Design and development of e- solutions and government-wide applications	 CITO is currently facilitating acquiring a government site license for ESRI's ArcGIS software; Beyond the basic software and associated functional modules there will be a variety of geospatial services that could be useful for multiple organizations. Consideration will need to be given to where and how these services should be provided to the BNSDI community 																
MFED	Central Information Technology Organization	Section	Provide data center and internet services	Ensure that the current and planned GoB network considers and can support the type and level of network traffic that could be generated though the BNSDI.																
MFED	Central Information Technology Organization	Section	Provide information security services	Establish a geospatial data security framework within the overall ICT security strategy Ensure that proper credentials and channels are established to allow access to sensitive geospatial data only by authorized persons	2	2														
MFED	Central Information Technology Organization	Section	Develop and implement E- Government and ICT policies, strategy and plan of action	Coordinate closely with BNSDI to ensure geospatial matters are well represented in national e-Gov and ICT policy frameworks and strategies	2	2	2													

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MFED	Central Information Technology Organization	Section	Provide ICT related training to government employees and the general public	 Incorporate basic GIS awareness as part of basic ICT training Ensure universal access to GIS technical training for interested government employees and the public Provide GIS as one component of a "Leadership and Technology" summit aimed at raising the awareness of country leadership in regards to the use of information technology as a component of progressive government transformation 	2	2														2
MFED	Central Information Technology Organization	Section	Conduct eGovernment and ICT stakeholder engagement and coordination across government	Facilitate geospatial special interest group participation in e-Government for a Align BNSDI with e-Government stakeholder community engagement programs			2													
MFED	Statistical Institute Belize	Section	Collect, compile and analyze statistical information	 Compile place-based statistical information across all sectors Develop statistical thematic maps by administrative areas Provide tools for field survey data capture Conduct geostatistical analysis of place-based data Access multi-sector data from other organizations for geostatistical analysis Provide geostatistical mapping and graphics Produce geostatical maps and outputs for statistical atlas of Belize 	2	2		2								2				
MFED	Statistical Institute Belize	Section	Conduct population census - Census Planning and Preparations	 Utilize GPS and/or national building database to assist in planning enumeration areas and to establish exact coordinates for most household locations; Use up to date high resolution imagery to verify that all settled areas are being accounted for in the census; Provide accurate and up to date maps to support pre-census household count verification; Produce electronic enumeration district maps to be used by enumerators 	2	2			2											
MFED	Statistical Institute Belize	Section	Conduct census taking	 Provide enumerators with location-aware devices to capture information in digital form in the field while also verifying location; Track and monitor census taking activities and status on a daily basis; Expedite data quality assurance and control workflow 	2													2	2	
MFED	Statistical Institute Belize	Section	Census publishing and distribution	 Support the delineation of statistically logical census reporting areas based on population numbers and typologies (not restricted to original enumeration districts); Publish census maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of population census information to various formats for use by stakeholders in other systems. 	2	2														
MFED	Statistical Institute Belize	Section	Conduct between- census population estimation	Provide tools to tie between-census household surveys to specific locations, and to extrapolate that information to derive place-specific estimations of population change	2	2		2										2	2	

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MFED	Statistical Institute Belize	Section	Conduct special analysis of population data	 Generate population and socioeconomic statistics by police beat; Generate population and socioeconomic statistics for settled areas with no official boundaries; Generate population and socioeconomic statistics by electrical distribution feeder area, water pressure zone, or sewer collection area; Derive consumer profile maps based on profiles provided by commercial vendors of products and services; Generate probably public transit ridership statistics by block face; Identify financially vulnerable populations down to the block level; 	2	2		2												
MFED	Statistical Institute Belize	Section	Publish and disseminate statistical information	 Support the delineation of statistically logical reporting areas based on analysis of location-based raw data; Publish statistic maps and statistics online for immediate consumption by all stakeholders; Provide tools to support download of geostatistical information to various formats for use by stakeholders in other systems. 	2	2		2												
MFED	Statistical Institute Belize	Section	Develop special products	 Provide online tools for different views and combinations of geostatistical information Provide geostatistical analysis services upon request Provide online geostatistical atlas Plan and manage special surveys; Conduct geospatial analysis to derive statistical summaries (e.g. average distance between students and where they go to school, persons within walking distance of a park, etc.); Create geostatistical summaries and analyses from existing geospatial data from other agencies; Produce geostatistical visualizations to better communicate key issues to decision makers and the public; 	2	2		2												
MFED	Statistical Institute Belize	Section	Conduct original surveys	Provide tools for location-based field collection	2	2		2										2	2	
MFED	Statistical Institute Belize	Section	Compile economic statistics	Utilize location-specific business and revenue information to prepare neighborhood and community level economic statistics	2	2		2												
MFED	Statistical Institute Belize	Section	Research and implement new methods and technologies	 Provide tools for location-based field data collection; Explore use of heterogenous data sources with algorithms for statistical pattern analysis for new insights; Test effectiveness of various geostatistical visualizations for communicating issues and concepts Test tools and methods for real-time analysis of information from sensor networks Test new geostatistical tools application to existing raw data 	2	2		2												
MFED	Social Investment Fund	Section	Identify potential projects	 Provide a geospatial reference to submitted project requests; Provide a map interface to access and track submitted project requests over time. 	2	2													2	
MFED	Social Investment Fund	Section	Conduct community needs and assets assessments;	Provide access to neighborhood level socioeconomic data; Provide access to development and environmental context data; Provide access to community infrastructure information; Identify community level natural hazards and vulnerabilities, including those related to climate change; Link community needs surveys to location for current and future reference; Utilize location-aware social media to solicit feedback from community members;	2				2	2	2	2	2							

