LAND INFORMATION COUNCIL OF JAMAICA

METADATA GUIDELINES

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Land Information Council of Jamaica
Ministry of Economic Growth & Job Creation

First draft prepared January 2006
Latest version prepared March 2019

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Acknowledgement

Thanks to the members of the Land Information Council of Jamaica (LICJ) who gave of their time and expertise in researching, preparing, reviewing and editing this document.

This document is a testament of the cooperation, commitment and voluntarism that are attributes of the LICJ.

Special thanks to the staff of the National Spatial Data Management Division for their input and support towards completing this document.

Executive Summary

The use of GIS and its related technologies within the public sector have been increasing within the last two decades. With the increased usage, has arisen a number of attending issues, such as ownership and copyright of geospatial data, data quality, accuracy and completeness, cost and accessibility constraints. These issues can be addressed through the collection, management and dissemination of geospatial metadata.

The LICJ over the years has been encouraging its members to collect metadata for the geospatial data sets they are mandated to create and maintain. This has been an uphill task as metadata management is seen as an added burdened to data creators, in terms of cost, time and complexity. Very few agencies are currently collecting and maintaining metadata.

This guideline provides a quick introduction to metadata, what it is, why its collection and management are important for organizations to maintain their investment in geospatial data and for national GIS development.

The first section of the document "Metadata Guiding Principles" is of particular importance, as it provides an overall framework and policy direction for members of the Council on the creation, management and dissemination of metadata.

The document also examines metadata standards from the ISO and FGDC. Selected elements from the ISO standard that were considered applicable to the Jamaican environment were selected. It is intended that metadata creators collect and maintain these elements.

Section V is for metadata developers. It provides guidelines for metadata creation, from an administrative and technical perspective.

The Appendices provide definitions of basic terminologies, explains framework data sets and identifies the agencies responsible for geospatial data creation and maintenance.

By establishing a common set of metadata terminology, definitions and creation procedures the guidelines should promote the proper use and effective retrieval of geospatial data. Data producers and users cannot afford to be without documented data. The initial expense of documenting data clearly outweighs the potential costs of duplicated or redundant data generation.

Comments on the guidelines and suggestions for improvements are welcomed and should be sent to the National Spatial Data Management Division, 191 Old Hope Road, Kingston 6, Fax 876-630-1850-1, info.spatialdata@megjc.gov.jm .

List of Acronyms

ESRI	Environmental Systems Research Institute
FGDC	Federal Geographic Data Committee
GIS	Geographical Information Systems
ISO	International Standard Organization
LICJ	Land Information Council of Jamaica
MEGJC	Ministry of Economic Growth & Job Creation
NLA	National Land Agency
NWA	National Works Agency
UML	Unified Modeling Language
WWW	World Wide Web

SECTION I Metadata Guidelines

Metadata Guiding Principles

Members of the Land Information Council shall:

1. Adopt the ISO 19115 Metadata Content Standard.
2. Identify and select core and mandatory metadata elements from the ISO standard, applicable to Jamaica.
3. Agree on a common set of terminology and definitions for framework geospatial data layers.
4. Prepare an inventory of their geo-spatial data layers.
5. Identify and make priority, geospatial data sets of importance to their mandate and business processes, for metadata creation.
6. Capture and maintain metadata for the data sets that they create.
7. Make metadata creation and maintenance an ongoing process within their organisations.
8. Ensure that metadata conforms to the standards and guidelines referred to in section C III.
9. Use metadata collection and authoring tools that are compliant with ISO 19115 standard. Recommended collection tools are **ESRI's ArcGIS ArcCatalog and ArcView Metadata Collector** - metadata2.avx extension.
10. Ensure that all distributed geospatial data are accompanied by metadata.
11. Ensure that metadata are available to users by:
    a. making metadata records available to the Council/National GIS Centre for inclusion in the proposed National Metadata Clearinghouse,
    b. distributing metadata as a printed catalog and or on-line, describing your data sets,
    c. making metadata available to its divisions/sections/agencies through internal networks/intranets, among others.
12. Collaboratively prepare a work plan for the creation of a national metadata clearinghouse.
13. Participate in training sessions for the collection and management of metadata.

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[1] The clearinghouse will provide access to information about spatial data, the organisation from which it originates, the characteristics of the data and how potential users can obtain it.

