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Country Report of Jamaica *

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Country Report on the Development of Jamaica's National Geospatial Information System

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Land Information Council of Jamaica

1.0 Introduction

Jamaica is the third largest island in size and the largest English-speaking island in the Caribbean with an area of 10,991 sq. km. The current population at the end of 2010 was 2.8 million with some 55 percent living in urban areas. Kingston, the capital city, is the commercial centre and seat of Government, and has a population of about 716,000. (Figure 1 shows a graphical representation of the island)

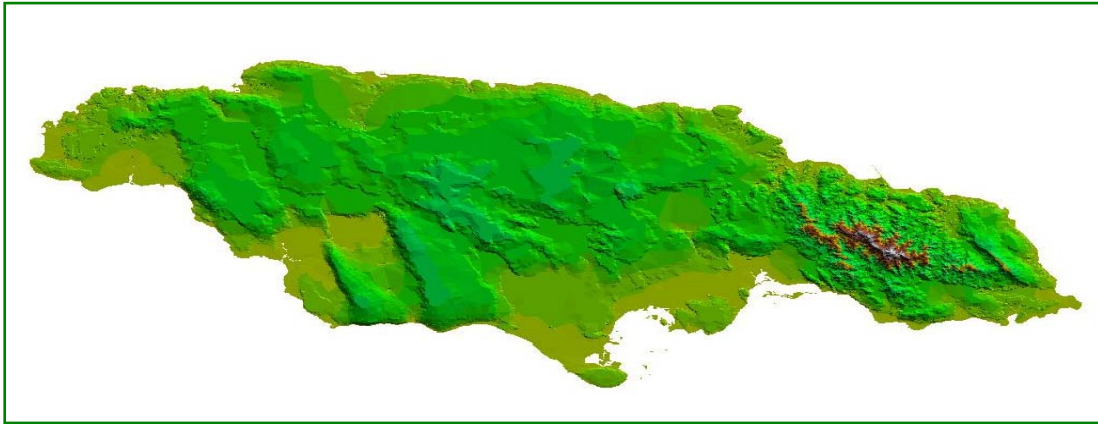


Figure 1 A topographic representation of Jamaica

2.0 National GIS Policy Framework

The importance of geographic information as an essential part of the nation's information infrastructure has been recognised and the government has been making the necessary investments, albeit with limited resources, to implement a national geographic data management system.

The value and importance of the management of geographic information was documented in the early 1990's when the **National Land Policy (1996)** was tabled on the houses of Parliament. Chapter 2 of the policy document, "*Land Information Management Systems*" outlines the issues and polices for establishment and management of a national GIS network. This policy is currently being revised and updated.

The importance of national GIS to the country's development was further enunciated in the first long-term strategic plan, **Vision 2030 Jamaica - National Development Plan**, 2009. The plan sets out the country's national vision statement: "*Jamaica, the place of choice to live, work, raise families, and do business.*" It also provides a comprehensive framework in which the economic, social, environmental and governance aspects of national development are integrated, and is expected to put Jamaica in a position to achieve developed country status by 2030. Spatial data infrastructure (SDI) development is addressed in national outcome 11, *a technology enabled society* and the strategy and key action is as shown in table 1.

National Strategy: Integrate Science and technology in all Areas of Development	
Sector Strategy	Key Action
Make available and accessible geospatial data, products and services to all users, to facilitate planning, sustainable use, management and development of the island's resources	Implement the national spatial data infrastructure strategic plan

Table 1 The strategy and key action which addresses SDI in the strategic plan Vision 2030 Jamaica

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. The following eight priority objectives were identified and are currently being addressed through various initiatives.

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.

3.0 Institutional Arrangements

The **Land Information Council of Jamaica (LICJ)** is the **first** of its kind in the Caribbean, established by Cabinet in 1991 to coordinate the development of Geographic Information Systems (GIS) and to create policies and national standards for the use and access of geospatial data.

The **LICJ** consists of over 50 government of Jamaica (GoJ) and private sector entities which oversees the development of a national spatial data infrastructure inclusive of, comprehensive and accurate spatial data, technologies, polices and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors and the academic community. The structure of the LICJ and reporting relationship is shown in figure 2, page 4.

