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Geospatial data collection, management and dissemination

Making Geospatial Data, Products and Services Available and Accessible in Jamaica[*]

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Land Information Council of Jamaica

Making Geospatial Data, Products and Services Available and Accessible in Jamaica

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"How the Jamaican national Spatial Data Infrastructure is planning to make available and accessible the geospatial data, products and services to all users, and to facilitate planning, sustainable development and the use and management of the islands resources"

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1.   INTRODUCTION

Many countries particularly those of the developing world are currently seeking to come to terms with the global challenge of sustainable development, which must be balanced against rapid changes in the world economy, burgeoning oil prices, international policy requirements – Agenda 21, the World Summit on Sustainable Development Plan of Implementation, the Millennium Development Goals and the World and Hemispheric Trade Agreements (e.g. the Free Trade Area of the Americas) .

Jamaica has had to address similar issues and has found it extremely challenging to integrate environment and development considerations while addressing critical social and economic issues related to limited physical resources, small domestic markets, vulnerability to economic pressures and natural disasters and urbanization.

Jamaica is located in the western Caribbean and is the largest of the English-speaking Caribbean islands with a land area of 10,990 square kilometres. In the last decade, there have been continued efforts to liberalise the economy, manage a significant external debt and achieve macroeconomic stability as a basis for sustained economic growth. The economy has been transformed from one based mainly on the export of primary agricultural products and mineral commodities to the UK and North America, to a service economy in which tourism is now the principal earner of foreign exchange. Over 80% of the GDP is generated by services that hire about 62% of the labour force.

It is against this background that the Government of Jamaica began to pursue the establishment of a strong spatial data infrastructure to create and provide access to geospatial data in order to effect change to facilitate improvements in the livelihoods of its nationals.

2.   SPATIAL DATA INFRASTRUCTURES

An infrastructure may be defined as "the basic physical and organizational structures needed for the operation of a society or enterprise". An infrastructure has the following characteristics:
- Its users are not conscious of its "ownership". Users are aware that 'somebody' maintains the infrastructure, but do not regard this maintainer as an owner
- The delivery or provision of the service is standardised to a large extent
- Infrastructures are expensive to develop and maintain, and the returns from the investment are usually long term.

It is analogous to a road or telecommunications network and like roads and wires, a SDI facilitates the conveyance of virtually unlimited packages of geographic information.

Within the last 10 years, increased attention has been given to the development and importance of SDI, through conferences and papers at the national, regional and global levels. The United Nations 1998 Handbook on GIS Standards and Standardization states that the establishment of SDI has been a response to the challenges of organizing and using geographic information.

Williams and Feeney, 2001 states that the SDI is a concept that is evolving which has required further research to understand the relationship within and between the different jurisdictional levels – local, state, national, regional and global.
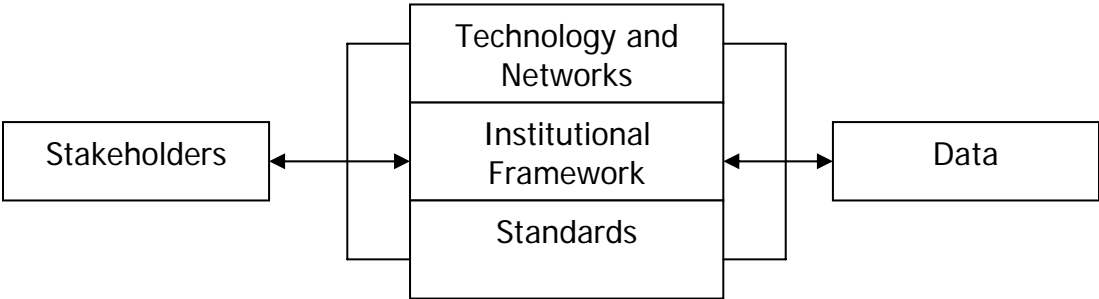
They further note that as a concept, SDIs are initiatives intended to create an environment that enables a wide variety of users, to access and retrieve consistent data sets in an easy and secure manner. The core components of SDI are policy, access networks, technical standards, people including partnerships and data. These provide an environment in which all stakeholders can cooperate with each other and utilize technology in a cost effective way to better achieve the objectives at the appropriate political/administrative level.

The Federal Geographic Data Committee (FGDC) defines the National Spatial Data Infrastructure (NSDI) "as the technology, policies, standards, human resources and related activities necessary to acquire, process, distribute, use, visualize, (catalogues and Web mapping), maintain and preserve spatial data throughout all levels of government, the private and non-profit sectors and academia. It provides a base or structure of relationships among data producers and users and focuses on processes that facilitate data sharing. The structure and consistency that the NSDI brings to accessing, sharing and using geographic data, enables more comprehensive analysis of data to help decision–makers locate and choose information that meet their needs.[1]

2.1.   Components of the SDI

The components of SDIs are fundamental data sets, technology inclusive of networks to provide access, common standards and institutional framework as well as the stakeholders (users, providers and value –adders).

