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1.0 INTRODUCTION

Throughout the world, the use of Geographic Information (GI) has grown steadily with a wide range of applications such as land use planning, zoning, transportation, site suitability analysis and economic development. In Guyana, GI use is concentrated in the natural resources and environmental sectors for use in land boundary demarcation, overlays and monitoring.

The urgent need to create Geographic Information System ready datasets and use GI applications for nation building is becoming more evident by government officials and other stakeholders. Empirical information and data, particularly spatial data should form a key pillar on which decisions are made. This policy provides the necessary framework for identifying key datasets needed for socio-economic development, and specifies the mechanism for data collection, storage and dissemination.

This policy is an update to the Geographic Information Systems Policy of February 21, 2002.

1.1 Geographic Information Systems

In general, Geographic Information (GI) refers to information that is spatially explicit – information that describes or refers to places and areas along with the attributes of those places and areas. GI therefore includes, but is not limited to, information about natural resources, natural and man-made features, location addresses, human activities, natural and environmental phenomenon, etc. It has been estimated that about eighty percent of the information handled and decisions made by governments are spatial in nature, i.e., the decisions have a location or geographical component or implication. It is therefore logical that an appropriate information system be utilized for the proper management of such geographic information.

A Geographic Information System (GIS), in one of its many contexts, is an extremely powerful and flexible computer aided tool that offers the most effective management of GI. In a practical sense, it is a tool for making geographic decisions or solving geographic problems. This is achieved primarily through the effective use of a wide range of easily integrated geographic data. In recent times, GI has moved to online servers using a variety of software and requiring only an internet browser and connection thereby making it more widely available than before.

GIS has evolved from developments in theory and technology, a widening of the application base, the emergence of philosophical and legal frameworks, and a growing economic impact. It is concerned with making decisions with GI and the technological advances to provide for this. It incorporates Remote Sensing (RS) and Global Positioning System (GPS) technology, Computer Science / Information Systems (IS) / Database systems, Geography, Spatial Statistics, Geo-Statistics, Decision Science and Decision Support Systems (DSS) amongst others, as components.
1.2 **Rationale**

In Guyana, with the rapid spread of several GIS and other land information systems in recent years, issues pertaining to domain, ownership, access, security, distribution of digital data, sale/charges, data dissemination/updating/interfacing, metadata standards, inter-agency relationships and human resources have been emerging.

The need for a government-approved policy governing geographic information systems has now become critical. Further, a national policy is required to encourage and expand the use of GI and GISs and the building of a National Spatial Data Infrastructure in pursuit of sustainable national development.

A clear national policy could consolidate the relatively rapid development of local systems by minimising the risk of duplication, ensuring compatibility of current and future implementations, identifying national priorities that could be best served, providing the conceptual framework within which the public and private sector can plan their efforts, guide the provision of information, and support education, research and training in this area.

A significant amount of GI is currently available, but with no mechanism in place for data sharing. The potential advantages of utilizing the data in various analytical and management scenarios are not being realized. Thus, there is need for compiling of all the GI data in a central location where it would be accessed via a clearing house mechanism and/or an online server.

1.3 **GIS in Guyana**

The development of Geographic Information Systems (GIS) in Guyana has seen relatively significant growth since July 1995 with the assistance of the Natural Resources Management Project (NRMP), which was a bilateral Technical Cooperation project between the Government of Guyana and the Republic of Germany through the German Agency for Technical Assistance (GTZ). Initially, the technology was introduced into five core agencies within the natural resources sector. The Lands and Surveys Department (L&SD)\(^1\), the Guyana Forestry Commission (GFC), the Guyana Geology and Mines Commission (GGMC), the Guyana Natural Resources Agency (GNRA) and the National Agricultural Research Institute (NARI). By 2001, with the continued support of the NRMP and additional support (via DFID, ACT, CPACC etc.) to these and other institutions, GIS technology has been firmly embedded within their operations. GIS has also seen significant growth within the Environmental Protection Agency (EPA), the Iwokrama International Centre for Rainforest Conservation and Development, the Centre for the Study of Biological Diversity (CSBD) and Conservation International - Guyana (CI).

\(^1\) The Lands and Surveys Department, Ministry of Agriculture has now been replaced by the Guyana Lands and Surveys Commission (GLSC)
Since 2005, there has been significant deployment of GIS within the operations of the GGMC, GFC, EPA and the GLSC. The advent of the Low Carbon Development Strategy (LCDS) has seen a significant deployment of data and technology within the GFC. Both the GFC and the GGMC are dependent on GIS for a significant amount of their day-to-day operations.