The Council's work is administered and implemented by the National Spatial Data Management Division (NSDMD) currently within the Ministry of Housing, Environment and Water. The NSDMD is the government entity charged with the task of providing national strategic direction, policy development, leadership, management and implementation of Jamaica's spatial data infrastructure. Its responsibilities make it central to the promotion and growth of Jamaica's geospatial sector and most importantly an enabler for national development.

Its main objectives are to:

1. develop the **policy framework** and guidelines for the development and growth of the local geo-informatics sector,
2. foster the creation and maintenance of a skilled, relevant and innovative **geo-informatics workforce**,
3. create the framework which facilitates and **provides access to geospatial data** among all stakeholders,
4. create and manage **a national geospatial portal/clearinghouse**,
5. adopt/adapt/create and maintain **national standards for spatial data** collection, management, discovery and exchange,
6. promote and facilitate the **creation and maintenance of digital spatial data sets**
7. provide LICJ members with geospatial **technical guidance and support**.

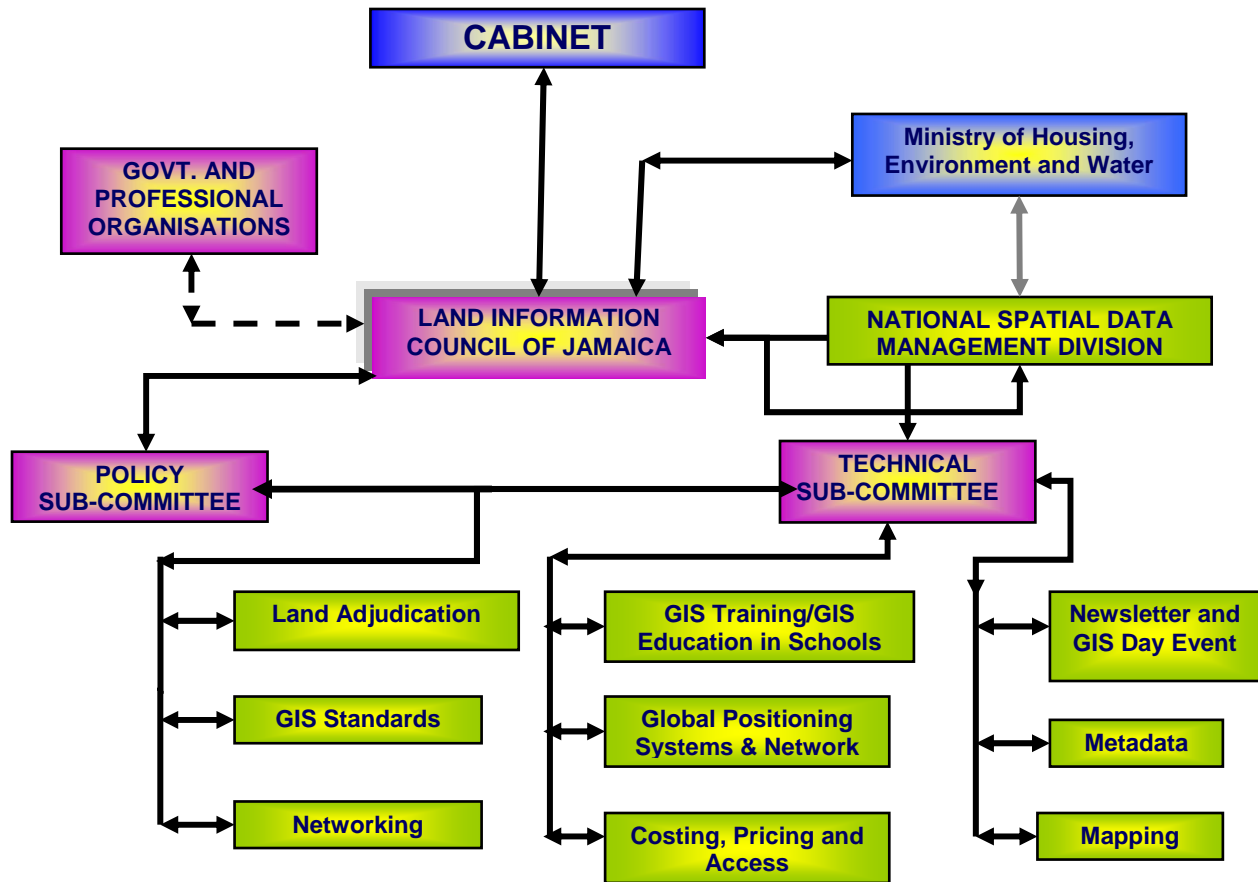


Figure 2 The Structure of the Land Information Council of Jamaica

4.0 Overview of Jamaica's Geospatial Sector

The geospatial sector in Jamaica may be described as young and maturing. Over the last 20 years an increasing number, now over 35 government entities and utility companies have been using GIS and related technologies (remote sensing, GNSS, web GIS) to support their core operations. Some of the major stakeholders are the National Land Agency (NLA), the National Environment and Planning Agency, the Rural Physical Planning Unit, the first GOJ Organization to establish a GIS, the Forestry Department, the Office of Disaster Preparedness and Emergency Management, the Mines and Geology Division, Water Resources Authority, the National Water Commission, the Planning Institute of Jamaica and the Statistical Institute of Jamaica. There has also been an increase in the number of private sector users in the areas of insurance, vehicle navigation, tracking and management, estate management, construction and facilities management. Government remains the largest user of geospatial technologies. See Appendix for diagram detailing the major milestones achieved in the evolution of GIS in Jamaica.