Figure 1   Components of SDI

From Rajabifard and Williamson GSDI 6, Budapest

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[1] Federal Geographic Data Committee, Reston, Virginia, USA, Jan.2004[1]

2.1.1. Data

The actual spatial data that reside in a SDI are obviously its most important component. Basic data sets upon which other data sets could be built are referred to as framework data. Examples of these are geodetic, cadastral, hydrography, transportation, boundaries and digital ortho-imagery. These should be accurate and updated regularly, according to an agreed standard, in order to acquire infrastructure status.

2.1.2. Technology

There are two major aspects to the technology component of SDIs. The first aspect is the technology that facilitates the exchange of information over networks. The telecommunications industry is therefore an important player in the development of SDI. The second aspect is the software technologies that allow users to capture, abstract, model and utilize the data and to maintain the datasets.

2.1.3. Common Standards and Institutional Framework

Common procedures and standards facilitate the sharing of data across the SDI. Standards, for data storage, encoding and transfer allow the best possible utilization and sharing of data among a wider community of users. Common standards within an SDI solve many of the incompatibility problems for newly created data.

2.1.4. Stakeholders

Fundamental in the establishment of an SDI are data providers, users and value-adders and the partnerships they form. Good communication channels and partnerships are extremely important as they allow for the successful sharing/trading/purchasing of data amongst the different stakeholders. The best computer network and set of databases are useless if the custodians of the data are not willing to share, trade, or even sell their data.

An SDI will not function, no matter how good the networking and technology is, if communication channels, standards and procedures, partnerships and data have not been developed.

2.2. The Importance of SDI

Both definitions of SDI share the same tenets as they refer to cooperation among stakeholders and having access to data to make better decisions. Many publications have documented the benefits of taking on SDI development. It is said to foster:

Greater collaboration and easier access to geospatial information will assist in avoiding multiple investments and facilitate sharing across agencies to support decision making and emergency response.

Benefits of SDI Participation

1. Better management of natural and land resources and actions that affect the community
2. Improved public access to data and information
3. Improved public image for all participants, maximizing resources, efficiency and transparency
4. Decision making methods established which are scientific, credible and can be replicated
5. Growth and expansion of resources, capabilities and knowledge base
6. Increased respect and trust among all geoinformatics stakeholders.
7. Generation of information with high values, creation of new industries and establishment of various information services
8. Optimization of spatial data servicing cost for the private sector
9. Creation of new businesses using spatial data

3. HISTORICAL OVERVIEW

3.1. Evolution of Jamaica's SDI

The development of Jamaica's SDI had its genesis with the creation of the Land Information Council of Jamaica (LICJ) in 1992, and the tabling in Parliament, 4 years later, of the National Land Policy. The LICJ provides the institutional framework and the National Land Policy the policy directive for SDI development.

3.2. The Land Information Council of Jamaica

The LICJ was established to serve as the policy and technical focal point for Geographical Information systems (GIS) development and to organize and manage a national computerized network of geographic information systems.

The LICJ is a "joined-up" government organization consisting of over 50 government and quasi government organizations, non-government organizations, professional bodies and interested private sector firms working together to achieve its objectives.
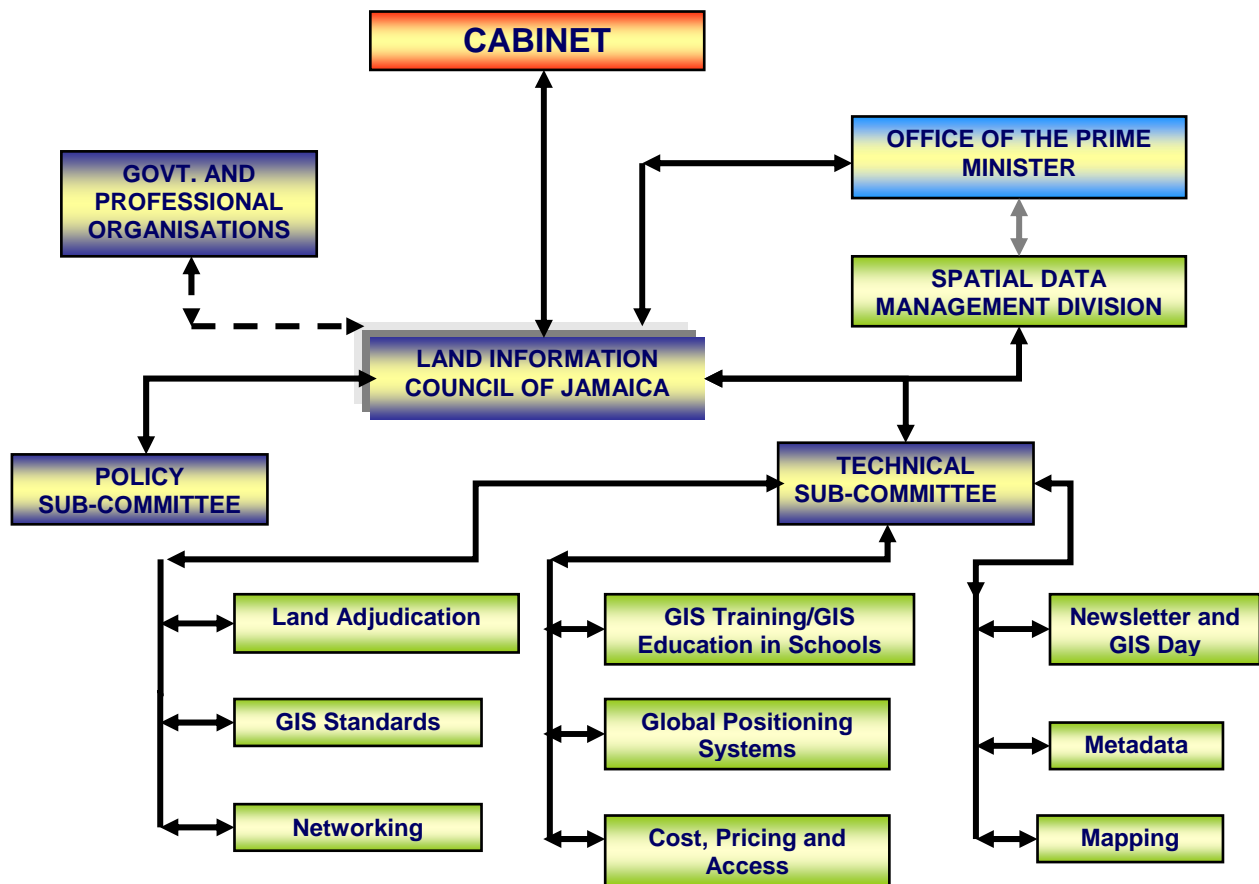
Figure 2   **Structure of the Land Information Council of Jamaica**