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MFED	Social Investment Fund	Section	Carry out project appraisals	 Provide access to wide variety of socioeconomic, infrastructure and environmental data to support needs and feasibility assessment; Utilize available data to explain issues and opportunities to community leaders and residents; Track project proposal status geographically. 	2				2	2	2	2	2							
MFED	Social Investment Fund	Section	Facilitate project approval process	 Provide data, visualization and reporting tools to support presentation of proposed projects to the Board of Directors; Provide data, visualization and reporting tools to support presentation of proposed projects to international finance institutions. 	2															
MFED	Social Investment Fund	Section	Manage project bidding process	 Provide bidders with contextual information needed for preparing responsive bid; Provide a map that indicates the location of all registered contractors; Track what projects were carried out by what contractors over time as a historical reference; 	2					2	2	2								
MFED	Social Investment Fund	Section	Supervise project implementation	 Link project management and status reporting information to project locations on a map; Create thematic maps indicating location, characteristics and status of all projects being undertaken; Provide a compiled and geo-located history of all projects overseen by BSIF 	2															
MFED	Social Investment Fund	Section	Conduct monitoring and evaluation	Monitor and assess the specific and cumulative outcomes of development projects	2							2								
MFED	Social Investment Fund	Section	Maintain contractor registry	Maintain geocodes for contractor office locations	2														2	
МОН	All Departments	Section	Provide medical laboratory services;	 Provide ability to link medical samples and test results to geographic locations; Provide selected access to geographically referenced test results for use by planners and researchers. 	2														2	
МОН	All Departments	Section	Manage medical stores;	 Record and display geographic locations of all public health facilities and health centers; Track delivery of medical supplies nationally; Provide spatially enabled dashboard showing the status of supplies in all health facilities and centers; Produce statistical maps and reports of medical supply usage at the facility level; Assess the location effectiveness of existing medical supply facilities and site new facilities; Provide planners and research analysts with access to dispensary data as part of early warning system for disease outbreaks. 					2				2							

					General Data View, Query & Report	ta Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MOH	All Departments	ADMIN_L3 Section	MAJOR_FUNCTION Provide public dental services;	• Provide map of all facilities where public dental services are offered; • Track and monitor mobile clinic locations and history; • Track and monitor urban and rural school dental visits and history; • Utilize location-aware social media for connecting with dental patient community; • Assess the location effectiveness of existing dental health facilities and services and site new programs; • Analyze dental service delivery facilities relative to population census information; • Produce statistical reports and maps concerning dental health at the community level; • Track and analyze dental service delivery by locations over time.	95 0	Data	ď	Ge	2	En	Vu	De	2	Nav	Sp	ă	G G G	Ε	9	O
МОН	All Departments	Section	Support environmental health;	Track and monitor the locations of reported environmental health issues; Assess conditions where environmental health issues arise; Utilize population census data to assess potential exposures to environmental health issues; Utilize location-aware social media to engage with the public in regards to environmental health issues; Analyze environmental health issues and trends over time; Produce statistics concerning environmental health issues at the community level; Monitor and assess effectiveness of responses to environmental health issues over time	2						2						2		2	
МОН	All Departments	Section	Monitor and assess chronic and communicable disease;	 Track and monitor the locations of reported chronic and communicable disease incidents; Assess contextual conditions where epidemiological and chronic disease conditions arise; Utilize population census and public facility data to assess potential exposures to disease outbreaks; Utilize location-aware social media to engage with the public in regards to communicable and chronic disease issues; Plan and track disease outbreak intervention activities; Analyze communicable and chronic disease issues and trends over time; Produce statistical reports and maps regarding communicable and chronic disease at the community level; Monitor and assess effectiveness of responses to disease outbreaks and chronic health issues over time. 	2						2						2	2	2	
МОН	All Departments	Section	Manage health education and participation bureau program;	 Monitor public health issues across the country geographically; Assess historical, current and project future public health conditions and trends; Assess public health issues relative to population census segments; Prepare maps and reports to assist in communicating public health issues and programs to the public; Utilize a map interface to support public health information access, sharing and analysis country-wide; Produce statistics concerning health education and public participation at the community level; Utilize location-aware social media to support two-way engagement with the public in regards to health related issues 	2												2			

ADMIN_L1	ADMIN L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
МОН	All Departments	Section	Manage maternal and child health program;	 Record and access mapped locations of urban and rural health centers; Provide access to birth data; Provide access to population census information and annual updates; Record and monitor pre and postnatal care services by patient location and health care facility; Record and track child immunizations by child home location and health care facility; Record and track micronutrient delivery areas; Record and monitor immune-preventable disease incidents in children by location; Record and track HIV incidents by patient home location; Produce statistics regarding maternal and child health issues at the community level; Assess the location effectiveness of existing maternal and child health facilities and services and site new programs; Record, analyze and track acute respiratory infections in children Monitor, report and evaluate effectiveness of maternal and child health care program interventions over time. 	2		.			3					0,2					
МОН	All Departments	Section	Manage mental health program;	 Record and access mapped locations of urban and rural mental health program facilities; Provide access to population census data; Record and monitor mental health cases; Monitor mobile clinic facility locations and movements; Track mental health issues and trends geographically across the country; Assess the location effectiveness of existing mental health facilities and services and site new facilities and service programs; Produce national statistics concerning mental health issues and trends at the community level; Monitor, report and evaluate effectiveness of mental health care program interventions over time. 	2			2				2								
МОН	All Departments	Section	Manage nutrition and healthy lifestyle promotion program;	 Monitor and track health and lifestyle conditions and trends nationally; Provide access to population census data at the neighborhood level; Provide access to Ministry of Health health statistics at the community level; Map and track nutrition education and outreach activity locations; Provide interactive online maps regarding the conditions and trends of health and lifestyle issues for access by the public; Support research and analysis on health and lifestyle issues in Belize; Monitor and evaluate the effectiveness of public health interventions on health and lifestyle condition is Belize. 	2			2				2								
МОН	All Departments	Section	Manage pharmaceutical services and supplies;	 Provide map locations for all government pharmacies; Provide map locations for all licensed pharmacies; Track all over the counter and prescriptions provided at each pharmacy. Ideally this would be a real-time system that could be used as an early warning system for disease outbreak; Monitor pharmaceutical inventories geographically; Provide access to population census information; Assess the location effectiveness of existing pharmacies and site new facilities and service programs. 	2				2											

