



**USAID**  
FROM THE AMERICAN PEOPLE

# LIBERIA ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT (ETOA)

## GIS and Spatial Data Infrastructure: Final Assessment and Recommendations

September 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by Development Alternatives, Inc.

# LIBERIA ENVIRONMENTAL THREATS AND OPPORTUNITIES ASSESSMENT (ETOA)

## GIS And Spatial Data Infrastructure: Final Assessment and Recommendations

Submitted to:

USAID/Liberia, Office of Economic Growth

Task Order EPP-I-02-06-00021-00 under the Prosperity, Livelihoods and Conserving Ecosystems  
Indefinite Quantity Contract (PLACE IQC)

Submitted by:

Development Alternatives Inc.

7600 Wisconsin Ave., Suite 200

Bethesda, MD 20814

Tel: (301) 771 7600

Fax: (301) 771 7777

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

## **CONTENTS**

ACRONYMS .....	2
INTRODUCTION .....	3
NATIONAL SPATIAL DATA INFRASTRUCTURE .....	5
NSDI Rationale .....	5
Good Governance.....	6
Project Management Decision Support.....	6
NATIONAL SDI WORKSHOPS .....	7
Metadata Workshop Summary.....	7
Open Source GIS Seminar Summary .....	8
SDI National Workshop Summary .....	8
SDI ROAD MAP FORWARD .....	10
NSDI Components .....	10
Approach .....	11
Political Will.....	12
SUMMARY .....	13

## **ANNEXES**

ANNEX A: LIBERIA NATIONAL GIS CO-ORDINATION UNIT TERMS OF REFERENCE.....	14
--	----

## ACRONYMS

CTO	Cognizant Technical Officer
EPA	Environmental Protection Agency
ETOA	Environmental Threats and Opportunities Assessment
FDA	Forestry Development Authority
FGDC	Federal Geographic Data Committee
GDSC	Geospatial Data Steering Committee
GIS	Geographic Information Systems
GSDIA	Global Spatial Data Infrastructure Association
GTCU	Geospatial Technology Coordination Unit
ISO	International Organization for Standardization
IT	Information technology
LISGIS	Liberia Institute for Statistics and Geo-Information Services
MLME	Ministry of Lands, Mines and Energy
NCDS	National Capacity Development Strategy
NSDI	National Spatial Data Infrastructure
SDI	Spatial Data Infrastructure
TOR	Terms of Reference
USAID	U.S. Agency for International Development

## INTRODUCTION

Geospatial data stored, managed and shared in a public spatial data infrastructure (SDI) provides important resources for multi-sectoral project management. Liberia's SDI initiative – under USAID's Environmental Threats and Opportunities Assessment (ETOA) program - has culminated in series of recommendations described in this document for harmonizing and documenting spatial data, promoting unified data management and promoting the use of spatial data and related analysis through building capacity in open source geospatial technologies. A National SDI (NSDI) initiative provides support to inter-agency collaboration and coordination helping to leverage geospatial data investments and reduces waste associated with redundancy. The Liberia Ministry of Planning has identified the need to provide a basis for the provision of public sector spatially referenced information to support the National Capacity Development Strategy (NCDS). SDI implementation provides a public resource by which geospatial data can be distributed to any public or private sector agency requiring this information for program planning, monitoring and or reporting.

Liberia is transitioning from a post-conflict state to a pluralistic democracy. Development agencies working in Liberia require reliable information by which to make informed rural development decisions. The 15 year civil war had a deleterious impact on the Liberian information technology infrastructure. Communication infrastructure and web access are slowly being restored and improved. Internet is becoming increasingly available to Government and non-government institutions fostering greater capacity to develop and exchange information. Emerging from its post conflict state various multi-sectoral planning and inter-agency development strategies are being proposed and formulated to accelerate the pace of rural development. Common reference data is vital to insuring that public and private agency coordination and collaboration can take place. For example:

- Official county, district, and clan administrative boundary information attributed with the most recent census data can help to insure that all planning agencies frame decisions based a nationally recognized data set;
- The task of protected area evaluation and assessment requires a commonly recognized definition of the protected area boundaries and associated natural resources;
- Land resource data are required for cross sector activity planning such as conservation, recreation, concession demarcation, etc. There is no official protocol for forest data developed by the Forestry Development Authority (FD) to be shared with other planning and monitoring institutions such as the Environmental Protection Agency (EPA), the Liberia Institute for Statistics and

Geo-Information Services (LISGIS), and the Ministry of Lands, Mines and Energy (MLME). In the absence of shared official forest area spatial data the risk lies that several interpretations of this information will be developed using different methods resulting in possible confusion.