The Council's work is executed through a policy committee and the technical working group with 9 sub-committees. The policy committee consists of heads of agencies and senior directors whose operations directly relate to the creation of the NSDI. This committee addresses policy, institutional, legislative issues critical to the establishment of the NSDI. The technical working group and committees examine issues and develop policies, strategies, standards and plans for the creation of a NSDI. The Spatial Data Management Division (SDMD) of the Office of the Prime Minister, coordinates and manages the Council's work and key programme areas.

Its members collect, produce, acquire, maintain, distribute, use and preserve land and land related data (e.g. maps, tables, photographs) in digital or paper form to fulfill their mission. These geospatial datasets range from security, health, socioeconomic, utilities, infrastructure, and parcels, among others. The LICJ meets on the fourth Thursday of each month, except in December, at 10:00 a.m. All members of LICJ are entitled to attend and participate in the monthly and sub-committee meetings.

The Land Information Council of Jamaica has played the lead role in creating the institutional and cooperative framework for the development of the NSDI.

3.3.   The National Land Policy

The objectives of the policy are to ensure the sustainable productive and equitable development, conservation, use and management of the country's natural and man-made resources and promote comprehensive and integrated development in urban and rural areas.

The Policy addresses a wide range of land and land related issues including, land management and administration. Chapter 2 of the Policy details the importance of Geographic Data Management Systems to national development; the issues that precipitated the need for the policy; the National GIS policies and the strategies and the programmes and projects to achieve the policy objectives. The Government of Jamaica through the Land Information Council of Jamaica (LICJ) is working to establish Jamaica's Spatial Data Infrastructure (JSDI).

The SDI Vision
Geospatial data, products and services will be made available and accessible to all users to facilitate planning, sustainable use management and development of the islands resources thereby contributing to sustainable development and economic growth.

Jamaica NSDI Goals

i.   The establishment of a comprehensive, NSDI network linking all land and land related agencies of government and the members of the Land Information Council of Jamaica to enable sharing of spatial data and to avoid the duplication of collection and storage activities.

ii. Ensure the commitment as decided by Cabinet, of all relevant government agencies and stakeholders to the NSDI initiative and the principle that basic spatial information inventory of individuals agencies forms a part of the states corporate resource to which substantial opportunities for access should be provided.

iii. The adoption/adaptation/creation of national standards for spatial data collection, storage, management and exchange.

iv. The development of human resources required to create and manage NSDI, through on the job, local and overseas training programmes and workshops

v.   The formulation, amendment of legislation, reorganization, creation of institutional structures and administrative mechanisms required for the creation of the NSDI.

vi. Support the establishment of a Government wide communication network for the transfer/exchange, maintenance and dissemination of spatial data

vii. The development of user mechanisms, tools and the World Wide Web to facilitate access to and ease of use of spatial information by the general public. Access will be limited in cases of security and confidentiality.

viii. The creation of digital spatial databases comprising of core data sets to be used and shared by all land and land related agencies of government.

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4.   CHALLENGES OF SDI DEVELOPMENT

K. Reece March 2004, Defining and Testing The Criteria for Effective Implementation of a Geospatial Data Clearinghouse in Jamaica, concluded "data exchange is relatively high and mainly informal with efforts towards collaboration particularly for undertaking large projects. There is a growing awareness of NSDI initiative among the stakeholders." She also notes "there is a high penetration of GIS technology (network, software and hardware, skilled personnel) within organisations". With regards to areas requiring attention she notes "on the organizational side there are limited policies and legislation to support digital exchange". However "there is a growing improvement in the communication links between stakeholders through the Land Information Council of Jamaica".