The Planning Institute of Jamaica evaluates the growth and development of the GIS industry on an annual basis and the results are published in the Sustainable Development Chapter of the *Economic and Social Survey*. The 2010 publication of the document is available on line at <http://webstore.pioj.gov.jm>. A survey is conducted based on a selected set of indicators ranging from institutional capacity, finance, metadata management, data access to level of awareness. This year, the survey was completed by 20 entities and 65 percent indicated that GIS was integrated into their mainstream operations and business processes. GIS was being effectively used for land resources assessment, the development approval and land procurement processes, traffic management, disaster management and customer surveys. Some 29 percent indicated that savings were earned from GIS implementation and 50 percent reported earnings from the sale of new and existing geospatial products and services. Whilst the results from this annual

survey are encouraging there is more to be done to refine the indicators used and to have more entities collect information in the format required to respond to and complete the survey.

5.0 Data Creation and Availability

The islands geospatial data stores are populated with the fundamental datasets as listed albeit various states of currency and accuracy. For example the large scale imagery is ten years old however a new initiative is being pursued to acquire a new set.

- | | |
|-----------------------------|--|
| 1. Imagery | <i>Satellite imagery</i> |
| 2. Governmental units | <i>place names, legally established boundaries and names</i> |
| 3. Transportation | <i>Roads, Rail ways, street centre line</i> |
| 4. Cadastral | <i>Parcels/Cadastral</i> |
| 5. Geodetic control | <i>Geodetic control points, Heights datum,</i> |
| 6. Hydrography | <i>Rivers, Stream</i> |
| 7. Elevation and bathymetry | <i>Digital elevation model</i> |

Within the last two years a data collection and collation exercise was conducted to consolidate geospatial data sets across all GoJ entities to support the preparation of a new national spatial plan. This exercise collated over 200 layers of base and thematic spatial data categorized as follows.

- | | |
|-----------------------------|--|
| (1) Administrative | - boundaries, coastline, communities |
| (2) Environmental | - Marine, Freshwater
- Conservation
- Hazards
- Geology
- Land Cover. |
| (3) Land Use | - Agriculture - Cultivation, Fisheries
- Commercial
- National Resources
- Industry
- Urban |
| (4) Physical Infrastructure | - Utilities, water, irrigation
- Transport, road
- Telecommunications |
| (5) Social | - Recreation, attractions, beaches
- Cemeteries
- Electoral
- Educational
- Emergency, Health
- Population
- Postal Services |
| (6) Socio Economic | - Financial
- Tourism
- Housing - formal and informal |

GoJ entities continue to create new and or update existing geospatial datasets to support project and programme activities and daily business process. The following are some selected organizations that created spatial data in 2010.