The ETOA was concerned with assessing and evaluating environmental threats and opportunities. Incorporating a spatial technological approach, the ETOA team collected geospatial data documenting where they traveled in Liberia to assess the state of Liberia’s environment. These data - when integrated and managed in a geographic information system (GIS) application - can serve as an important project management tool by clearly illustrating where project resources are being allocated. When analyzed with ancillary information such as socio-economic data, assessments can be made relating to development program needs, gaps and priorities.

A GIS can be described as linking a data table to a map. The data tables must have a field that describes location, this could include an officially recognized place name or spatial

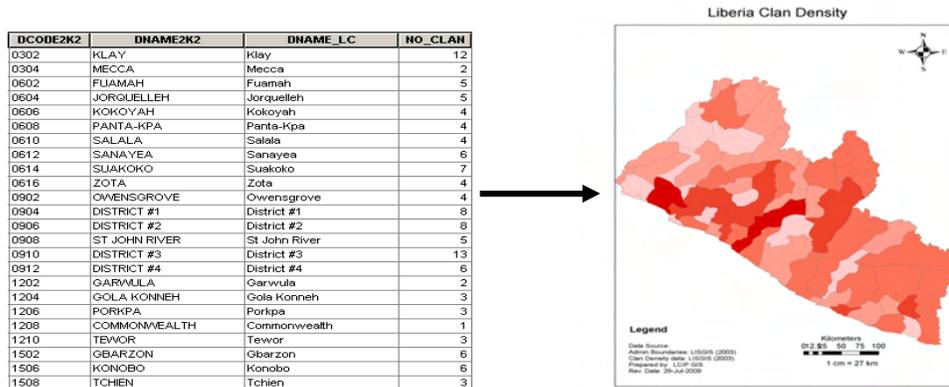


Figure 1: GIS links a data table to map translating simple to complex data into readily understood informative map graphic and providing the basis for thematic map layers.

coordinate derived from a reliable map or a GPS survey that generates latitude and longitude coordinates (x,y). The census data developed by LISGIS have a ‘geo-referenced’ field based on administrative boundaries to the clan level. Hence, any of the tabular information contained in the census can be mapped (see Figure 1 above).

Spatial analysis of geo-referenced data provides insight into the forces that influence the growth and/or degradation of Liberia’s natural resource assets. For example, roads that are constructed in and around protected areas are associated with loss of forest cover. Satellite imagery can be used to establish a forest cover baseline and monitor the impact that new infrastructure has on forest cover using up to date satellite imagery. Spatial analysis can help to illuminate impact of deforestation and the drivers that cause it.

Prescriptive and predictive spatial analytical models are based on standardized data that allowing other researchers and development workers to replicate results. As data development processes describing the state of Liberia's natural resources and economic development efforts become more commonplace, a network for sharing this information becomes increasingly important. Currently, there is no common repository by which the ETOA and other spatial data can be stored, managed and retrieved. An organized geospatial resource for investments made in spatial data will provide a vital resource for achieving the national development agenda.

Officially sanctioned spatial data standards and a distribution approach are important inputs to Liberia's coordinated national development planning process. Currently, there is limited spatial and tabular data coordination in Liberia; LISGIS provides access to core thematic information - including census data (to the district level), FDA develops forest data, and MLME is responsible for land cover and hydrological data. SDI implementation ensures that these and other attributed spatial data resources are documented, stored, managed and retrieved in a central unified location. The ETOA GIS initiative reviewed requirements for implementing a standardized and distributed geospatial data approach, and several workshops were conducted introducing various methods and tools to support a spatial data framework.

The ETOA's GIS initiative had several objectives:

- Work with the USAID to insure a smooth ETOA project close-down;
- Meet with National SDI workshop participants to review the proceedings and make revisions as appropriate;
- Review the plan for enabling the SDI with the GIS super user group;
- Consult with the Ministry of Planning regarding transfer of the SDI initiative to a local institution; and
- Per a Liberia Ministry of Planning request, draft Terms of Reference for a Geospatial Technology Coordination Unit (GTCU).

## **NATIONAL SPATIAL DATA INFRASTRUCTURE**

### *NSDI Rationale*

Investments made into developing spatial data for a variety of planning, monitoring and reporting activities in Liberia are typically not documented and subsequently cannot be used as a multiple objective project management resource. Spatial data can be developed and managed such that investments made into developing these resources can be leveraged as a national asset that support Liberia's development planning process. A spatial data infrastructure is designed to consolidate spatial data and related descriptive attribute information that is managed in a centrally located resource. Standards are

required to insure that the data can be integrated seamlessly allowing for data interoperability.