SECTION II INTRODUCTION

1. What Is Metadata

Simply defined, metadata is "data about data." Used in the context of digital spatial data, metadata is the background information, which describes the content, quality, condition, source organisations, data format, accuracy and other appropriate characteristics of the data. Paper maps contain metadata, primarily as part of the map legend. In this form, metadata is readily apparent and easily transferred between map producers and map users. When map data are in a digital form, metadata are equally important, but its development and maintenance often require a more conscious effort on the part of data producers and the chain of subsequent users who may modify the data to suit their particular needs.

In essence, metadata answers what, who, how, when and where about every facet of the data that are being documented for example:

- **What** geographic data set? – *title and description of the data set*
- **Who** collected it? – *data set originator or creator and supplier*
- **How** was it collected? – *how to obtain more information on the data set, how to order, available formats and access constraints*
- **When** was it created? – *date of creation and update cycle if any.*
- **Where** does the data reside? – *the geographical extent of data set based on coordinates*

2. The Importance of Metadata

It is important to keep spatial metadata records as it maintains an organisation's investment in spatial data. Metadata provides information about the data available within an organisation. It helps users to find data, and also tells how to interpret and use this data. Publishing metadata facilitates data sharing. Sharing of data between organisations stimulates cooperation and a coordinated and integrated approach to spatial related policy issues.

Metadata serves many important purposes, including:

- Data discovery
- Data assessment to determine fitness for use
- Data access
- Data use,
- Data transfer, and
- Data management

Metadata can be organized into several levels ranging from a simple listing of basic information about available data to detailed documentation about an individual data set. At a fundamental level, metadata may support the creation of an inventory of the data holdings of government agencies and statutory bodies. Spatial metadata is one of the key components of a national geospatial data infrastructure, where potential users can search to find the data they need for their intended application. At a more detailed level, metadata may be considered as insurance. Metadata insures that potential data users can make an informed decision about whether data are appropriate for the intended use. It also insures that the data holdings of an organisation are

well documented and are not vulnerable to losing all the knowledge about their data when key employees retire or accept other jobs.

The Major Uses of Metadata are:

- To help organize and maintain an organization's internal investment in spatial data,
- To provide information about an organization's data holdings to data catalogues and clearinghouses and
- To provide information to process and interpret data received through a transfer from an external source.

3. Characteristics That Define The Role of Metadata

- Availability - data needed to determine the sets of data that exist for a geographic location.
- Fitness for use - data needed to determine if a set of data meets a specified need.
- Access - data needed to acquire an identified set of data.
- Transfer - data needed to process and use a set of data.

These characteristics form a continuum in which a user moves through a number of choices to determine what data are available, to evaluate the fitness of, to acquire, transfer and process the data. The order in which data elements are evaluated, and the relative importance of the data elements, will not be the same for all users or for all tasks that use metadata. In addition, users with different tasks or at different stages of evaluation may require (or prefer) that a set of information be available at different levels of abstraction or in different forms.

4. Who Will Create Spatial Metadata

The creation and management of metadata within an organisation appears burdensome but its long term advantages are much greater than the disadvantages. Metadata must be created for newly produced and previously created datasets. Often times the information required to describe the data is unavailable as data creators have left the organisations or the information is lost. It is therefore necessary for metadata to be captured at the stage of data creation when the information is best known.

Metadata creation is typically considered to be an obligation of the data producer. Database managers and their data entry/conversion staff will be required to collect and maintain metadata. Creating correct metadata is like library cataloging, except the creator needs to know more of the scientific information behind the data in order to properly document them.

It is envisaged that within the next couple of years GIS data quality will improve and metadata use will increase. This should therefore reduce the effort and cost for data acquisition and increase the time available for data analysis. Meta data management therefore needs to be properly implemented in order to guarantee high levels of quality and use.

SECTION III METADATA STANDARDS

1. Standardizing Spatial Metadata

"For metadata to be useful it is essential that they follow a widely accepted standards." Standards are a tool that makes communications comprehensive by assigning precise meanings to bits and bytes. Standards should be consistent, unambiguous, comprehensive, flexible and efficient. Standards solve particular problems, such as how to represent data efficiently and they create benefits such as interoperability, portability, ease of use, and economies of scale. This is only possible when many systems do things in the same way.

Standardization and consistency are necessary to ensure that comparison can be made by data users about the suitability of data from different sources. By adhering to common metadata standards, spatial data can be shared within and among organizations.

2. Metadata Standards

A number of international, regional and government organisations have been actively developing metadata standards and promoting, encourage and supporting its use and the establishment of clearinghouses.