An analysis by the Council on the use of GIS and progress towards NSDI development revealed the following:
1. There are, problems with sustainability. Many government agencies cannot compete and lose their skilled staff to the private sector. They in turn as well as the government suffer from the brain drain to the developed world.
2. GIS implementations are often times funded through projects and are compartmentalized to achieve a specific objective/goal without being integrated in the business process of the organisation.
3. Changing the methods and techniques for digital spatial data collection to maintain and sustain geo-spatial databases. Systematic collection of data that is spatially referenced. The use of varied geographic units (enumeration districts, health districts, SDC communities) for data collection by different agencies makes comprehensive spatial analysis difficult.
4. Inadequate financial resources to purchase and maintain required software and hardware,
5. Absence of a government wide communication network with the capacity and coverage to facilitate the effective and efficient sharing, exchange and delivery of geospatial information.
6. Absence of legislation (a JSDI Act) with guidelines for the commitment and participation of stakeholders.
7. The need to adopt/develop and adhere to geo-spatial standards and to address the following issues:
    -   the collection and maintenance of metadata
    -   maintaining data quality and control
    -   the contentious matter of pricing of digital data for sale
    -   ethics in the collection, creation and dissemination of geo-spatial data
    -   the need for users to acknowledge the work of GIS professionals in map creation, database design and analysis etc.

5.   MAKING GEOSPATIAL DATA AVAILABLE AND ACCESSIBLE

The Council has been advancing the national SDI vision through a number of inter-related, multi-faceted strategies and programmes. Very early initiatives were the creation of geospatial training infrastructure and data creation projects. It was recognized that geo-informatics technical skills and competencies were needed to support the creation of geospatial data and products.

The following are the initiatives and programmes that have been implemented to create the framework, environment and mechanisms that enable users to access geospatial data.
1. The preparation of a national SDI strategic plan
2. The drafting of a data sharing and access framework protocol
3. Preparation of data sharing and internal pricing policy for government entities
4. The creation of fundamental and thematic geospatial data sets
5. The adoption/adaptation of geospatial data standards in particular metadata
6. The creation of access mechanisms, i.e. the LICJ website, metadata and geospatial portals, special geospatial web services
7. Capacity building inclusive of training and education and public awareness.

5.1.   The National SDI Strategic Plan

In 2006 the Council prepared a five year strategic plan. This was in recognition that greater focus and direction were needed to advance the access to and use of geospatial data in the country. A series of workshops were held with the objectives to:
1. strengthen existing strategies and programmes and design new ones to move forward the implementation of the Council's work to create the national spatial data infrastructure (NSDI) for Jamaica,
2. prepare a 5-year strategic plan for the LICJ that is visionary, conceptual, directional, measurable and realistic and
3. ensure that LICJ members are committed to and share the same vision and strategies for NSDI creation

The resulting plan identified the following 8 priority objectives:
1. to prepare and enact legislation to support the creation and management of a national SDI
2. to create a national network among spatial data providers
3. to define and establish a funding framework to support the maintenance of base maps and imagery
4. to strengthen the development and use of geospatial standards
5. to leverage the use of information and related technologies to operate sustainable spatial data management systems.
6. to strengthen coordination and build partnerships across all levels of stakeholders in the public and private sectors in support of SDI development and growth
7. improve and strengthen education and training offerings in geo-informatics and
8. to create a national geospatial data clearinghouse.

The Council guided by the SDMD has been implementing projects and programmes to achieve these objectives in support of the SDI vision.

5.2.   Geospatial Data Sharing and Access Framework and Data Sharing and Pricing Policy

A major challenge within the Jamaican geospatial sector is the lack of consensus on data access, pricing and sharing mechanisms among LICJ members.

To address this challenge a **Framework for Geospatial Data Access and Management**   was developed. The purpose of the framework was to define a set of consistent and workable arrangements to be used by GoJ organisations and other relevant stakeholders to streamline access to data and derived information products, and to ensure consistency with protocols, standards and guidelines for the development of the Jamaican SDI.   The protocol defined the SDI goals, guiding principles, access arrangements, metadata management, framework operations and an agreement to be signed by geospatial stakeholders of the LICJ.

A series of consultations were held with geospatial stakeholders, which evoked great discussions, comments and amendments. To date the framework has not been finalized and accepted. This has been due largely to differing positions on whether data generated by government entities should be provided free of cost or for a fee to other government entities.
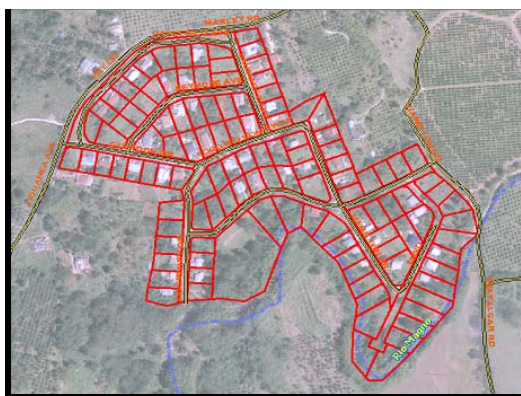
There has been a growing recognition that access to and the sharing of land and land related/geospatial data among government entities are critical to the promotion of social, economic and physical development and the protection of natural resources and the environment.   In addition the high cost of data is often seen as a barrier to efficient planning and joined-up service delivery for agencies and the public. The ability of the public sector to deliver high quality services and to formulate timely and relevant evidence-based policies is therefore largely dependent on an adequate policy framework for data sharing and internal pricing.