### **Good Governance**

By adopting a NSDI that allows for ready inventory, assessment and retrieval of spatial data, investments made in creating these information resources can be leveraged as a multiple objective planning, monitoring and reporting resource. By providing key data, the NSDI is a resource which public and private sector institutions can use to support Liberia’s national economic growth. Maps created with spatial data are used to plan, monitor and communicate national investments made in natural resource conservation, infrastructure and related community development initiatives. The general public can readily interpret the map features such as points that represent location of an investment. That investment can be assessed in the context of socio-economic or bio-physical ancillary data. Transparency afforded through maps supports good governance by insuring stakeholders at all levels have access to information relating to public investments allowing for assessments of national priorities, needs and gaps.

### **Project Management Decision Support**

Consistency and reliability of the data used in spatial analysis lends credibility to results that are used to inform program management decisions. Certain spatial data used in multi-objective decision support systems such as land cover analysis, urban and rural development baselines and on-going updates help to inform national policy, and hence quality control is a central concern for program planners at every level. Layering of thematic data helps planners to develop a model of the ‘real world’. Planners can use this real world representation to make assessments relating to distribution of project investments in the context of the bio-physical and socio-economic landscapes, serving as a resource by which to make strategic project management decisions.

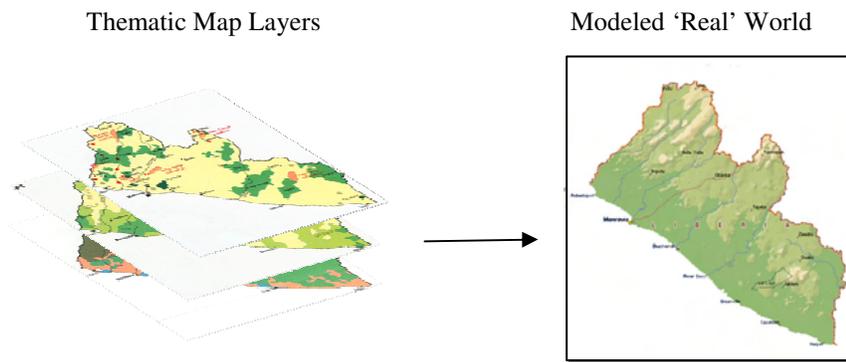


Figure 2: Thematic data layer integration to create a real model of the world

Leveraging investments made in spatial data require that data and/or its descriptive

metadata be made public for use as a multiple objective program planning and monitoring resource.

Administrative boundaries, populated place data, cadastral maps are examples of spatial data that must be developed using recognized standards and practices. Standard requirements have fueled the dialogue for creating and sustaining a Liberia SDI. Several workshops have been organized through the ETOA GIS initiative to support the implementation of a SDI, helping to insure that spatial data relevant to future environmental studies in Liberia are available to the future planning and monitoring teams.

The Ministry of Planning has determined that spatial data and analysis are critical inputs to the national development planning process. Hence this information must be managed in a distributed fashion ensuring that all public and private sector institutions that use spatial information for project management purposes have access to the most recent and accurate data resources. Consolidating officially recognized spatial data investments under a unified SDI management ‘system’ will help to insure that all planning agencies are using the same base data layers (e.g., administrative units, land cover, transportation networks, and physical infrastructure).

## **NATIONAL SDI WORKSHOPS**

With a focus on creating awareness of the core SDI components, a series of workshops were held to generate understanding and discussion regarding the implementation of a National SDI. The following topics were covered in previous ETOA workshops.

### ***Metadata Workshop Summary***

A daylong workshop was organized to introduce metadata concepts and its relevance to a SDI through providing core documentation describing spatial data investments. Metadata is documentation about data providing information regarding the author, date, methods and purpose for spatial data. The workshop reviewed various standards being used in different countries together with commercial and open source software packages that are developed to manage metadata. Metadata in the SDI is stored electronically in a web-based application allowing end-users to search on key words to find specific information. The metadata catalogue is not unlike a library card catalogue where information is stored systematically for easy retrieval. Defining a metadata standard is an important task for the SDI as this provides the reference by which the general public can inventory and access information stored in the national framework. Workshops participants have singled this component out as a challenging yet very necessary initiative to undertake for an operational SDI. Implementing a metadata standard as a routine process in spatial data

development will be an important first step in leveraging these investments as a cross-sectoral planning and monitoring tool.

### *Open Source GIS Seminar Summary*

Promoting the SDI through GIS training is an effective approach to creating awareness. However, participants who typically participate in information management involving commercial products are not provided the resources to apply tools and methods that have been learned. Open source software products are license free and can be readily distributed to the participants allowing practical application of concepts learned. Software and data resources are copied to a recordable storage media (DVD-ROM) for distribution. Where trained personal are available, these resources can be used to support the planning and monitoring requirements at all levels of program planning and management. Using cost-free open source products allows planning and implementing agencies to direct limited resources toward capacity strengthening. Open source allows planning agencies to evaluate GIS in cost free manner to determine to what level this resource can be adopted in activity management and decision support.