ADMIN_L1	ADMIN L2	ADMIN L3	MAJOR FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
мон	All Departments	Section Section	Conduct public health planning and policy development;	Analyze public health issues and trends nationally; Record, monitor and assess the effectiveness of public health facilities and services across the country; Compare public health statistics and indicators at the community level relative to national and international standards; Define and model the potential impacts in public health planning and policy scenarios	2		<u> </u>	0 4	2	3		2	,	2 0	0) 2		0 =	<u>"</u>		<u> </u>
МОН	All Departments	Section	Manage health sector reform project;	 Geographically based analysis of public and private health facility and service demand and supply; Support the formulation of public health sector policies, facilities, services and operations plans and strategies; Track and monitor projects geographically; Monitor and evaluate impacts of health sector reform community, district and national levels. 					2			2								
МОН	All Departments	Section	Develop and manage public health information system	Manage geospatial component of all health information records															2	
MNS	Police Department	HNCIB	Investigate crimes	 Geocode crimes, incidents and complaints to locations; Conduct crime analysis, including the assessment of the geographic patterns of crimes over time; Manage and retrieve crime case file information by location; Trace car navigation system information; 	2									2					2	
MNS	Police Department	Special Branch	Conduct internal intelligence gathering and analysis	 Capture, manage, distribute and correlate geo-intelligence information among multiple organizations; Track gun and ammunition sales and use by location; Define and assess infrastructure and resources vulnerability; Develop contingency response plans; Monitor and track suspicious land, air and sea vessel traffic; 	2									2					2	
MNS	Police Department	Commander Operations	Conduct police dispatch activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 	2									2					2	
MNS	Police Department	Commander Operations	Conduct drug intervention activities	 Capture, manage, distribute and correlated geo-intelligence information among multiple organizations; Map and monitor suspected drug production, transport and distribution networks; Develop and implement intervention plans. 	2									2					2	
MNS	Police Department	Commander Operations	Monitor and track released felons	Track released felons by residential and work address or other geographic location; Make released felon information accessible for crime analysis and related policing functions; Support and track probation officer activities	2									2				2	2	

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNS	Police Department	Commander Operations	Carry out preventative patrols	 Monitor locations of incidents, complaints, and reports; Monitor released felon locations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Geospatially enabled computer aided dispatch; Crime analysis and asset deployment management; Fleet tracking and management. 	2									2				2		
MNS	Police Department	Commander Operations	Conduct gang suppression activities	 Tracking gang areas and activities; Tracking of released felons with gang associations; Utilize geospatially enabled social media to strengthen interface with local neighborhoods; Crime analysis and asset deployment management; Track known gang member residence by address; Monitor gun and ammunition purchase and use. 	2												2		2	
MNS	Police Department	Commander Operations	Conduct national traffic management	Record and analyze traffic accidents by location Develop and maintain inventory of traffic safety signage, markings, pedestrian crossings and other relevant features Analyze traffic accident concentrations and trends over time Produce traffic accident analysis and statistical output maps and reports	2														2	
MNS	Police Department	Commander Operations	Conduct special patrol operations	 Prepare special patrol plans; Provide common operating picture for special patrol activities; Monitor and track special patrol activities. 	2									2						
MNS	Police Department	Commander Operations	Support joint emergency response	Maintain inventory of security staging facilities and equipment Identify security risks associated with natural hazard vulnerable populations, facilities and infrastructure Support preparation of the security component of the national emergency contingency and response plans Provide access to common operating picture mapping during emergency response Provide tools for tracking vehicles and human resources during emergency response	2	2								2				2	2	
MNS	Police Department	Police Information Technology Unit	Conduct facility and asset management	Develop and maintain inventory of police facilities, fixed and movable assets Prepare maintenance plans and contracts Maintain police facility space plans Plan and conduct maintenance inspections Plan for facility and equipment refurbishment and replacement	2	2							2							

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
MNS	Police Department	Police Information Technology Unit	Develop, manage and operate crime information system	 Provide GIS support to address the needs of the Belize Police Department Maintain facility map and records for police ICT network assets Support GIS training for police personnel Provide online mapping capability Provide geospatial tools for application development ICT geospatial research, assessment, testing and documentation Administration and Training of all ICT services including GIS Provide GIS tools for the development, infrastructural management and administration of the Crime Information Management System (CIMS) Support ICT Crisis Emergency Response Support location-based public education and communication (social network) Support geospatial aspects of systems analysis GIS software development Crime Mapping Geospatial data quality qssurance Geosptial analysis of CIMS records 	2								2					2		2
Regional	CCCCC	Sections	Conduct climate modeling;	 Analyze and assess climate conditions and trends; Refine regional models utilizing locally available national data; Provide input to climate change vulnerability analysis; Monitor and refine trend forecasts and vulnerability assessments over time. 	2	2														
Regional	CCCCC	Sections	Conduct CARIWIG Project;	 Assess climate change related hazards and vulnerabilities Compile and manage from hydro-meteorological and environmental data Prepare hazard and vulnerability maps Train project participants in climate change tools and methods 							2	2	2							
Regional	CCCCC	Sections	Manage SIDS DOCK Program;	 Conduct renewable energy potential geographic analysis; Prepare inventory and assessment of existing energy supply and demand; Support Climate-Smart energy program planning and development; Provide a repository (knowledge network) of data and information regarding the application of geospatial tools and data to renewable energy planning and development; Support renewable energy project formulation and feasibility assessment; Support renewable energy project engineering and design; Provide asset management framework for renewable energy system operations and maintenance; Monitor and evaluate single and cumulative project effectiveness over time. 	2	2					2	2	2							