Other private and public organisations have also embraced GIS technology to varying degrees.

A pertinent observation over the last five years is the lack of current, thorough and high quality datasets (both digital and analog) with which to adequately address development questions – and if these do exist, they exist in disparate form amongst many agencies, and access is not easy. Significant also is the fact that most of the GIS applied in Guyana thus far has been concentrated in the natural resources and environmental sectors. There is an urgent need to create a number of datasets at an appropriate scale that are relevant (and critical) for nation building. These include infrastructure (roads, settlements, sea-defence, public utilities etc.), physical features (hydrograph, terrain elevation), environmental data, climatic data, natural resources (minerals, forestry, etc.), vegetation, soils, geology, bio-diversity, cadastral and housing data, socio-economic and demographic data, administrative and political infrastructure. With the widespread existence of newer sources of digital data (such as satellite imagery and GPS), the possibilities for updating many of the out-of-date datasets are increasing (especially in terms of cost and accuracy).

2.0 THE POLICY CONTEXT

The availability of accurate, reliable, and up to date information for decision making, which can be easily filtered down to an operational level in a transparent manner is a widely known catalyst for alleviation of poverty and effective resource management. Adequate information technology, such as GIS was sighted in the last GIS Policy of 2005 – 2011 as a critical component to integrate the complex nature of social, environmental and even financial matters into a single platform for such decision making.

Moreover, the Low Carbon Development Strategy (LCDS), which has effectively succeeded the NDS of 2000 – 2010, has as its primary objective the maintenance of our forest for the fight against climate change and to receive financial resources for doing so. A case for the disbursement of REDD+ incentives through an efficient Monitoring, Reporting and Verification Systems (MRVS) needs little justification in this regard.

However, on a much broader context, the following areas for which this GIS Policy will have a direct impact for success within the LCDS initiatives are:

- High data availability for natural disaster (flood) mitigation on our coast and urban areas.
- Need for web applications and “online” data to encourage and even facilitate internet activities.
- Free, "well informed" and prior consent for opt in mechanism for Amerindians, and finally,
- Hydro electricity generation will require advanced services and data products that are built on a National Spatial Data Information (NSDI) framework to be able to maximize energy generated (smart grids, current power consumption, built/planned infrastructure, etc).

Although not discussed in detail here, a SDI is the natural progressing result from this policy. The main reason being, such a framework is built on essential data which is the emphasis of this policy.

The environment in Guyana is not unique. Though progress in GIS has been commendable, skills in this area are still limited and administrators and consumers of GIS products still need to be sensitised about the creation, use and dissemination of GI products and the implementation of GIS generally. Most institutions that possess GIS capabilities are limited to data creation and mapping activities, with the core analytical powers of GIS along with implication of poor data quality sources still to be developed or understood.

3.0 GIS POLICY STATEMENTS

3.1 Data Inventory and Metadata

3.1.1 Government agencies are to examine their data holdings and prepare a metadata listing of those that are spatial or that can otherwise be spatially-enabled. The metadata standard will be recommended by the GIS Committee to the GLSC for approval.

3.1.2 Quality and coverage of datasets will be recorded amongst other attributes. This will indicate suitability-to-task of some data, as well as the need to update/improve some data.

3.1.1 The various metadata will be collated into a National metadata database by the GIS Committee that will be accessible to the general population. This will help to improve access to data and to reduce duplication of effort.

3.1.2 Each agency managing a spatial database shall be responsible for the update and maintenance of the metadata database of their spatial datasets. This metadata

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2 Metadata refers to the systematic documentation of data. In this case, a metadata database can be thought of as a database describing a spatial database without actually containing the spatial data itself. (analogous to a telephone directory).
database shall be regularly uploaded to the National metadata database managed by the GIS Committee.

3.1.3 Metadata shall be available free to all users. Government shall encourage the dissemination of metadata via hard copy or in electronic format.

3.2 Geographic Reference

3.2.1 Government agencies will incorporate a geographic reference for each data record/item within their domain. This storage of geographic references will be considered once an agency manages a spatial domain, and independent of whether it has GIS capability or will adopt a GIS in the near future.

3.2.2 The use of global positioning systems (GPS) technology will be encouraged by Government agencies as a means of providing the geographic reference for spatial data.