### *SDI National Workshop Summary*

Introducing the key components of a unified national SDI was the objective for the national workshop. The concepts were introduced in a non-technical fashion to accommodate the majority of the audience who do not have a technical background in geospatial science. Key workshop concepts included an introduction to spatial data development standards, centralized management and distribution. Discussion specific to the creation of a Geospatial Data Steering Committee (GDSC) centered on its role in establishing SDI standards, defining thematic data layers and working with the Government and Private Sector institutions to submit requests for new data used for activity planning and monitoring.

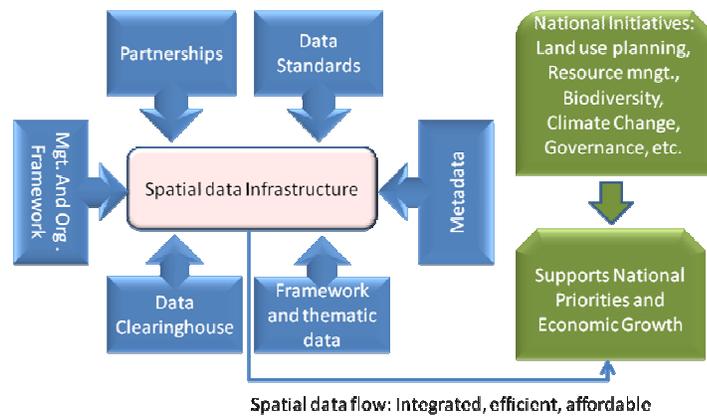


Figure 3: Generic SDI diagram.

Per workshop proceedings and follow-up meetings with the geospatial technological

stakeholder community, the following summarizes the rationale for implementing a Liberia SDI:

- Eliminates data development redundancy;
- Leverages investments as a multiple objective planning/monitoring resource;
- Cost effective;
- Allows for sharing and utilization of geospatial across agencies
- Reduces effort;
- Accelerates projects and decision making;
- Authorizes unified core reference data;
- Supports national planning development;
- Formalizes a national map; and
- Promotes public/private sector partnerships in geospatial data development

A spatial data clearing house provides general public access to the spatial data and its metadata documentation. As internet availability is limited in Liberia, agencies without an internet service will be able access the spatial data clearing house via a dedicated desktop computer house for the public through the SDI, Universities or other public institutions/kiosks that have internet connectivity. Using the clearing house approach the end users can acquire spatial data that is in the public domain or communicate with the custodian of the data to request information about data that has already been created. Providing this access to data allows the Liberian government to leverage investments made into spatial as a multiple objective resource. For example, there is a plan for an updated country land cover map involving a large investment in satellite imagery. Data products derived from this resource can be used to support a variety of development initiatives such as a baseline for natural resource monitoring, urban planning and transportation infrastructure maintenance. Access to open source resources allows any agency to investigate and explore Liberia's growing spatial data resource assets.

Membership and participation in the Global Spatial Data Infrastructure Association (GSDIA – see [www.gsdi.org](http://www.gsdi.org)) can provide additional guidance and support to the development of a Liberia SDI. The GSDIA is an institution established to encourage international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that allow nations to better address social, economic and environmental issues. Membership allows for networking opportunities with other country nationals involved in implementing a sustainable SDI, valuable lessons learned can help the Liberian SDI team to avoid mistakes and pitfalls associated with previous implementations.

## SDI ROAD MAP FORWARD

Achieving a NSDI in Liberia requires both administrative and technical expertise. Liberia's Ministry of Planning has the mandate to undertake this initiative, and with a vibrant new administration characterized by technology savvy professionals, it is well positioned to provide the administrative support for a sustainable SDI initiative.

The primary components that must be well developed for a successful SDI include the following:

### *NSDI Components*

*Policies and institutional framework*, including:

- Creating technical committees and related institutions;
- Enacting procedures and policies;
- Drafting legislation;
- Fostering partnerships; and
- Supporting cross-sectoral collaboration/coordination.

*Technological framework* (components selected per technical requirements analysis), including:

- Hardware;
- Software and related applications;
- Computer networks;
- On-line / off-line geospatial data services; and
- Web-based data clearing house / portals.

*Standards and specifications*, including:

- Unified geodetic reference system;
- Data catalogue and query protocol;
- Metadata standards; and
- A user-friendly metadata profile.

*Geospatial data and documentation (metadata)*, including:

- Nationwide multi-scale datasets;
- Interoperability allowing for seamless integrated geospatial data; and
- Defined digital products

*Qualified human resources*, including:

- A plan for human resources development;

- Qualification assessment;
- Certification program; and
- In-service training to remain on the cutting edge.