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Regional	cccc	Sections	Manage Pilot Program for Climate Resilience:	 Develop and pilot geospatial tools, techniques and data modeling sound practices and standards for climate risk assessment and resiliency planning; Support capacity building for use of geospatial technology and methods; Support integrated surveillance system (ISS) and early warning systems for vector borne disease; Develop and disseminate geospatial tools and methods for improving regional climate monitoring and projections, and applying multi-sector (water, health, agriculture and marine) adaptation strategies; Provide framework for scaling pilot geospatial tools and methods to other countries and regionally; Establish NSDI in member countries to institutionalize optimum coordination, information sharing and utilization for climate-smart, sustainable development. 	2	2					2	2	2							2
Regional	CCCCC	Sections	Planning for climate compatible development in the Caribbean regional framework;	 Introduce GIS and NSDI as an integral aspect of scientific and evidence-based climate change risk assessment and adaptation strategy development across all potentially impacted sectors; Establish institutional and technical mechanisms to facilitate open access to shared information resources across national and regional stakeholder communities; Provide visualization tools to communicate issues and alternative plans to decision makers and the public; Develop place-based strategies and defensible project plans for optimizing renewable energy utilization and attracting new investment; Assess climate change vulnerable populations and infrastructure and develop effective mitigation and resilience measures; Provide tools and methods for the effective inventory, management and utilization of standing forests; Provide effective tools and information for geographically based monitoring, evaluation and adaptive management options related to climate change related environmental and infrastructure conditions and trends; 	2	2				2	2	2	2							2
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Meteorological and Hydrological Data and Projections	 Provide geospatial framework for precipitation and general meteorological monitoring; Conduct a spatial assessment to support expansion of the meteorological monitoring network; Support geographically-based climate modeling and forecasting; Assess potential climate change impacts to agricultural productivity, tourism, and infrastructure Conduct a spatial assessment to support expansion of the hydrologic monitoring network; Provide framework for sharing of information among all the various groups currently maintaining meteorological and hydrological data and projections 	2	2					2									

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Regional	CCCCC	Sections Sections	Caribbean regional environmental change observing network - Hazards and Risks	 Conduct flooding vulnerability assessment based on conditions and trends; Forecast drought conditions and possible impacts to agriculture and water availability; Assess current and future projected hazard potential and vulnerability of communities, infrastructure and resources at risk of damage from hurricanes and storm surge impact; Assess and monitor beach erosion; Assess risk to disease and pest distribution and impacts to human health and agriculture; Provide framework for sharing of information among all the various groups currently hazard and risk assessments; 	2	2		O		4	2		*	0 2	0) =		0 =	<u>.</u>		
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Geographical and Biophysical Environment	 Support detailed topographic modeling and analysis; Provide a geographic basis for terrestrial ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining terrestrial resource and monitoring data; 	2	2					2									
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Coastal Zone and Ocean	 Support detailed bathymetric and hydrodynamic modeling and analysis; Provide a geographic basis for marine ecosystem and biodiversity monitoring and assessment of potential climate change impacts; Provide framework for sharing of information among all the various groups currently maintaining marine resource and monitoring data; 	2	2					2									
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Land Cover and Land Use	 Provide geospatial framework for the inventory and monitoring of land use and land cover change; Forecast potential impacts to existing land use and land cover from climate change; Support the management of protected areas and parks in both terrestrial and marine environments; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or enforcing protected areas and parks; 	2	2					2									
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Agriculture and Food Security	 Provide geospatial framework for the inventory and monitoring of agriculture and agricultural productivity; Assess and monitor existing agricultural productivity; Assess and forecast seasonal agricultural productivity and potential impacts of climate change; Support the mapping and assessment of soils for various agricultural purposes; Provide framework for sharing of information among all the various groups currently involved with food security and planning 	2	2		2												
Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Water: Availability, Quality, and Use	 Support the inventory, monitoring and assessment of water availability, quality and use; Assess the potential impacts of climate change on water availability; Provide a geographic basis for monitoring water abstractions and trends; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using water resource data; 	2	2		2												

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Regional	CCCCC	Sections	Caribbean regional environmental change observing network - Energy: Use, Generation, Availability	 Provide geospatial framework for the inventory and monitoring of existing energy supply and demand; Support geographic-based forecasting for future energy demand; Support the inventory and analysis of potential new renewable energy resources; Support the planning, design and development of new energy infrastructure; Support the operations and maintenance of energy infrastructure; Assess the vulnerability of existing and planned energy sources to climate change; Provide framework for sharing of information among all the various groups currently involved in managing, monitoring or using energy resource data; 	2	2		2				2	2							
Regional	cccc	Sections	Caribbean regional environmental change observing network - Socio-Economic Status	 Support the inventory and monitoring of commercial and industrial activities; Inventory and monitor the job market and household income levels and trends; Monitor and assess socio-economic status at the neighborhood level; Identify communities that are most susceptible to natural disaster impacts and economic shocks Provide framework for sharing of information among all the various groups currently involved in the planning, development and supply of community and social services; 	2	2					2									
Regional	cccc	Sections	Caribbean regional environmental change observing network - Critical and Emergency Infrastructure	 Conduct hazard assessment and identify vulnerable populations and infrastructure at risk; Formulate adaptation strategies to minimize risks to populations and infrastructure; Prepare and record emergency contingency and response plans; Inventory and record location of emergency response resources; Provide a common operating picture for multi-user coordination during emergency response events (rescue and evacuation, food, water, medical supplies, etc.); Support the planning and implementation of post-disaster recovery activities. 	2	2					2							2		
Regional	CCCCC	Sections	Conduct EU GCCA project	Support the compilation, management and analysis of climate monitoring data Provide more detailed local data to calibrate and refine regional climate models Conduct climate analysis and impact studies Conduct hazard and vulnerability analysis for populations, community facilities, infrastructure and environmental resources Provide information and tools to support the identification, formulation, design, implementation, monitoring and assessment of climate adaptation projects Support the formulation of programs and projects that can increase access to carbon financing	2	2					2	2	2							