To address this critical issue the Cabinet Office, Office of the Prime Minister has embarked on a project to draft **a National Data Sharing And Internal Pricing Policy**. The policy is being drafted to be supportive of the government's strategic objective for improving access to quality information and should strike a balance between the accessibility and affordability of data. An interagency committee was established to provide advice and general direction on the key issues to be addressed and incorporated into the policy. A consultative and participatory approach is being taken with inputs from the private sector, non-government organizations and civil society. This is to ensure that the resulting policy will reflect consensus of all stakeholders. The policy will be submitted to the appropriate Cabinet Committees and subsequently, Cabinet for approval.

5.3.   Creation of Spatial Data Sets

The LICJ actively coordinates the development of strategies and proposals, identifies resources and methodologies to facilitate the creation and maintenance of spatial data "framework data sets" for the island.

The LICJ recognized that the country had no comprehensive and complete parcel maps that could be used for activities such as the identification of land parcels for the collection of property taxes and to be used by other agencies to collect data. The LICJ therefore in the mid 1990's initiated discussions with the Inter American Development Bank (IDB), with regards the preparation of cadastral maps for the country. The IDB indicated that their interest was in developing proper land markets and therefore the preparation of a cadastral map should be tied to a clarification and title registration process. As an interim measure the LICJ recommended to the Cabinet that the cadastral index be prepared using the existing paper based valuation maps and this was agreed. A cadastral index map of 700,000 parcels was created using valuation parcel/enclosure maps. This was done through the National Land Agency with the financial assistance of the World Bank under the Public Sector Modernization Programme. The Forestry Department in association with the Nature Conservancy created maps covering a section of Trelawny and the National Works Agency did parts of St. Ann.

Section of the Cadastral Index map superimposed on IKONOS image

Diagram 1   Cadastral Index Map

To facilitate the creation of framework data sets, access to and availability of base maps is fundamental. In 2000 to 2003 the LICJ coordinated the purchase of:
- 1:4,800 satellite image maps of the entire island and
- 1:2,000 maps for the urban areas of Kingston and St. Andrew, Portmore, Spanish Town, Port Maria and Montego Bay.

Before these maps were acquired, the country's maps were severely out-of-date. The most recent maps were the 1:50,000 metric series that were done twenty years ago and were based on aerial photographs that were taken in the 1970s. Prior to the 1:2,000 maps of Kingston and St. Andrew, the last comprehensive large scale mapping of Kingston was over 40 years old and was based on 1950 photographs.

This purchase was made at a 40% discount (JA$40 million) specially provided to the LICJ by Space Imaging/GeoEye. ***This acquisition was made possible through a joined-up government approach, using collaborative financing amounting to over US$1million by some twenty one members of the LICJ.*** This was the first time that a comprehensive island wide, large scale mapping exercise was undertaken using 80% local financing. Twenty percent was received

from loan and grant funds through projects supported by the Organisation of American States, the IDB and The Nature Conservancy.

These maps and the digital surface model have been distributed to fifty LICJ members and are currently used for a variety of purposes. The maps provide a comprehensive modern base that many agencies are using in their daily operations, and when combined with other spatial data facilitates more efficient and effective decision-making. The images are now out of date and a new joined-up initiative is being pursued to acquire new images for the island.

Greater emphasis is being given to the creation of new and required framework data sets such as street centerlines and the development of some mission critical GIS applications in health, bauxite mining and disaster management.
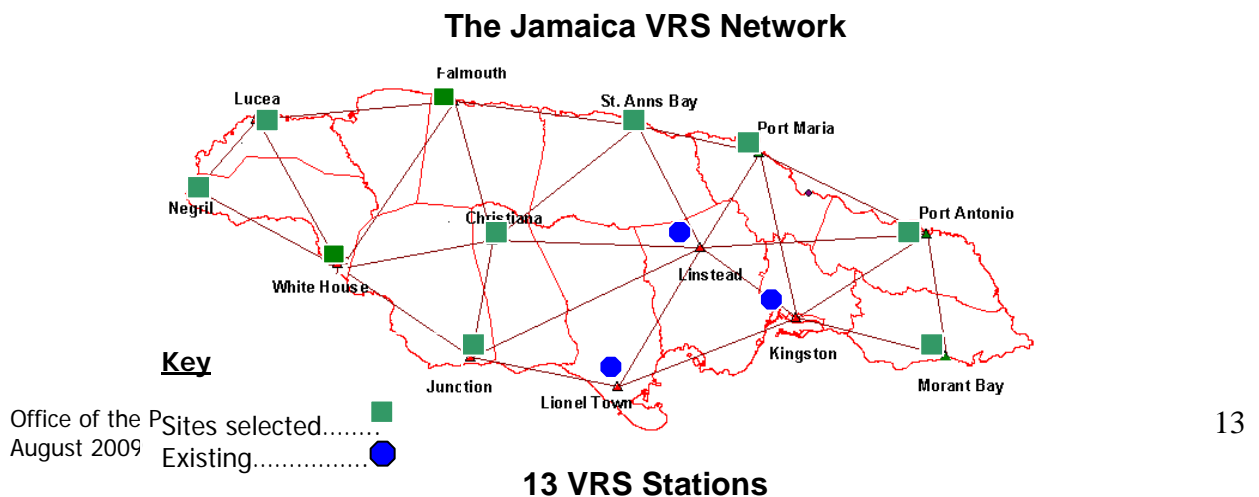
Table 1   Fundamental Datasets