## **Approach**

Per recommendations from National Workshop participants and follow-up meeting with Liberia’s GIS user community and the Ministry of Planning, the following approach has been recommended in establishing a Liberia SDI:

**1. Policy Level:** National Geospatial Technology Coordination Unit to oversee the activities of the various SDI committees and working groups. This unit is tasked with the following illustrative responsibilities:

- Sets policies, procedures and regulatory framework for the NSDI;
- Encourages involvement of key stakeholders through promoting awareness, and building a community of practice and participation;
- Assures quality of spatial data managed in the NSDI for decision support;
- Increases access to timely and accurate spatial information;
- Promotes training in the use of these data through existing education infrastructure and specialized training; and
- Supports public/private partnerships for spatial data development as an input to program management decisions support systems.

**2. Management level:** The Geospatial Data Advisory Steering Committee (GDASC) is responsible for the SDI technical Institutional Framework. Illustrative tasks include:

- Advising on spatial data standards;
- Defining the national metadata standard;
- Working with the public private sector to define spatial data themes;
- Assigning responsibilities for thematic data development;
- Developing the SDI technical institutional framework;
- Working with public/private sector working groups who will help inform the GDASC regarding agency specific spatial data requirements (e.g., soils, forest cover, health facilities, etc.); and
- Providing capacity building / technical training support (e.g., open source methods).

**3. Operational level:** Public/Private Sector technical committees responsible for SDI implementation at the institutional level – formulate technical protocol and guidelines for creating SDI components, including:

- Housing/maintaining the Geospatial Data Clearinghouse server;
- Developing strategies for marketing the SDI as a unified public/private sector program planning and monitoring resource; and
- Developing approaches to creating capacity within the various institutions opting to adopt spatial technologies for project management purposes.

The benefits of an SDI have become apparent to certain sectors of the Liberian development program planning community. Equally important, the Ministry of Planning has identified the implementation of a SDI as a national priority. Over the course of several meetings with the Ministry's Deputy Minister, a coordination unit has been proposed. Illustrative Terms of Reference (TOR) for this Coordination Unit are provided in Annex A.

### ***Political Will***

Finally, the implementation of a NSDI cannot proceed without political will. Operating and governing policies, procedures and regulations must be defined and enacted at the Ministerial level for the SDI to succeed. Highest level recognition that investments made into developing spatial data constitutes a national asset that should be leveraged as multiple objective project management resource will give the SDI the credibility it requires to become a full fledged entity. Communicating how the NSDI goals and objectives support the national development agenda across ministries is a vital preliminary task required to gain comprehensive political support. Making geospatial technologies available throughout public and private sector institutions is central to promoting the SDI as a planning, monitoring and reporting resource. Effective use of the SDI requires user training and access to affordable resources by which to apply spatial data in a practical context (open source applications and public domain data). The Ministry of Planning has stated it will provide the political support to insure the Liberia SDI is sustained.

## SUMMARY

Timing is optimal for a well-structured Liberia SDI. Liberia's national development plan is augmented by spatial data as an input to a program management decision support tool. Managed in a GIS, spatial data and related attribute information informs field teams where there are gaps and priorities related to project resource allocation. Investments are typically made by independently by public and private sector institutions. Establishing a unified SDI will help to leverage spatial data investments as a multiple objective resource for potential use by all agencies involved in implementing the national development plan. An SDI will only be effective if there is political will to enact the procedures, policies and regulations defined by the associated steering committees and technical working groups. The Liberia Ministry of Planning is taking the lead role in championing this SDI effort. Recognizing spatial data as national asset and its structured management crucial to leveraging this resource as a multiple objective cross-agency planning and monitoring resource the Ministry of Planning is well positioned to provide overall guidance and coordination throughout the implementation of Liberia SDI.

# ANNEX A

## ILLUSTRATIVE LIBERIA NATIONAL GIS CO-ORDINATION UNIT TERMS OF REFERENCE

### INTRODUCTION

Geographic information science is characterized by a growing data-rich environment fostered by the development of high spatial and temporal resolution environmental monitoring technologies, global positioning systems, unified spatial information infrastructures for data distribution and interoperability, and increasingly affordable data storage costs. Liberia is well situated to take advantage of emerging geospatial technologies and capabilities to support a national development plan.

A National Geospatial Technology Coordination Unit (GTCU) will provide formal support for an innovative cross-cutting strategy for building capacity in adopting geospatial technologies, related standards and a data distribution system to support national planning and monitoring initiatives. Formulating a master plan for establishing a National Spatial Infrastructure (NSDI) is a core function for the GTCU. The scope of the initiative includes preparation of organizational bodies, technical standards and other vital facilities for the NSDI. An efficient coordination unit is a pre-requisite for successful SDI implementation and promotion of geospatial technologies and data to support the national development agenda.