ADMIN L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Regional	cccc	Sections	Coordinate 2011-2015 Caribbean regional resilience development implementation plan;	 Utilize the BNSDI as a comprehensive common repository for access to information about Belize; Support better and more defensible project formulation, design and feasibility analysis; De-risk projects through systematic analysis and utilization of accurate, authoritative data, and thereby attracting a broader range and diversity of project financing options for development of new climate smart infrastructure; Support more coordinated efforts among organizations and sectors; Provide a comprehensive information framework for project monitoring and evaluation; Provide a project dashboard to understand the location, extent and status of funded project works; Provide a geographically based historic record of projects and trends; Assess cumulative impact and program effectiveness. 	2		,		2	2	2	2	2							
Regional	CCCCC	Sections	Coordinate 2012-2013 Caribbean risk management program;	Provide GIS and NSDI as an enabling environment for climate smart government and development;	2	2			2	2	2	2	2							
Regional	CCCCC	Sections	Coordinate 2012-2014 Australian Caribbean Coral Reef Collaboration;	 Provide GIS and NSDI as an enabling environment for climate smart coral reef science, policy and management; Support the inventory and assessment of coral reefs throughout the Mesoamerican barrier reef system; Monitor and assess reef health and trends over time; Provide a geographic basis for reef protection and regulatory enforcement; Provide framework for sharing of information among all the various groups currently involved in the protection, management and use of coral reef environments. 	2	2		2		2										
Regional	cccc	Sections	Manage coastal protection for climate change adaptation in the small island states in the Caribbean;	 Support inventory and assessment of coastal ecosystems and ecosystem services; Assess the vulnerability of coastal ecosystems and services to various climate change impacts; Support the formulation and modelling of alternative investment options; Provide a geographic basis for coastal ecosystem monitoring and adaptive management; Capacity building using geospatial tools, methods and "spatial thinking" to address coastal ecosystem management matters in a holistic, systemic and place-based manner. 	2				2	2	2									
Regional	CCCCC	Sections	Manage the organization's information and communications infrastructure.	Compile and maintain repository of geospatial data Provide geoportal for discovery and discovery of available geospatial data resources Link to other relevant local, regional and international data federations	2	2														
Regional	CATHALAC	Sections	Provide education and training	Provide access to technical education courses and infrastructure; Provide channel for student exchange and study abroad Establish and maintain online learning opportunities	2	2														2

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Regional	CATHALAC	Sections	Provide specialized services	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods for integrated water resource management; Technical cooperation and sharing of information and methods for hazard and vulnerability assessment; Technical cooperation and sharing of information and methods for environmental monitoring. 	2	2														
Regional	CATHALAC	Sections	Compile, manage and publish geographic information	 Provide infrastructure and tools for the compilation, processing, discovery and dissemination of geospatial data Provide analytical and visualization tools to support the development and dissemination of specialized derivative information products Provide online access to data and application services in standardized formats 	2	2														
Regional	CATHALAC	Sections	Support regional cooperation	 Participate in regional and international initiatives for disaster management and emergency response; Participate in regional and international initiatives for water and environmental management; Participate in regional and international technical advisory fora 	2	2														
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Compile, manage and disseminate agriculture knowledge and information;	Provide access to information regarding the application of GIS and SDI to the agriculture sector; Provide a geographic framework for geo-referencing and accessing bibliographic information regarding projects, reports, technical bulletins, and other resources	2	2									2					
Regional	Inter- American Institute for Cooperation on Agriculture	Sections	Support agricultural development strategies and projects	 Provide access to comprehensive agricultural census and farm data; Provide access to population census at the community and neighborhood levels; Provide access to topographic and natural resources information; Provide access to geographically based natural hazard information; Provide access to climate change induced hazard forecast information; Support analysis of existing situation and identification of issues, opportunities and constraints; Provide tools and information infrastructure to support agriculture research and development activities; Provide geographic framework for working with local communities and compiling local knowledge about the current situation; Provide maps and information to support farming community meetings and workshops; Strengthen the formulation and assessment of proposed agriculture development projects; Provide tools and data to support community based problem identification and solution development; Monitor and evaluate program outcomes geographically over time. 	2	2			2	2	2	2								
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to hurricane wind exposure	Compile historical hurricane wind data; Refine existing wind models with topography, land cover data and other relevant information; Assess extreme and average local hurricane wind exposure geographically utilizing refined wind model.	2	2					2									

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Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to storm surge and wave exposure	 Compile historical storm surge data; Refine existing storm surge models with topography, bathymetry, and land use/land cover data for coastal areas; Assess extreme and average storm surge exposure geographically utilizing refined storm surge model. 	2	2	,				2							_		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Determine areas subject to flooding from excessive rainfall	 Compile historical flooding and stream gauge data; Refine existing wind models with topography and drainage data; Assess extreme and average flooding exposure geographically utilizing refined flooding model. 	2	2					2									
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify built environment resources at risk	 Identify buildings and structures within areas exposed to wind, storm surge or flooding; Identify transportation routes, bridges and structures within areas exposed to wind, storm surge or flooding; Identify electrical, water, telephone and other critical infrastructure within high risk areas. 	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify government and other critical facilities at risk	 Identify critical government offices and facilities within areas exposed to wind, storm surge or flooding; Identify hospitals, schools, and other social critical facilities within high risk areas. 	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify touristic and other commercial facilities at risk	• Identify touristic and other commercial buildings, facilities and commercial enterprises within areas exposed to wind, storm surge or flooding that could be disrupted.	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify populations at risk	Identify population concentrations within high risk areas	2	2					2									
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Identify agricultural resources at risk	Identify agricultural farms, facilities and fields within areas exposed to wind, storm surge or flooding that could be damaged.	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate built environment vulnerability	 Determine the vulnerability of buildings and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures; Determine the vulnerability of transportation routes, bridges and structures to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the roadways and structures; Determine the vulnerability of electrical, water, telephone and other critical infrastructure within high risk areas based on the type and degree of exposure and the physical characteristics of each utility network. 	2	2					2		2							

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ADMIN_L1 Regional	Caribbean Catastrophe Risk Insurance Facility	ADMIN_L3 Sections	MAJOR_FUNCTION Calculate risk and establish policy - Calculate vulnerability of government and other critical facilities at risk	• Determine the vulnerability of government buildings and other critical facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures;	2	2	<u> </u>	8 A	De	Er As	2	De Me	2	Na an	S _M	Ш	9 1	Ĕ	ŏ	ō
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of touristic and other commercial facilities	Determine the vulnerability of touristic and other commercial buildings and facilities to wind, storm surge or flooding damage based on type and degree of exposure and the physical characteristics of the structures and facilities;	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Calculate vulnerability of populations at risk	 Determine the vulnerability of populations within high risk areas based on the potential structural damage to homes and sources of employment. Assess socioeconomic situation and financial resilience and potential self-reliance of neighborhoods during an emergency 	2	2					2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to built environment	Calculate potential damage based on exposure and vulnerability assessments.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to government and other critical facilities	Calculate potential damage based on exposure and vulnerability assessments.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted damage to touristic and other commercial facilities	Calculate potential damage based on exposure and vulnerability assessments.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model predicted impacts to populations at risk	Calculate potential loss of life and injury based on exposure and vulnerability assessments.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to built environment	Calculate cost of damage based on coefficients.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to government and other critical facilities	 Calculate cost of damage based on coefficients. Calculate cost of restoring priority facilities to operational condition for disaster recovery. 							2		2							