1. The National Land Agency creates and maintains a digital cadastre of the island (Survey function) and standard maps of the whole or parts of the island (Mapping function). For 2010 to 2012 master maps for the towns of Ocho Rios and Spanish Town and its environs were created. This is part of the ongoing master mapping project to create an updated map for at least one major town in the island each year. In addition all 20 sheets of the 1: 50,000 topographic map series were updated and are now available;
2. GIS and GPS were used by the Forestry Department to prepare maps, delineate forestry reserves and to monitor encroachment in selected parishes and
3. the Water Resources Authority also reported using high end GPS hand held devices, digital camera with GPS, mobile PDA, remotely sensed images, wide scale scanner, telemetric stations, data loggers and in situ water quality loggers for the improvement of the organization's database and the monitoring of water resources. GIS and GPS technology was also instrumental in identifying ground and surface water resources, in the rainfall harvesting project and overlay and proximity analysis to propose the best solution for sewage disposal in proposed subdivision plans.

6.0 Geodetic Network

Through a collaborative project among the NSDMD, the NLA and the National Water Commission, 13 permanently continuously operating reference stations (CORS), a virtual reference station network, referenced to the JAD2001 datum based on the WGS84 spheroid, named **gFIX.net** (shown in figure 3 below) was established in 2010. The network is used to augment the accuracy of GPS receivers solving a variety of positioning applications mainly covering surveying and GIS mapping. The network delivers real-time and post processed corrections via the Internet, at centimetre (cm) level accuracy to clients conducting satellite derived observations in the field.

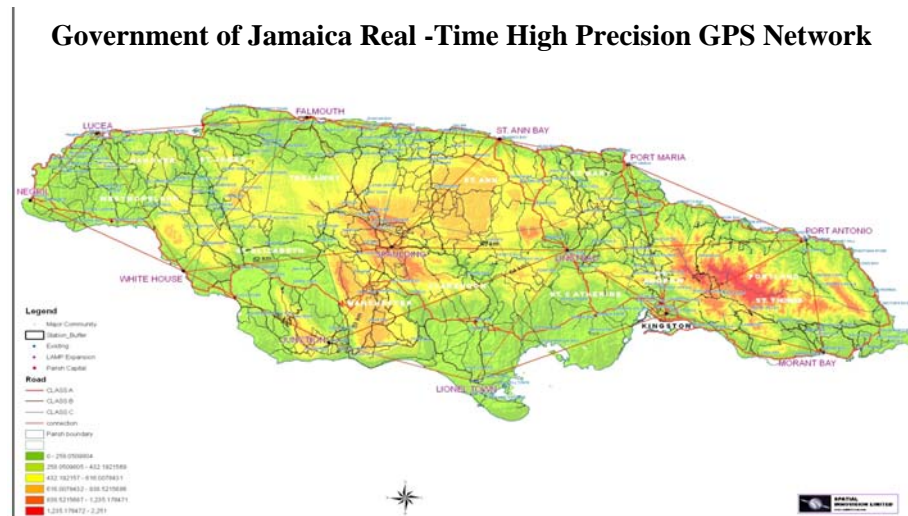


Figure 3 Jamaica's Virtual Reference Station (VRS) known as "gFIX.net"

The gFIX.net is expected to revolutionize the surveying and construction sectors, enabling increased accuracies with enhanced performance and reliability, in addition to improved productivity. The benefits and impacts of adapting GNSS technology in the social and institutional structures of government and the private sector are many. gFIX.net is being used to reduce production time and cost of cadastral surveying under the Land Administration and Management Project (LAMP) II.

7.0 Data Discovery and Access

The Council has been advancing the national SDI vision, to provide access to the nation's geospatial data through a number of inter-related, multi-faceted strategies and programmes.