The GTCU will unlock Liberia's spatial data investments for use by the public and private sectors supporting transparent development activity planning and monitoring, growing the national economy and promoting good governance at all levels. This attachment is based on a shared vision for a Liberia SDI per several national level workshops and meetings at various government levels specific to policy formulation and technical implementation.

### LIBERIA'S NSDI

#### *NSDI vision statement*

An operational and distributed NSDI for Liberia will serve to improve efficiency and effectiveness of governance and will support economic growth and sustainable livelihoods. End users will have ready access to core interoperable spatial data that is generated through investments made into

### ***NSDI core principles***

The following core principles contribute to the SDI shared vision:

- Investments in spatial data are made once and maintained at a level where these national assets can be managed effectively;
- Spatial data standards that support interoperability for seamless integration with other geo-referenced data sources;
- Distributed geospatial data systems design to be deployed as a shared public resource;
- Strategic national planning is supported by spatial data collected at one level that is made available to all levels for coordination and collaboration;
- Geospatial data should be intuitive and relatively straight forward to investigate, assess and acquire; and
- Spatially referenced data is used to promote transparency and related good governance through making national planning and monitoring information available to the public in the form of readily understood maps.

### ***NSDI mission statement***

The National Spatial Data Infrastructure (SDI) is a complex undertaking requiring support from within and across government ministries and institutions. Promoting a sense of national ownership is achieved through inviting broad public and private sector participation during the NSDI planning and implementation phases. Supporting a coordinated and integrative planning process requires a Geospatial Technology Coordination Unit.

### ***NSDI objectives***

- To support good governance through improved efficiencies and transparency;
- To promote new business opportunities and economic development initiatives through providing access to reliable and timely spatial and related tabular information; and
- To contribute vital planning and monitoring resources in support of the national development agenda.

### ***Requirements for successful NSDI implementation***

#### ***Spatial Data Inventory***

- A survey of spatial data developers/providers and associated institutional capacity and human resources;
- An inventory of publicly funded spatial data to assess where there are needs, gaps and priorities related to data development;
- A spatial data quality assessment to determine those data investments that can be included in the NSDI; and

- Reducing redundant spatial data development is a core objective for the NSDI.

#### Access to information

- Data distribution is currently hindered by limited internet capacity, however investments are being made to strengthen and broaden this resource. As internet infrastructure grows access to spatial data will via the NSDI the potential for widespread data distribution becomes a reality. A plan is necessary to utilize growing internet connectivity as a means by which to share data resources;
- SDI systems design will need to take into account increasing requests on its servers and strategies for managing the increased demand;
- A national effort aimed at promoting awareness regarding the benefits of spatial data as a planning/monitoring tool for public/private sector investment planning will contribute to increased demand; and
- Policies related to copyright protection and cost recovery must be reviewed and formalized.

#### Integration of information (interoperability)

- Convening geospatial technology experts to define and formalize a national data standard including a system for describing common spatial reference systems and for converting data between projections;
- Formally accepted spatial data standards must be adopted by all current and potential public or private sector GIS specialist whose data products contribute to a National development and/or monitoring activity; and
- National spatial data standards are adopted in National geospatial technology training curricula development.

#### SDI data quality assurance

- Promoting confidence in geospatial technology is achieved through quality assurance. An awareness strategy must include a readily understood approach to assessing the reliability of the spatial data stored and managed in the SDI; and
- Data defined by its temporal attributes (e.g. land cover, urban development etc) must be updated per a regular time-step defined by users of this spatial resource.

#### Spatial Data as a standard program management tool

- A strategy to incorporate geospatial technology training, such as spatial analysis and cartography in public education institutions will foster mainstreaming of spatial technologies for project management decision support; and
- Training initiatives must insure trainee access to the tools and data used to enable practical utilization of new skills learned. Initial focus on open source GIS tools allows for cost-free distribution of software and is an affordable approach to introducing spatial data throughout the public and private sectors.

# THE NATIONAL GEOSPATIAL TECHNOLOGY COORDINATION UNIT

## *Mission statement*

*The Mission of the National Geospatial technology Coordination Unit is to provide support and guidance to the development of a Liberia NSDI and sustaining its implementation and maintenance.*

The GTCU provides administrative coordination functions as well as general advisory support relating to strategies for promoting the NSDI among public and private sector stakeholders. Stakeholders include all levels of government (national to district administrative divisions), academia, professional organizations, private enterprises and individual citizens.