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of damage to touristic and other commercial facilities	 Calculate cost of damage based on coefficients; Calculate lost revenue and economic activity for each facility. 		_					2		2					_		
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Calculate risk and establish policy - Model cost of impacts to populations at risk	Calculate cost of emergency response to each neighborhood based on predicted loss and injury, access, and other issues.							2		2							
Regional	Caribbean Catastrophe Risk Insurance Facility	Sections	Process post-disaster payout.	Calculate hazard scenario and correlate to insurance provisions							2		2							
Regional	National Aeronautical and Space Agency	Sections	Collect and publish satellite remote sensing data;	Provide integrated tools to discover and assess available geospatial data and imagery Provide online access to data and applications services for basic and derived data	2	2														
Regional	National Aeronautical and Space Agency	Sections	Conduct and/or support special studies.	 Provide access to specialized technical expertise and infrastructure; Technical cooperation and sharing of information and methods for environmental modeling and analysis; Technical cooperation and sharing of information and methods in multiple disciplines Provide funding and technical support for special studies 	2	2														
Utilities	Belize Electric Ltd.	Sections	Electric utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor power consumption rates and trends geographically; Monitor long term climate trends and assess impacts on hydroelectric power generation; Monitor the adoption of local power generation from renewable sources (solar, wind, etc.); Track new highway and road development; Model all of the above to assess potential future demand and load growth scenarios geographically over time; Assess feasibility of supplying powers to more remote communities; Assess emerging technologies and methods for smart power management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future power transmission and substation facilities; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate power facilities; Environmental impact assessment for planned facilities; Develop and illustrate defensible future electrical utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Develop renewable energy atlas for Belize to support planning, design and development of sustainable energy for the Country (also see MESTPU stakeholder survey write-up); Monitor, assess and recalibrate plans proactively over time based on 	2	2			2	2	2	2	2					2	2	

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY changing conditions and trends.	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic	Field GIS	Geocoding	Online Training
Utilities	Belize Electric Ltd.	Sections	Electrical network design and construction	 Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand load forecasting and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to fixed asset inventory. 	2	2			2	2	2	2	2		2					

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Utilities	Belize Electric Ltd.	Sections	Electrical network operations and maintenance	 Provide a complete geospatially located fixed asset inventory; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid outage analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for SCADA visualization and control from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 	2	2						2						2	2	
Utilities	Belize Electric Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Route meter readers Cluster and route complaint followup activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 	2	2								2						
Utilities	Belize Electric Ltd.	Sections	Manage ICT systems	Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data	2	2														

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Seocoding	Online Training
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer utility systems planning	 Monitor urban development plans and changes in land ownership; Monitor population growth, densification and expansion geographically; Monitor water consumption rates and trends geographically; Monitor socioeconomic trends and their impacts on water consumption; Monitor long term climate trends and assess impacts on water resources; Track new highway and road development; Model all of the above to assess potential future demand and demand growth scenarios geographically over time; Assess feasibility of supplying water and sewer services to more communities; Assess emerging technologies and methods for smart water and sewer system management; Conduct utility siting opportunity and constraint modeling to determine best potential routes for future water source and transmission facilities, sewer treatment plant and related works; Automate design and as-built record management; Conduct spatial analysis to determine optimum routing for distribution networks; Plan for land acquisition to accommodate water production and sewer treatment facilities; Environmental impact assessment for major planned facilities; Develop and illustrate defensible future water and sewer utility expansion plans in a compelling manner that can be easily understood by the utility Board, Public Utilities Commission (PUC), policy makers and the general public; Monitor, assess and recalibrate plans proactively over time based on changing conditions and trends 	2	2			2	2	2	2	2							
Utilities	Belize Water Supply Ltd.	Sections	Water and sewer network design and construction	Base mapping – providing up to date and accurate information concerning existing roads, buildings, and other infrastructure; Land ownership and land use; Demand and contribution calculations and system modeling; Facility siting analysis; Alternative network design analysis; Construction drawings in real world coordinates, usable with other information in GIS; Construction management and status tracking; As-built data consolidation; Transfer of as-built inventory to GIS-enabled fixed asset inventory.	2	2						2	2							

					General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Utilities Utilities	Belize Water Supply Ltd.	ADMIN_L3 Sections	Water and sewer network operations and maintenance	 GEOSPATIAL ACTIVITY Provide a complete geospatially located fixed asset inventory for all water and sewer systems; Common fixed asset registry between mapping, financial and maintenance management system components; Schedule and route preventive maintenance activities, and tie work orders to specific maintained assets; Access up to date and accurate land use, cadastral, detailed aerial photography, high resolution satellite and other information from other entities; Identify and route ad hoc maintenance activities and tie work orders to specific maintained assets; Rapid main break analysis and response support; Tie customer complaint calls to location; Automatically generate schematic diagrams for water control system from the GIS maps, thus eliminating redundant data maintenance and ensuring systems data is consistent and up to date; Provide mobile devices to field crews to access as-built network data and record redlining and other observations in the field to correct or update the facility mapping database; Assess historical maintenance activities to identify repeat problem areas or devices; Provide geospatially enhanced view of all fixed assets and preventive and reactive maintenance and trends over time for planning and PUC reference. 	2	2	ง ร	GG Ar) O	Er As	× ×	ğ	2 2	N≼	N. W.	E	<u> </u>	Ë	ğ	Ō
Utilities	Belize Water Supply Ltd.	Sections	Customer care	 Geospatially located meters and ability to tie customer information to locations and to analyze and visualize the character and distribution of consumption, complaints and other transactions over time; Cluster and create routes for complaint follow-up activities for more rapid and efficient response; Maintain geographically enhanced customer satisfaction profiles and monitor key performance indicators over time 	2	2						2	2							
Utilities	Belize Water Supply Ltd.	Sections	Participate in emergency preparedness and response activities.	 Pre-identify specific neighborhoods and water and sewer infrastructure that is likely to be damaged in major events. Work this information into contingency and response plans; Record sources and measures for temporary potable water supply and sanitary accommodation post disaster; Manage water and sewer system status information during response; Track and manage field staff activities during response; Manage and track damage repair and mitigation activities; Record activities and assess effectiveness for post-disaster refinement of contingency plans. 	2	2					2									
Utilities	Belize Water Supply Ltd.	Sections	Manage ICT systems	Provide geospatial data and tools as an integral component of the utility's information infrastructure Provide user assistance and technical support for geospatial matters Provide programming tools for the integration of geospatial functions within enterprise business application software systems Utilize geospatial dimension as a mechanism for integrating and associating disparate databases together Provide specialized tools and methods for the administration of geospatial data	2	2														