Initiatives and Programmes Implemented to Facilitate Access to Geospatial Data
1. The drafting of a data sharing and access framework protocol
2. Preparation of data sharing and internal pricing policy for government entities
3. The creation of fundamental and thematic geospatial data sets
4. The adoption/adaptation of geospatial data standards in particular metadata
5. The creation of access mechanisms, i.e. the LICJ website, metadata and geospatial portals, special geospatial web services (http://www.licj.org.jm/licj/)
6. Capacity building inclusive of training and education and public awareness.

Table 2 Access to Geospatial Data Initiatives and Programmes

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 and pricing framework. Notwithstanding 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. 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 and the Office of the Prime Minister in collaboration with a number of stakeholders inclusive of the NSDMD have embarked on a project to prepare 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 the consensus of all stakeholders.

Another initiative to manage and monitor access to geospatial data was the creation of the **Geospatial Data Sharing and Advisory Council (GeoDSAC)**. The Cabinet 2008 approved the operation of the **GeoDSAC** which has the responsibility for evaluating and approving international requests for Jamaica's geospatial data from foreign countries and organisations. Also approved was a list of datasets critical to national security that should not be made available to foreign entities.

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.

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 exists 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.

Factors contributing to 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

Table 3 Metadata Management contributing factors

To address these challenges, the LICJ/NSDMD over the past 4 years embarked on a series of technical workshops and metadata creation projects such as **“From concept to Practise: dealing with the Backlog”** and **“Fostering a Culture of Metadata Production”** which increased awareness and strengthen metadata management skills of GIS personnel.

A metadata portal was created using **GeoNetwork** portal software. This is an open source catalog application for managing spatially referenced resources through the web. It provides powerful metadata editing and search functions as well as an integrated interactive web map viewer InterMap. The portal (shown in figure 4) 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 organizations to manage their records. Users are allowed to search and retrieve metadata records.

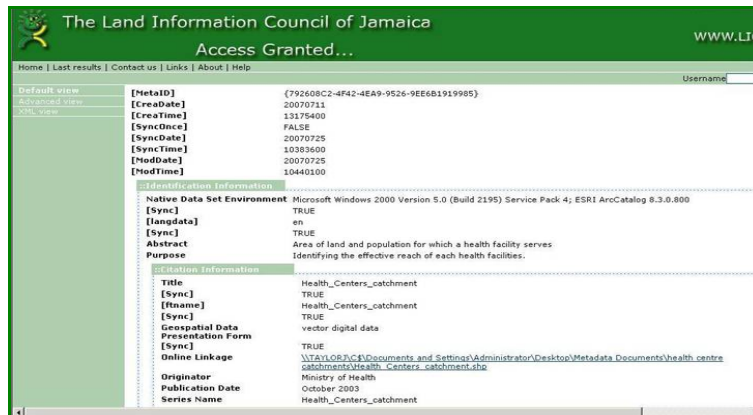


Figure 4 Land Information Council of Jamaica (LICJ) metadata portal

The NSDMD 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.

Access Mechanisms

The NSDMD and LICJ members such as the NLA, the National Works Agency and others have been putting in place the necessary investments to make geospatial data available and accessible. Two major portals are the **Government of Jamaica Web Map** (shown in figure 5) prepared in support of the creation of the National Spatial Plan and **iMap Jamaica** (shown in figure 6), a joint public and private sector managed initiative.