## *Unit goals and objectives*

*GTCU's goal is to provide direct support for defining and implementing an effective NSDI operation plan, a resource that insures a high quality service that delivers reliable spatial data.*

GTCU objectives towards achieving its goals include:

### **Objective 1:** To implement a shared SDI vision

- To insure agreement among the geospatial data user community, the GTCU will convene a workshop to review the findings from the National SDI workshop held in July 2009 and work towards consensus on next steps;
- The Unit assures facilitates GIS user community consensus specific procedures and processes for the handling and distributing spatially referenced data;
- The Unit will insure all concerned public and private institutions have access to information relating to the 'shared vision;' and
- The Unit will promote the use of this vision as a basis for future policies and procedures aimed at supporting a growing infrastructure for geographic information.

### **Objective 2:** To co-ordinate activities central to the design and long-term implementation of the NSDI

- The Unit will provide high level support to defining and implementing the NSDI Master plan and monitor overall progress in achieving its goals;
- The Unit will engage dialogue with NSDI stakeholders regarding the creation of

- various working groups to support the overall implementation; the Unit will assess the efficiency of these working groups; and
- The Unit is responsible for arranging NSDI and related workshops, seminars and consultations to promote constructive engagement between the Unit and the public/private community stakeholders.

**Objective 3: To promote the creation of core spatial databases**

- Working with public and private sector GIS data developers, users and stakeholders the Unit will define the core spatial databases required for the NSDI, co-coordinate a strategy for data standards sustained database creation;
- The unit will coordinate a plan for codification of new spatial dataset that are created to support of Liberia's infrastructural development; and
- The unit will work with public and private sector institutions to manage investments made in new spatial data development insuring a multiple objective approach that eliminates data redundancy.

**Objective 4: To define a spatial metadata standard to be adopted on all geospatial data initiatives in Liberia**

- A metadata standard is required for spatial data to be searched via query functions, the Unit will work with geospatial data technical specialist to define a national standard (ISO, FGDC etc.);
- The Unit will promote creation of spatial data metadata as a national standard for anyone creating spatial data for the public good; and
- New data resources from the public and private sectors will be identified, assessed for accuracy and catalogued for NSDI submission.

**Objective 5: To promote use of spatial data and related analysis as a National planning, monitoring and reporting asset**

- The Unit will explore the general development community attitudes and practices regarding use of spatial data for project management purposes;
- Strategies aim at promoting broader adoption of geospatial technology as a decision support resource will be developed through the GTCU; and
- Coordinating NSDI resources and activities with other appropriate Liberian national initiatives will be handled through the Unit.

**Objective 6: To insure spatial data quality assurance**

- The unit will work with spatial data developer to insure a quality control process that provides an assessment of the accuracy of each data set managed through the SDI. End users will be encouraged to use this information to determine the degree of confidence the specific data set can be used for decision support purposes.

**Objective 7:** To serve as a liaison to other government institutions regarding use of geospatial technologies for decision support

- The GTCU will endorse agreed upon policies related to NSDI management; and
- Provide advice and guidance throughout all government ministries regarding the adoption of geospatial technologies at all appropriate levels of implementation.

### ***Liberia NSDI Master Plan***

***The Master Plan is designed to outline coordination activities that support the ‘vision’. The GTCU will review, revise and support the implementation of the Master Plan and provide regular monitoring to insure activities are ongoing, on-time and of high quality.***

The Liberia NSDI implementation is based on an openly discussed and debated Master Plan that defines priorities, assigns responsibilities and identifies achievement milestones. The Master plan will be used to:

- Support the creation of permanent and ad hoc working groups needed to support the design and implementation of the NSDI;
- Schedule and draft annual work plans for all GTCU members;
- Insure support programs and activities are identified and implemented including geospatial data research, development and training; and
- Set a calendar for regular GTCU events including conferences and seminars.

### ***SDI members and working methods***

#### ***Participating organizations***

The National GTCU will consist of representatives from public and private sector organizations as defined by the Ministry of Planning. Participating GTCU member organizations should nominate a representative based on stated interest and demonstrated motivation in mainstreaming geospatial technologies as a project management resource for Liberian institutions. A deputy should also be named allowing for on-going participation in GTCU meeting in the event that the organization representative unable to convene.

The GTCU will hold quarterly meetings however, during the first few months of implementation meeting will be held every other week to insure the operational work plan is on schedule and potential road-blocks are identified and solutions discussed.

GTCU members should have the authorization to act on behalf of his/her parent organization to make decisions specific to the implementation of the NSDI. All members

must have adequate time to review SDI documents at least one week prior to coordination meetings being held.

### **GTCU Secretariat**

The Planning Ministry will determine the appropriate Government agency to be named the GTCU secretariat. The GTCU secretariat will be responsible for organizing meetings and drafting technical and non-technical documents intended for distribution. This includes managing a GTCU webpage and related public information.