Fundamental Datasets	Jamaica
Hydrography	100%
Cadastral	100%
Government units	100%
Orthoimagery	100%
Geodetic control	100%
Elevation	100%
Transportation network	100%
Infrastructure and utilities	100%
Land use	100%

Jamaica has the distinction of having 100% coverage of all the fundamental geospatial data sets as listed in table 1.

To support the collection of geospatial data and most importantly the fixing of reference points the Government of Jamaica has established a **Virtual Reference Station Network**, referred to as gFIX.net. It is a nation-wide active reference network based on Global Positioning Systems (GPS) consisting of a configuration of 13 high precision GPS base stations, as shown in Diagram 2. Before the end of the 2009 calendar year users will be invited to access and test the services, in real time and post processing modes. Services will be made accessible via the internet at www.gfix.nla.gov.jm

Diagram 2   VRS Network Configuration

The Jamaica VRS Network

Key
Sites selected........
Existing...............

13 VRS Stations

VRS services, when applied, should lower the cost of positioning, increase productivity and improve the accuracy of positioning. VRS network is expected to revolutionize the surveying and construction sectors, enabling increased accuracies with enhanced performance and reliability, in addition to improved productivity.

5.4. Metadata Management

The production and maintenance of metadata is essential to the management of and access to geospatial data. The objective of the NSDI is to facilitate the stimulation of cooperation and develop an integrated approach to the resolution of policy issues and data sharing. Metadata production is essential to its success.

Metadata is "data about data" it describes the content, quality, source, format and accuracy among other characteristics of data. The collection and management of this information facilitates the management of data resources, data recovery, reuse and data sharing among users.

In July 2006 Cabinet approved the 13 point Metadata Guidelines. These guidelines are to ensure the maintenance of the Government's investment in spatial data and to allow decision makers to know what spatial data exits and where it is available. The metadata guideline requires that metadata collection methods be compliant with the ISO 19115 metadata standard.

In an effort to encourage and streamline the collection and management of metadata to support NSDI activities a survey of spatial data collectors was done in 2007. Results from the questionnaire analysis showed that 66% of the organizations that have implemented the Metadata Guidelines were at the first stage of metadata management i.e. collection, editing and updating. Only a third of the organizations were at the stage of transfer and publication. The following factors accounted for the low level of metadata management.
  i. A large number of geospatial datasets do not have metadata records
  ii. Metadata production and maintenance is seen as a burden
  iii. Limited or no time is allotted for the production and maintenance of metadata
  iv. Metadata management is not included in the job descriptions and work plans of GIS officers
  v. A lack of personnel trained in metadata management

To address these challenges, the LICJ/SDMD over the past 2 years embarked on a series of technical workshops and metadata creation projects.

  a. The **"From concept to Practise: dealing with the Backlog"** metadata workshops trained Thirty eight (38) persons from twenty (20) organizations in metadata creation and management as well as how to deal with the backlog of datasets without metadata. A six (6) month action plan was developed and implemented by five (5) organization to address their metadata issues.

b. **Fostering a Culture of Metadata Production**" project funded by the Global Spatial Data Infrastructure small grant programme trained and placed four tertiary students in four GOJ organizations to collect/create metadata.

c. A metadata portal was created using Geonetwork portal software. This is an opensource catalog application for managing spatially referenced resources throughout the web. It provides powerful metadata editing and search functions as well as an integrated interactive web map viewer InterMap. The portal is accessible via the LICJ web site http://www.licj.org.jm or directly via http://www.licj.org.jm/geonetwork.   All the metadata records created from the project were uploaded to the portal. The portal allows participating organisations to manage their records. Users are allowed to search and retrieve metadata records.

GeoNetwork supports both the FGDC and ISO standards for metadata content management. The portal allows for remote searches through interconnectivity with other metadata search engines across the internet. This ultimately facilitates the global discovery of geospatial datasets via the internet.

The SDMD continues to monitor the progress of government entities that create geospatial data to ensure full implementation of the action plans as well as to provide technical assistance where required to institutionalize metadata production. A Cabinet submission is to be prepared requesting that metadata production be institutionalized. This aims to make the production of metadata mandatory for the creators of geospatial data. Successful metadata management is dependent on the commitment and dedication of geospatial data creation organizations.

5.5. Access Mechanisms

A major initiative of the LICJ/SDMD to make geospatial data available and accessible is the establishment of a Geospatial Web Portal for the country. The objective is to provide local, regional and international access to the country's geospatial data via the internet. In this regard, the portal will serve as the single point of contact for anyone wishing to access the country's geospatial data. The Geospatial Portal will initially integrate geospatial datasets at the local level inclusive of all government ministries, agencies and departments and various private sector organizations.   Once this has been fully established, a link to other regional and international portals will be formed. This will facilitate data sharing at all levels and allow for the concept of a Caribbean Spatial Data Infrastructure **(CSDI)** and a Global Spatial Data Infrastructure **(GSDI)** to become a concrete reality.