ADMIN L1	ADMIN L2	ADMIN L3	MAJOR FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial consulting and technical services	 Provide stakeholders with technical consulting support; Support GIS users in developing and maintaining their GIS infrastructure; Support geospatial database development projects; Support geospatial application software development projects; Conduct geospatial analysis and visualizations projects on behalf of clients; Prepare capacity building and training programs. Work with Esri to Develop a National Basemap for Belize 	2	2									<i></i>			-		2
Private Sector	Total Business Solutions Ltd.	Sections	Provide geospatial computing infrastructure and software products	 Provide stakeholders with quality hardware and software products and support; Introduce and promote new emerging products to the marketplace; Expand the geospatial technology user community through marketing and sales activities. Provide immediate access to Esri's growing Partner Community for required software 																
Private Sector	Total Business Solutions Ltd.	Sections	Support geospatial awareness, education and training	Build awareness and appreciation for geospatial technology across all sectors in Belize; Support GIS incorporation to all levels of the education system by hosting events (World GIS Day, My Virtual City Competition, Presentation to Teachers) to support its GIS Education for Primary and Secondary Schools initiative Provide technical geospatial software and hardware training; Provide student internships for gaining practical skills in a private sector setting																2
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Record and promote membership	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide real estate geographically based information services that attract new membership to the association. 	2	2														2
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Lobby relative to policies and regulations affecting the real estate market;	 Lobby for access to government geospatial information that is relevant to the real estate industry; Analyze the potential impacts of policies and regulatory proposals and options on development and real estate; Monitor and evaluate the impacts of policies, regulations and activities on the real estate market over time. 	2	2														
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Disseminate information regarding real estate in Belize;	 Provide member with access to selected government data that are relevant to the Real Estate industry; Provide a geographically enabled multiple listing service to track properties for sale; Provide a geographically enabled method for tracking real estate sales and analyzing comparable properties for market valuation purposes; Provide an ability to track development projects and analyze development and property value trends over time; Provide access to natural hazard information and identification of vulnerable properties; Identify properties that may be impacted by climate change over time; Provide access to real estate information over the internet, both to support local as well as international users; Forecast the likely impacts of policies, regulations and trends on the real estate market over time and make this information available to association members. 	2	2			2		2									

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Professional Associations	Association of Real Estate Brokers of Belize	Sections	Build capacity of real estate professionals in Belize	 Conduct workshops to raise the awareness regarding how GIS and BNSDI can be used to support real estate activities; Provide access and training in the use of GIS enhanced tools for real estate marketing, valuation, trend analysis, development tracking and other relevant issues. 	2	2													2	
NGO's	Belize Tropical Forest Studies	Sections	Develop and maintain BERDS	 Provide a geospatial data warehouse for the storage and management of commonly needed information; Provide metadata catalog and tools to allow stakeholders to locate useful information; Provide online mapping services to allow stakeholders to access and use geospatial information for their own purpose; Provide help desk and technical support for BERDS stakeholders; Link geospatial location data with other information media (sample, photo, observation, sound, video, etc.). 	2	2				2								2		
NGO's	Belize Tropical Forest Studies	Sections	Conduct biodiversity assessments of protected areas and private lands	 Access and compile geospatial and related information from multiple sources; Conduct and record environmental species observations; Delineate habitat and other environmental resource data based on image interpretation combined with ground truthing; Observe species movement with tracking devices; Assess species habitat, population and population status and trends information; Assess and delineate species ranges, including migratory patterns; Conduct environmental issue, opportunity and constraint analysis; Prepare environmental impact assessment analyses and reporting 	2	2				2								2		
NGO's	Belize Tropical Forest Studies	Sections	Participate in technical partnerships	 Coordination and alignment of activities and resources where shared interests are involved; Sharing of geospatial data resources among partners; Conduct joint research; Jointly lobby for changes in policies and practices affecting GIS or BNSDI 	2	2														
NGO's	Friends for Conservation and Development	Sections	Conduct co- management of the Chiquibul National Park and Cave System;	 Map and record inventory of ecological resources of the National Park and surrounding bio-geographical region; Map and record communities and other human land use; Analyze park development issues, opportunities and constraints; Conduct ecological analysis and identify conservation issues, opportunities and constraints; Maintain ongoing geographically referenced record of incidents; Monitor land use change; Coordinate and share incident information with Belize Defense Force and Police; Utilize geo-enabled social media for two-way exchange with local communities; Coordinate and share information with other stakeholders; Prepare and record national park management plan; Monitor and assess ecological and biodiversity status over time; Produce tourism maps and information for the National Park; 	2	2							2	2	2			2	2	
NGO's	Friends for Conservation and Development	Sections	Conduct environmental education and awareness;	Produce education and awareness materials; Link surveys to locations where they were conducted; Link education and awareness programs to specific communities where these have been conducted.	2	2														2