Organisation	Standard	Clearing house	About the Standard
Federal Geographic Data Committee (FGDC), *USA*	Content Standard for Digital Geospatial Metadata (CSDGM)		Provides a common set of terminology and definitions for the documentation of digital geo-spatial data. All US federal agencies that produce geospatial data are required to use the CSDGM standard.
European Committee for Standardization (CEN) and Information Society Standardization System (ISSS), *International group*	Dublin Core		A metadata element set that is designed to describe digital resources. It supplements existing methods for searching and indexing electronic resources on the internet. It is much simpler than other standards. This standard is to be mapped to the ISO 19115 and the FGDC standard.
International Organisation for Standardization (ISO)	ISO 19115 International Metadata Standard		This standard was adopted in March 2003. It defines the schema required for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference and the distribution

Organisation	Standard	Clearing house	About the Standard
			of digital geographic data.
Association of Geographic Information (AGI), *UK*	Discovery Metadata Specifications (previously known as the National Geospatial Data Framework	GIgateway	
Australia New Zealand Land Information Council (ANZLIC)	ANZLIC Metadata guidelines		The standard consists of 41 core elements grouped into ten categories. This standard is consistent with the CSDGM and ISO 19115.

The two most common standards are the United States, FGDC Content Standard for Digital Geospatial Metadata, first published in 1998 and the International Organization for Standardization (ISO) spatial metadata standard that was published in August 2003.

3. Federal Geographic Standard for Digital Geospatial Data

In the United States the Federal Geographic Data Committee (FGDC) approved their standard for digital geospatial metadata in 1994. This standard supports their National Spatial Data Infrastructure and specified the structure and content of over 220 metadata elements. Version 2 of the FGDC standard was endorsed in 1998.

This standard is complex, but it provides a common framework for agencies to build detailed metadata. State and local agencies have been encouraged to adopt this standard to help support the National Spatial Data Infrastructure in the USA.

4. The International Organization for Standardization (ISO)

The ISO 19100 series is a multi-part International Standard for Geographic information that is being developed by Technical Committee 211,[2] Geographic Information/geomatics of the ISO. ISO 19115, Geographic Information Metadata is part of the ISO 19100 series. In July 2003 ISO announced the approval and publication of ISO 19115, Geographic information – Metadata.

ISO 19115:2003 defines the schema required for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data.

ISO 19115:2003 is applicable to:

- the cataloguing of datasets, clearinghouse activities, and the full description of datasets;
- geographic datasets, dataset series, and individual geographic features and feature properties.

[2] ISO Technical Committee 211 (www.isotc211.org) has approved a project to develop ISO 19139, Geographic information - Metadata - Implementation specification. ISO 19139 will define a UML implementation model based upon the abstract UML model in ISO 19115.

ISO 19115:2003 defines:

- mandatory and conditional metadata sections, metadata entities, and metadata elements;
- the minimum set of metadata required to serve the full range of metadata applications (data discovery, determining data fitness for use, data access, data transfer, and use of digital data);
- optional metadata elements - to allow for a more extensive standard description of geographic data, if required;
- a method for extending metadata to fit specialized needs.

5. Geospatial Data Clearing Houses

Standards for metadata enable the data clearinghouse concept, also know as a catalog service. A Geospatial Data Clearinghouse is a location, typically accessed through a home page on the World Wide Web (WWW), to query, search and present spatial data. Search engines within a clearinghouse are connected to metadata records and can be sued to search for specific attributes such as keywords, titles, abstracts, bounding coordinates and dates etc. The search engine parse the catalog and gives in return a complete description of the attributes of the dataset, maps and links to download the data.

Clearinghouses allow different agencies and organisations to come together and promote their geospatial data. The clearinghouse is a distributed array of metadata sources, each retaining local control of its operations, but responding to user queries from a few World Wide Web gateways. The chief advantage for users is that they do not have to learn a hundred different search interfaces created separately by different organizations. Instead, a search request can be directed to several different data providers at once. Clearinghouses provide a very powerful and cheap system to advertise data to the community/users through the internet.

Two well known geoportals are ESRI's Geography Network (www.geographynetwork.com) and the U.S. Department of the Interior's Geospatial One –Stop (www.geo-one-stop.gov).

The Geospatial-one-stop is a single geolibrary/geoportal to vast and distributed resources of spatial data. It is a catalog of datasets residing in federal, state, local , tribal and private archives. Users are allowed to search across theses datasets independently of their storage locations.