 The initial attempt to establish a portal was done with technical and financial assistance from the Global Spatial Data Infrastructure (GSDI), the Global Map Programme and the United States Geological Survey (USGS) - EROS Data Centre in 2007. This portal was created using ESRI's ArcIMS. Emergency shelters, rivers, roads geospatial datasets from ODPEM were made available online for viewing and searching. The configuration of the web service is shown in figure 3.
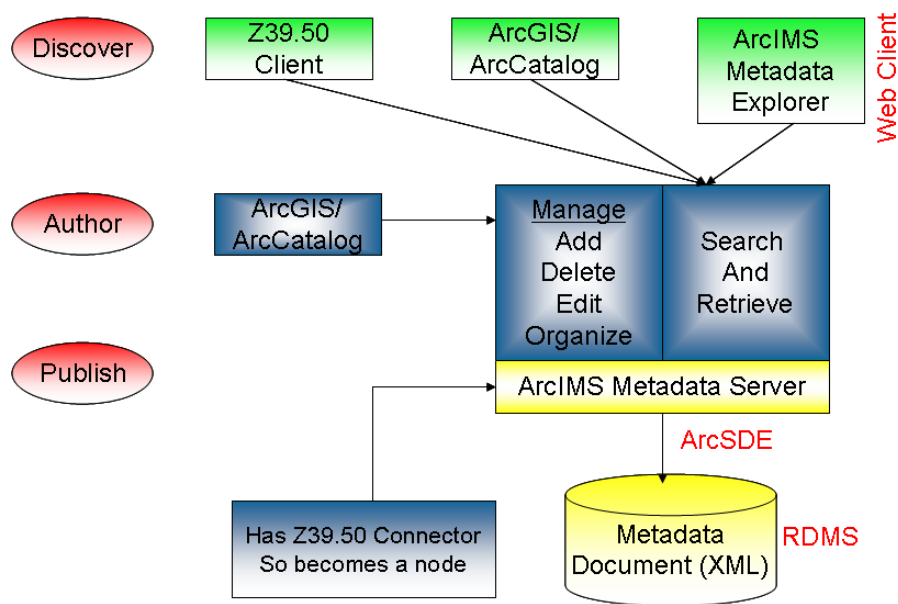

Figure 3   Portal Configuration with ArcIMS

With the release of ESRI's ArcGIS Server, the decision was taken to migrate portal services to ArcGIS Server 9.2 which allowed for the efficient storage, management and publishing of geospatial datasets on the internet. A comprehensive geodatabase of Jamaica's geospatial data sets inclusive of but not limited to the following are available via the portal.
- Administrative: Parish,

- Topography
- Land use/land cover
- Roads
- Hydrology, rivers, watersheds etc
- Geology: faults, earthquakes
- Critical Facilities – emergency shelters, police and fire stations, hospitals, schools etc.

With the installation and commission of ArcGIS Server a number of web applications have been created to facilitate general and project specific data access. The following are some of the applications that are currently running:-

i. Green House Site Selection - This was created to assist the Ministry of Agriculture with the site selection process for green houses across the island. The criteria for site selection were based on elevation, slope and topography.
ii. Place Finder- This application allows users to locate places of interest
iii. Banana and Plantain web mapping application provides access to query and view information on farmers farms – size, type of bananas, name of farm, source of water, ownership status etc.

The Geospatial portal will make geospatial datasets readily available to various stakeholders inclusive of decision makers when it is required. At the touch of a button, datasets on geology, topography and socioeconomic conditions among others can seamlessly be integrated. This will help to improve the development approval process, sustainable planning activities, and disaster management initiatives among others. The information which is needed to make decisions will now be readily available and accessible. This will bring forth new possibilities while simultaneously assisting the country as it moves toward achieving sustainable development.

The LICJ/SDMD is on its way to achieving its objective of creating a framework that facilitates the sharing of and access to geospatial information. However there are a number of technological issues related to networks and hardware that are to be addressed. In addition the implementation of the National Data Sharing and Pricing Policy, will provide an open and transparent framework to streamline the exchange of data among public sector entities and therefore an increase in the number of geospatial datasets that can be made accessible, viewable and searchable via the Land Information Council of Jamaica geospatial portal.

6.   CAPACITY BUILDING

6.1.   Training and Education

One of the major areas identified as critical to the development and sustainability of the national spatial data infrastructure is the implementation of on-going training in GIS and related disciplines. Additionally there is also the need to create an environment which nurtures and retains dedicated and proficient staff.

The Council has been at the forefront in increasing knowledge and awareness on cutting edge spatial technologies. It has consistently delivered GIS and related training, hosted technical workshops and demonstration sessions for both the public and private sectors.

An early achievement was the establishment of the Geo-informatics Training Centre in 1995 and the creation and delivery of seven 40 hour GIS training courses.