3.2.1 Position references shall be extracted from the best maps/data available of the area. Where data has to be agglomerated, the reference frames must be extracted from the best maps of the area obtainable from the GLSC.

3.2.2 Geo-referencing will satisfy the geodetic standard set by the GLSC which should consist of these basic elements:

   i. Projection: Universal Transverse Mercator (UTM) Zone 20 North or Zone 21 North
   ii. Datum: World Geodetic System 1984 (WGS 84) OR SIRGAS

OR

   i. Coordinate system: Latitude/Longitude (decimal degrees)
   ii. Datum: World Geodetic System 1984 (WGS 84) OR SIRGAS

3.2.3 The use of the Provisional South American Datum of 1956 will be discontinued beyond December 31, 2015, with the exception of historical data.

3.3 Data Collection

3.3.1 To ensure integration of spatial datasets, government agencies should attempt to work to achieve high quality datasets and common semantic reference frames and accessible data formats. Where possible, revision of similar datasets already collected under different classification schemes into a useful, common, single, and perhaps new classification scheme should be done.
3.3.1 To reduce duplication of effort, agencies will coordinate their collection of spatial data via GIS Committee.

3.3.2 Except in highly classified cases/situations and in cases where it is deemed that Remote Sensed Imagery or data to be acquired by Government institutions will be beneficial for other institutions, such imagery will be licensed to the “Government of Guyana”, and be made available to the respective agencies through National Clearing House Mechanism in a timely manner.

3.3.3 Data will be collected at the highest positional accuracy affordable.

3.3.4 Spatial data will be collected and stored by public agencies in the most discrete/detailed form possible and affordable. In cases where data are associated with individuals or business or NGO’s particulars of such will be recorded which will include the respective Tax Identification Number (TIN).

3.3.5 All sectors of government that collect spatial data should ensure that these data are stored in digital form.

3.3.6 Agencies shall maintain and update their datasets on a regular basis.

3.3.7 Considering the paucity of spatially-enabled social and economic data, especially in digital form, the Guyana National Bureau of Statistics and the National Registration Centre shall work towards the creation of such spatially-enabled datasets.

3.3.8 The government will provide direction and the means to fill gaps or needs identified in spatial datasets of the country. New sources of data such as satellite and airborne sensors (conventional optical, radar or Lidar) will be pursued for updating of relevant datasets and the creation of new ones.

3.4 **Data Quality and Duplication**

3.4.1 The GLSC through the GIS Committee shall prepare and approve spatial data standards to be met by government agencies. Other institutions shall be encouraged to conform to these standards. These standards shall be subject to periodic review.

3.4.1 Quality control procedures will also be implemented as recommended by GLSC through the GIS Committee.

3.4.2 GLSC shall establish standards for core data and will be responsible for their update.
3.5 **Data Protection and Privacy**

3.5.1 An agency shall not divulge confidential data to an unauthorized third party.

3.5.2 An agency storing digital spatial data shall implement industry-standard/good-practice data backup procedures. Such backups shall be securely stored off-site.

3.6 **Copyright and Intellectual Property Rights**

3.6.1 Government will retain ownership of its data and shall promote and enforce full copyright protection and licensing.

3.6.2 Government shall encourage the use of officially released datasets while ensuring that copyrights are not infringed.

3.6.3 Each agency managing a spatial domain shall prepare a licence outlining the terms of use of its spatial data.

3.6.4 The government will allow open access to its digital data sets, under licence, to defined users as determined by the GIS Committee.

3.6.5 Publication of work utilising such data shall be made only with the appropriate acknowledgement(s) as set out in the licence.

3.6.6 Those agencies that may have already transferred paper maps into digital vector or raster data will be granted amnesty from copyright infringement under the rationale that these digital data may be provided to the GLSC and the GIS Committee as a common contribution to improving the digital data stock in the country.

3.6.7 Considering the implications of data manipulation and enhancement on copyright, the GLSC, supported by the GIS Committee, shall determine when such manipulations and/or enhancements result in new information that merits the transfer of copyright.