SECTION IV CORE METADATA ELEMENTS

1. Metadata Elements Categories Overview

CORE META-DATA ELEMENTS CATEGORIES	DEFINITIONS OF DATA ELEMENTS CATEGORIES
1. IDENTIFICATION	basic information about the data set. Examples include the title, the geographic area covered, currency, and rules for acquiring or using the data.
2. DATA QUALITY	- an assessment of the quality of the data set. Examples include the positional and attribute accuracy, completeness, consistency, the sources of information, and methods used to produce the data.
3. SPATIAL DATA ORGANISATION	the mechanism used to represent spatial information in the data set. Examples include the method used to represent spatial positions directly (such as raster or vector) and indirectly (such as street addresses or county codes) and the number of spatial objects in the data set.
4. SPATIAL REFERENCE	description of the reference frame for, and means of encoding, coordinates in the data set. Examples include the name of and parameters for map projections or grid coordinate systems, horizontal and vertical datums, and the coordinate system resolution.
5. ENTITY AND ATTRIBUTE	information about the content of the data set, including the entities types and their attributes and the domains from which attribute values may be assigned. Examples include the names and definitions of features, attributes, and attribute values.
6. DISTRIBUTION	- information about obtaining the data set. Examples include a contact for the distributor, available formats, information about how to obtain data sets online or on physical media (such as cartridge tape or CD-ROM), and fees for the data
7. METADATA REFERENCE	information on the currency of the metadata information and the responsible party. Examples include currency and information about the organization that provided the metadata.

2. Summary of Metadata Elements

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
Identification			basic information about the data set.	
	Citation		information to be used to reference the data set.	
		Originator	the name of an organization or individual that developed the data set	**M**
		Publication Date	the date when the data set is published or otherwise made available for release.	**M**[3]
		Publication Time	the time of day when the data set is published or otherwise made available for release.	**O**
		Title	the name by which the data set is known	**M**
		Edition	the version of the title.	**O**
		Geospatial Data Presentation Form	the mode in which the geospatial data are represented	**M**
		Series Information	the identification of the series publication of which the data set is a part.	**O**
		Publication Information	publication details for published data sets	**M**
		Other Citation Details	other information required to complete the citation.	**O**
		Online Linkage	the name of an online computer resource that contains the data set	**O**
	Description		a characterization of the data set, including its intended use and limitations	**M**

[3] **'M'** indicates that the element is mandatory and shall be documented
'**O**' indicates that he element is optional and may or may not be documented

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
	Time Period of Content		time period(s) for which the data set corresponds to the currency reference.	**M**
		Single Date /Time	means of encoding a single date and time	**O**
		Multiple Dates/Time	means of encoding multiple individual dates and times	**O**
		Range of Dates/Time	means of encoding a range of dates and times	**O**
	Status		the state of and maintenance information for the data set	**M**
	Spatial Domain		the geographic areal domain of the data set	**M**
	Keywords		words or phrases summarizing an aspect of the data set	**O**
	Access Constraints		restrictions and legal prerequisites for accessing the data set	**M**
	Use Constraints		restrictions and legal prerequisites for using the data set after access is granted	**M**
	Point of Contact		contact information for an individual or organization that is knowledgeable about the data set.	**O**
	Browse Graphics		a graphic that provides an illustration of the data set. The graphic should include a legend for interpreting the graphic.	**O**
	Data Set Credit		recognition of those who contributed to the data set	**M**
	Security Information		handling restrictions imposed on the data set because of national security, privacy, or other concerns.	**M**
	Native Data Set Environment		a description of the data set in the producer's processing environment, including items such as the name of the software (including version), the computer operating system, file name (including host-, path-, and filenames), and the data set size	**M**
	Cross Reference		information about other, related data sets that are likely to be of interest	**O**

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
Data Quality			a general assessment of the quality of the data set	
	Attribute Accuracy		an assessment of the accuracy of the identification of entities and assignment of attribute values in the data set	**M**
	Logical Consistency Report		an explanation of the fidelity of relationships in the data set and tests used.	**O**
	Completeness Report		information about omissions, selection criteria, generalization, definitions used, and other rules used to derive the data set	**M**
	Positional Accuracy		an assessment of the accuracy of the positions of spatial objects. horizontal and vertical coordinate measurements and a description of the tests used	**M**
	Lineage		Information about the events, parameters and source data which constructed the data set and information about the responsible parties.	**M**
		Source	Information about the source data used in creating the data specified	**M**
		Process Steps	Information about tan event or transformation in the life of a dataset including the process used to maintain the dataset.	**O**
	Cloud Cover		area of a data set obstructed by clouds, expressed as a percentage of the spatial extent.	**O**
Spatial Data Organisation			the mechanism used to represent spatial information in the data set.	
	Indirect Spatial Reference		name of types of geographic features, addressing schemes, or other means through which locations are referenced in the data set.	**O**
	Direct Spatial Reference Method		the system of objects used to represent space in the data set	**O**
	Point and Vector Object Information		the types and numbers of vector or nongridded point spatial objects in the data set.	**O**
	Raster Object Information		The types and numbers of raster spatial objects in the data set	