The Planning Ministry will seek financing for the GTCU secretariat and other joint initiatives including public awareness campaigns and support SDI services.

### ***Steering committee and technical working groups***

A Geo-spatial Data Steering Committee (GDSC) will be organized under the GTCU to support on-going SDI work. The GDSC will define core and thematic foundation data sets to be managed in the SDI per a GIS community user requirements assessment. The GTCU will work to identify the organization(s) to be tasked with development and maintaining these SDI data resources. For example, the Ministry of Lands, Mines and Energy is responsible for a national geodetic survey.

Other spatial data development and responsibilities will be defined by the GTCU in close collaboration with the Geospatial Data Steering Committee. In this context, working groups will be convened under the GDSC to identify resources and prepare work plans for specific tasks. Possible working groups include:

- **Metadata standards.** A sub-group, based out of the GDSC comprised of qualified geospatial technologists will be organized through the GTCU and will be tasked with researching, reviewing and selecting a metadata standard by which all public and private sector investments made into creating spatial data are documented. Metadata is an essential resource as it provides a basis by which spatial data are inventoried and queried through the SDI.
- **Spatial metadata standards.** A spatial metadata standard is defined by a technical committee comprised of experts who understand current “state of the art” data documentation and management applications and procedures. The GDCU will select committee members who will collaborate with others in the Liberian geospatial user community to define a user-friendly data documentation standard, providing training in how to effectively use these standards and developing strategies for informing the geospatial data development about policies related to the implementation of a national metadata standard.

- **Geospatial data quality control.** Data quality assurance is central to SDI credibility as a resource that can be used with confidence as a program management resource. Under the guidance of the GTCU and working, the GDSC will create a spatial data quality control technical working group tasked with defining and implementing a strategy assessing the accuracy of thematic data managed through the SDI. Assessment protocol must evaluate the completeness of metadata documentation, data timeliness and ground accuracy assessment through a sub-sampling field based effort and other parameters as defined by the technical working group.
- **Architecture and infrastructure.** Defining requirements for the SDI clearinghouse and related portals will be completed by a team of IT professionals selected and supervised by the GTCU to determine how the ‘systems’ infrastructure will be designed, structured and deployed. The IT technical working group will evaluate/assess national web infrastructure, institutional capacity, human resource and training needs, current web-based networks, and SDI hardware and software requirements.
- **Human resources and education.** The GTCU will organize a working group to assess how spatial data is currently being used by the public and private sector. This group will conduct a survey to evaluate human resource capacity building requirements to support the increased utilization of spatial information for national planning purposes, including short and long term SDI staffing. Short term technical training requirements will be assessed and documented. A strategy for long term capacity building through formal academic institutions will be formulated.

- **Institutional and organizational framework.** Determining how the GIS user community will interact with the SDI is largely based on a well defined readily understood institutional and organizational framework. A working group selected by the GTCU will evaluate how the GIS user community can provide on-going feedback and direct support to the SDI, to create a sense of ownership among the user community. Determining an effective approach for on-going GIS stakeholder interaction with the institutional framework will promote a sense of local ownership.
- **SDI awareness campaign.** Promoting the activities and services offered through the SDI will better insure that current and new users of spatial data will be aware of the national data standards defined and governed by the NSDI. The GTCU will organize and provide oversight for a SDI awareness campaign working group where strategies for outreach campaigns will be discussed, formalized and implemented. SDI objectives, policies and procedures must be made available to all users of spatial data for government program planning and monitoring.

### *SDI costs and financing*

Pricing the short and long-term SDI implementation will be a function of internal review GTCU meetings assessments taking into account a systems requirements assessment, definition of human resource requirements and related training, spatial data development/update costs, maintaining the institutional infrastructure, outreach and awareness campaigns and other factors. Cost recovery strategies that do not levy a heavy financial burden GIS user community must be considered if the SDI is to be deemed a public good. In certain countries, participating public and private sector organizations seek finances to sustain it own operating costs to insure participation in a growing SDI resource.

Filename: ETOA Final GIS report.doc  
Directory: P:\Operating Groups\Projects\ENR\EN\NR\PLACE IQC\Liberia  
          ETOA\Deliverables  
Template: C:\Program Files\Microsoft Office\Templates\Normal.dotm  
Title:  
Subject:  
Author: Bob Bouvier  
Keywords:  
Comments:  
Creation Date: 10/26/2009 4:24:00 PM  
Change Number: 2  
Last Saved On: 10/26/2009 4:24:00 PM  
Last Saved By: Dan Whyner  
Total Editing Time: 1 Minute  
Last Printed On: 12/28/2009 4:48:00 PM  
As of Last Complete Printing  
Number of Pages: 24  
Number of Words: 6,751 (approx.)  
Number of Characters: 38,487 (approx.)