3.7 **Distribution and Sharing**

3.7.1 Core Datasets

3.7.2 The National Basemap at the scale of 1:1,000,000 shall be made available to all non-commercial users.

3.7.3 In order to provide a reference for data creation and analysis, the following datasets shall be made available by the GLSC to the relevant agencies, when they
are equipped to appropriately make use of them and compile and produce spatial data:

- The National Boundary
- Principal rivers
- Major roads
- Urban centers
- The Administrative Boundaries (Regional, Sub-Regional, Districts, Neighbourhood Democratic Councils and Peoples’ Cooperative Units)
- The National Census
- Amerindian Lands
- Protected Areas
- National Gazetteer of Guyana

Additional datasets that are recognized as needed for key decision making will be made available by a clearing house mechanism as decided by the national GIS Committee. These datasets include, but are not limited to;

- Land Use Plan as is available and approved
- Mineral Property Tenure
- Mineral Exploration Data
- Forest Concessions
- Vegetation and Soil data
- Lease and Privately held land (as is available)

3.7.4 Considering the National Gazetteer’s importance as a source of reference, the GLSC shall consider measures to provide the same at minimal cost in digital form.

3.8 Thematic Datasets

3.8.1 The government shall encourage the utilisation of government spatial data in decision-making by public and private agencies.

3.8.2 The GIS Committee will create and maintain a National Spatial Database for all spatial data for national land use planning, policy and spatial information and a clearing house mechanism to manage same.

3.8.3 Government agencies that manage a spatial domain shall deposit relevant spatial data into the National Spatial Database as these become available.

3.8.4 The National GIS Committee shall institute a registration and licensing mechanism for agencies wishing to access spatial data.

3.8.5 The National GIS Committee shall establish clear guidelines regarding the distribution and sharing of government spatial data, including the category of agency and the type of data.
3.8.6 Government shall support global and regional mapping and database initiatives.

3.9 **Cost Recovery**

3.9.1 Each participating member shall include the cost, if any, in their metadata listing of spatial information available.

3.9.2 Agencies may establish and publish user charges for their spatial data which differentiate among the following user groups:

- The GIS Committee participating Agencies
- Other Government Ministries/Agencies
- Universities, schools and other research institutions
- Non-Governmental Organizations
- The general public
- Private Firms

3.9.3 In establishing user charges, agencies shall distinguish between free, cost recovery and market price categories.

3.10 **Sustainability**

3.10.1 Government will promote the sustainability of information systems.

3.10.2 Government will promote and support pilot projects utilizing spatial data and GIS.

3.10.3 The government will promote education and training courses in GIS, and awareness of spatial information systems.

3.10.4 The government shall consider educational, training, licencing and other policy changes to encourage the use of spatial data in decision-making and the provision of services and shall evaluate on a regular basis, by public consultation and other means, the use of spatial data.

3.10.5 This policy on GI shall be evaluated and updated as necessary, but not exceeding a duration of five (5) years.
4.0 POLICY IMPLEMENTATION CONSIDERATIONS

For the successful implementation of the proposed policy, a national body (National GIS Committee) should be set up and given the mandate for the enforcing of data sharing agreements, data standards, etc., and the general management and implementation of this Policy. This body should encompass agencies outside of the traditional natural resources sector agencies where the initial focus for the deployment of GIS was made.

Several models exist for such a national body and its composition, such as the NGA (National Geospatial-Intelligence Agency) in the United States of America or IBGE (Instituto Brasileiro de Geografia e Estatística) in Brasil. However, discussed in this policy is a GIS Committee, with the primary focus to implement and maintain the country’s national spatial data infrastructure. The body will be tasked with the following objectives;

- Promulgation and enforcement of standards and data procedures throughout government.
- Provide necessary training and support for the effective deployment of GIS.
- Manage national data web portal and oversee clearing house mechanism.
5.0 LIST OF ABBREVIATIONS

ACT      Amazonian Cooperation Treaty
CD       Compact Disc
CHPA     Central Housing & Planning Authority
CPACC    Caribbean Planning for Adaptation to (Global) Climate Change
CSBD     Centre for the Study of Biological Diversity
DFID     Department for International Development
EPA      Environmental Protection Agency
GFC      Guyana Forestry Commission
GGMC     Guyana Geology & Mines Commission
GI       Geographic Information
GINRIS   Guyana Integrated Natural Resources Information System
GIS      Geographic Information System
GIS(Science) Geographic Information Science
GLSC     Guyana Lands and Surveys Commission
GNRA     Guyana Natural Resources Agency
GoG      Government of Guyana
GPS      Global Positioning System
GTZ      German Agency for Technical Cooperation
LUP      Land Use Planning
MNRE     Ministry of Natural Resources and Environment
NARI     National Agricultural Research Institute
NDS      National Development Strategy
NGO      Non Governmental Organisation
NRMP     Natural Resources Management Project
NSDI     National Spatial Data Infrastructure
UTM      Universal Transverse Mercator