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ADMIN_L1 NGO's	Friends for Conservation and Development	ADMIN_L3 Sections	MAJOR_FUNCTION Conduct community support programs;	GEOSPATIAL ACTIVITY Share population census information for communities that affect the National Park on both sides of the border; Plan and track community outreach programs; Establish location aware social media channels for two way interaction with communities; Provide geographically based recording of community based conservation success stories.	2	2	<u> </u>	04) () ()	ш ∢)	:> ४	ΔΣ	V	<u> </u>	ωΣ	ш	. <u>0 =</u>	<u> </u>	<u> </u>	0
NGO's	Friends for Conservation and Development	Sections	Conduct environmental monitoring and research;	Monitor biological resource conditions and trends; Monitor ecosystem health and landscape change; Track locations and associated information regarding specific research studies; Utilize environmental monitoring and research results for conservation planning and policy making.	2	2				2										
NGO's	Friends for Conservation and Development	Sections	Development and promotion of policy recommendations;	 Monitor and report biological resource conditions and trends, and identify priority issue "hot spots"; Solicit opinions regarding community based conservation ideas and priorities; Model the likely outcomes of various policy and plan scenarios; Utilize geographic information and visualization tools to explain complex issues to decision makers and the public. 	2	2		2												
NGO's	Friends for Conservation and Development	Sections	Conduct bi-national cooperation;	Support sharing of geographic information across national borders; Share incident and related security information; Plan and implement coordinated community education programs and monitor outcomes; Share research information and research program planning and execution.	2	2														
NGO's	Friends for Conservation and Development	Sections	Conduct cave management;	 Develop and record comprehensive inventory of the cave system and related information; Conduct issue, opportunity and constraint analysis for use of portions of cave system for touristic development, ongoing research, and other uses or conservation; Support cave system environmental monitoring and assessment; Utilize cave data to support education and awareness programs 	2	2														
NGO's	Programme for Belize	Sections	Placeholder																	
NGO's	Belize Audubon Society	Sections	Placeholder																	
NGO's	Red Cross of Belize	Sections	Placeholder														_			
Academic & Research	University of Belize	Environmental Research Institute	Manage the National Biodiversity Monitoring Program (NBMP)	 Analyze and establish monitoring priorities and sites; Develop and disseminate data collection and content standards; Collect, manage and disseminate biodiversity management data; Provide data analysis and visualization maps and reports regarding biodiversity conditions and trends; Provide access to wide range of contextual data from other BNSDI stakeholder organizations; Identify and monitor threats to biodiversity and habitat; Monitor biodiversity issues, opportunities and trends and provide input to the formulation of policies, plans and projects 	2	2				2										

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic	Field GIS	Geocoding	Online Training
Academic & Research	University of Belize	Environmental Research Institute	Manage the Belize Spawning Aggregation Working Group (SPAGS)	 Provide geographic base for the management, monitoring and patrolling of spawning aggregation sites; Develop location aware social media applications to help support the involvement of multiple stakeholders in monitoring, research an patrolling of spawning aggregation sites; Collect, manage and disseminate spawning aggregation data; Provide geospatial and statistical analysis tools to assess spawning conditions and trends, identify pressures, and monitor enforcement actions; Formulate and provide recommendations for conservation, protection and sustainable use of spawning aggregation sites; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of the spawning aggregation sites; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	2	2		2									2	2		2
Academic & Research	University of Belize	Environmental Research Institute	Support the National Coral Reef Monitoring Network (NCRMN)	 Provide geographic base for the compilation, management and sharing of coral reef monitoring data; Utilize location aware social media applications to help support the involvement of multiple stakeholders in monitoring and reporting coral reef observations; Provide geospatial and statistical analysis tools to assess coral reef conditions and trends, identify pressures, and monitor interventions; Formulate and provide recommendations for conservation, protection and sustainable use of coral reefs; Support development of educational materials for stakeholders and the public; Produce analysis and visualization outputs to advocate and build support for the management, conservation, protection and sustainable use of coral reefs; Provide data and analysis results for input to the formulation of related policies, plans and activities of other organizations. 	2	2		2		2										
Academic & Research	University of Belize	Environmental Research Institute	Conduct Terrestrial Mapping	Provide geographic base for the compilation, management and sharing of coral reef monitoring data;	2	2				2										
Academic & Research	University of Belize	Environmental Research Institute	Assess Potential Impacts of Climate Change on Belize Water Resources	 Provide geographic base for the compilation, management and sharing of surface and groundwater quantity and quality information; Provide access to current and historical weather data and forecasts; Provide access to water extraction permits and monitoring information; Provide access to topographic, land use, land cover, soils and other data available from the BNSDI community; Provide geographic-based tools for the assessment, monitoring and reporting of water resource conditions and trends; Develop and model the potential impacts of water resource management policy and plan options; Produce easy to understand analysis output maps and reports to help communicated water resource management issues to decision makers and the public. 	2	2					2									

ADMIN_L1	ADMIN_L2	ADMIN_L3	MAJOR_FUNCTION	GEOSPATIAL ACTIVITY	General Data View, Query & Report	Data Publishing	Spatial eGovernment	Geostatistical Analysis	Development Management	Env Sensitivity Assessment	Vulnerability Assessment	Development Project Mgmt	Asset Management	Navigation, Routing and Tracking	Spatial Document Management	Executive Dashboard	Geographic Information	Field GIS	Geocoding	Online Training
Academic & Research	University of Belize	Environmental Research Institute	Conduct Sea Turtle Nest and Wildlife Monitoring	 Provide geographic base for the compilation, management and sharing of wildlife monitoring data among qualified stakeholders; Provide tools for the analysis and visualization of wildlife monitoring data and trends; Assess threats and pressures to wildlife populations; Generate analysis maps and reports regarding wildlife population issues and trends for decision makers and the public; Provide wildlife consideration inputs to the policies, plans and activities of other organizations. 	2	2				2	2									
Academic & Research	University of Belize	Environmental Research Institute	Conduct National Training Program for Protected Areas Management (NTPPAM)	 Incorporate geospatial tools and methods to the Protected Areas Management program; Provide access to wide range of environmental and related contextual GIS data from the BNSDI community; 	2	2														2