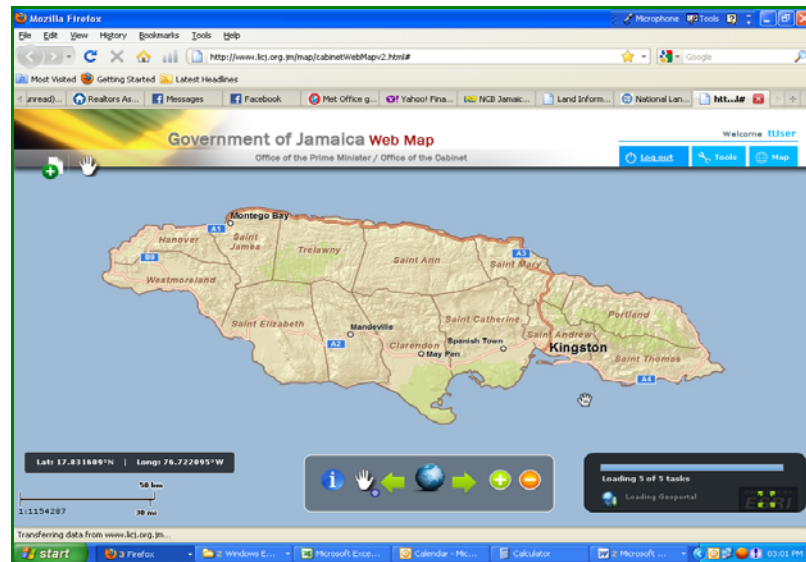


Figure 5 National Spatial Plan Web Map of Jamaica

The LICJ, NSDMD is on its way to achieving its objective of creating a framework that facilitates the sharing of and access to geospatial information. Government of Jamaica web map serves up a comprehensive geo-database of Jamaica's geospatial data sets inclusive of but not limited to administrative, parish, civic, environmental, physical, infrastructure, social, socioeconomic data and imagery.

The growth in application of GIS continued as evidenced by the increased use of internet-based GIS applications to support business processes of both government and private sector organizations and to facilitate access to critical spatial data by the general public. iMap Jamaica web application is one such example. iMap displays the parcel, street centerline and IKONOS imagery as the base along with most of the features found on the 1:250,000 topographic map. The datasets on display such as the parcels are updated on a regular basis.



Figure 6 National Land Agency (NLA) web map application “iMAP Jamaica”

The web mapping applications serve as points of contact for anyone wishing to access the country's geospatial data. 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 increase the number of geospatial datasets that can be made accessible, viewable and searchable via the Land Information Council of Jamaica geospatial portal.

8.0 Capacity Building

Very early initiatives were the creation of geospatial training infrastructure and GIS course offerings. It was recognized that geo-informatics technical skills and competencies were needed to support the creation of geospatial data and products. The LICJ established its Training Lab in 1993 and begun offering a range of Courses first to GOJ personnel involved in GIS and later to private sector individuals.

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. The joint GIS program between the Caribbean Institute of Technology (CIT) and LICJ/NSDMD which offers a certificate in GIS, is one such offering. The University of Technology, Jamaica and the University of the West Indies, Mona also offers GIS related courses in various degree programmes.

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. Assistance of US\$1 million from ESRI in soft ware and training material have been given to the LICJ for this Programme.

The Council has partnered with other institutions such as the Caribbean Institute of Technology and teacher training colleges to strengthen and or add GIS to their education program.

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 the University of the West Indies (UWI), Mona and the local ESRI distributor Spatial Innovision Limited.

As part of **Geography Awareness Week and GIS Day** celebrations since 2007 an annual GIS Business 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.

Interagency Collaboration

The growth and resilience of Jamaica's geospatial sector can be attributed to the strong levels of interagency assistance and technical support that prevails. The creation of the national VRS network previously mentioned is one such initiative. Another collaborative initiative is that of the National Emergency Response GIS Team (NERGIST). This is a multi-agency group of GIS volunteers coordinated by the NSDMD is tasked to undertake damage assessment and analysis prior to, during and post meteorological and geological events to facilitate response, relief and recovery operations. This group has been activated many times in response to tropical storms and hurricanes to undertake map preparation, data collection and analysis and damage assessment. The last deployment was in 2010 post tropical storm Irene. An Emergency Shelter Google map was created that showed the location of areas affected by rains and the locations of the shelters.

Global predications for climate change will continue to influence national action coupled with other challenges to induce economic growth. Increase emphasis is being placed on the use of geospatial and related technologies to support the management of the islands resources and to make informed decisions. Work continues in updating and improving geospatial data sets, the adoption/adaption of geospatial standards, strengthening education and training offerings, finalizing the mash-up project and joining regional initiatives such as GeoSUR and GEOSS in the Americas and drafting Jamaica's SDI

Some Milestones in the Evolution of GIS in Jamaica