The Council launched the GIS in Schools Education Programme (GISSEP) in 2002 and continues to manage it in collaboration with the Ministry of Education and other LICJ members. The Council has partnered with other institutions such as the University of Technology and Caribbean Institute of Technology, to strengthen and or add GIS to their training program.

6.2.   Public Awareness

International GIS Day is recognized each year in November during Geography Awareness Week. A special committee of the LICJ with support of the Ministry coordinates the celebration of GIS Day. Since 2002, it has become a feature of the GISSEP and is held each year in collaboration with the Ministry of Education and the University of the West Indies (UWI), Mona.

As part of **Geography Awareness Week and GIS Day** celebrations since 2007 an annual GIS Executive Forum is held. The event is held to **raise awareness** on how GIS applications can impact all facets of our lives and business. The target audience is usually non users of GIS technology, in business, public sector and educational institutions. Participants are treated to technical presentations and an exhibit hall with posters and live demonstrations.

Geography Awareness Week and GIS Day activities continue to increase awareness and educate children, adults and the general public about GIS and related technologies and how it impacts their daily lives.

7. Conclusion and Recommendations

Over the past 17 years the LICJ has coordinated and prepared policies and guidelines and has led a number of successful initiatives to facilitate the use of spatial technologies in member agencies and by extension the development of a national SDI.
Some of these initiatives include:
1. procured and provided access to fundamental spatial datasets, for e.g. 1:2,000 orthophoto and IKONOS ortho imagery of the island,
2. facilitated greater collaboration – LICJ member entities provide technical support and assistance to each other,
3. provided GIS and related training through internships , the GIS in School Education Programme (GISSEP) and the LICJ training center,
4. through workshops and focused Council meetings raised awareness of and encouraged the collection of metadata. Cabinet has approved the Metadata guidelines,
5. generated increased awareness of GIS and related technologies through activities such as GIS Day and Geography Awareness week and facilitated seminars by private sector Geoinformatics products and service providers,
6. received two Environmental Systems Research Institute (ESRI) Special achievement in GIS awards, for the work of the Council and GISSEP. The Council is also the recipient of the First (1st) Urban and Regional Information Systems Association (URISA) Caribbean Spatial Vision Award for its contribution to the advancement of GIS in the region through inspiring leadership, outstanding training programmes, perseverance, and community involvement. The Chairperson of the Council has been recognised by ESRI as a GIS Pioneer for being among the earliest users GIS technology and contributions to geographic science. She was also awarded by URISA Caribbean as their first GIS Pioneer.
7. fostering the establishment of GIS Units in an increasing number of Ministries, agencies and departments,
8. adoption of a national coordinated approach to create a National Spatial Data Infrastructure for Jamaica with local skills

Providing access to spatial data is clearly critical to decision making and resolving development questions in a wide range of areas including economic growth, trade, municipal planning and development, disaster planning and risk reduction, agriculture and food security, humanitarian assistance and environmental conservation. The users benefit by being able to access data/information, which in turn enables more informed public participation and accountability. To achieve this requires consistent, long-term strategies, sound policies, leadership and participation.

There is much more to be done in the areas of:
1. increasing the awareness of SDI and its benefits to a wider cross section of potential users, particularly in the private sector. The GIS professional must be aware of where they are, and where they wish to go in order to continue to generate the dynamism required to accomplish their goals.

2. the finalization, use and adherence to GIS standards;
3. increase local training initiatives to increase the pool of GIS technicians and professionals to combat the inability of governments to retain skilled staff who leave to seek better opportunities in the developed world;
4. the design and sale of products and services to generate revenue which can and should be reinvested in SDI maintenance and the creation of a data investment market place to facilitate members of the infrastructure combining resources for sustained and guaranteed investment to support data creation and update and the maintenance of the portal.

Voluntarism, willingness and innovation have been the hallmark of the LICJ given limited resources. The success and continuation of the work being done require continued cooperation, coordination and willingness to share and exchange knowledge and technical expertise.

References

1. Blakemore, Michael (2004) Reflections on the Usefulness of Spatial Information Globalisation, Infrastructure and Agenda. *GIM International* 1 Volume 18:11-13

2. daCosta J., (2001) Keynote Address URISA Caribbean GIS Conference

3. Federal Geographic Data Committee, (2004) Geospatial One-Stop

4. Ministry of Land and Environment, Spatial Data Management Division Ministry (2003) Ministry Paper: National GIS

5. Reece K. (2004) Defining and Testing The Criteria for Effective Implementation of a Geospatial Data Clearinghouse in Jamaica

6. RESOLUTIONS, Urban And Regional Information Systems Association, Third Caribbean GIS Conference, Atlantis Resort The Bahamas, November 22, 2006

7. Land Information Council of Jamaica, National Spatial Data Infrastructure Strategic Plan, 2006

8. Government of Jamaica, National Land Policy, 1996

9. Ministry of Agriculture and Lands, The Implementation of the Metadata Guidelines, Semi-Annual Report, August, 2007

10. Land Information Council of Jamaica, National Spatial Data Infrastructure Framework For Geospatial Data Access And Management, 2005

11. Spatial Data Management Division Annual Reports – 2005 to 2008