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
Spatial Reference			the description of the reference frame for, and the means to encode, coordinates in the data set	
	Horizontal Coordinate System Definition		the reference frame or system from which linear or angular quantities are measured and assigned to the position that a point occupies e.g. JAD2001	**M**
	Vertical Coordinate System Definition		the reference frame or system from which vertical distances (altitudes or depths) are measured. e.g. Above mean sea level.	**M**
Entity And Attribute			details about the information content of the data set, including the entity types, their attributes, and the domains from which attribute values may be assigned	
	Detailed Description		description of the entities, attributes, attribute values, and related characteristics encoded in the data set	**M**
	Overview of Description		summary of, and citation to detailed description of, the information content of the data set.	**O**
Distribution			information about the distributor of and options for obtaining the data set.	
	Distributor		the party from whom the data set may be obtained	**M**
		Contact Person Primary	the person, and the affiliation of the person, associated with the data set. Used in cases where the association of the person to the data set is more significant than the association of the organization to the data set	**O**
		Contact Organisation Primary	the organization, and the member of the organization, associated with the data set. Used in cases where the association of the organization to the data set is more significant than the association of the person to the data set.	**M**
		Contact Position	the title of individual	**O**
		Contact Address	the address for the organization or individual	**M**

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
		Contact Voice Telephone	the telephone number by which individuals can speak to the organization or individual.	**M**
		Contact Facsimile Telephone	the telephone number of a facsimile machine of the organization or individual.	**M**
		Contact Electronic Mail Address	the address of the electronic mailbox of the organization or individual.	**M**
		Hours of Service	time period when individuals can speak to the organization or individual.	**O**
		Contact Instructions	supplemental instructions on how or when to contact the individual or organization.	**O**
	Resource Description		the identifier by which the distributor knows the data set.	**O**
	Distribution Liability		statement of the liability assumed by the distributor	**M**
	Standard Order Process		the common ways in which the data set may be obtained or received, and related instructions and fee information	**M**
	Technical Prerequisites		description of any technical capabilities that the consumer must have to use the data set in the form(s) provided by the distributor	**O**
	Available Time Period		the time period when the data set will be available from the distributor	**O**
Metadata Reference			information on the currency of the metadata information, and the responsible party.	
	Metadata Date		the date that the metadata were created or last updated	**M**
	Metadata Review Date		the date of the latest review of the metadata entry	**M**
	Metadata Future Review Date		the date by which the metadata entry should be reviewed.	**O**
	Metadata Contact		the party responsible for the metadata information	**M**
	Metadata Standard		the name of the metadata standard used to document	**O**

CATEGORY	ELEMENT		DESCRIPTION OF ELEMENT	OBLIGATION
	Name		the data set.	
	Metadata Standard Version		identification of the version of the metadata standard used to document the data set.	**O**
	Metadata Time Convention		form used to convey time of day information in the metadata entry. Used if time of day information is included in the metadata for a data set	**O**
	Metadata Access Constraints		restrictions and legal prerequisites for accessing the metadata.	**O**
	Metadata Use Constraints		restrictions and legal prerequisites for using the metadata after access is granted.	**O**
	Metadata Security Information		handling restrictions imposed on the metadata because of national security, privacy, or other concerns.	**O**
	Metadata Extensions		a reference to extended elements to the standard which may be defined by a metadata producer or a user community	**O**

SECTION V IMPLEMENTATION GUIDELINES

This section looks at issues associated with the creation and management of metadata. It is hoped that future versions will provide information on the publishing of metadata records that are collected.

The approach taken to implement these guidelines will vary depending on the size and diversity of the organisations data holdings and the existing data management arrangements. For some organisations a simple and unsophisticated approach may be appropriate, at least in the early stages. For others with large and complex data holdings, more advanced methods, tools and different approaches may be required for effective metadata collection and management.

1. Organisational Approach

Metadata implementation is considered to be "too hard" and "an added burden". A study by Gelbman 1999 showed that even though a majority of data producers recognized the benefits of metadata there continues to be reluctance to commit time to creating metadata. It is perceived that commitment to metadata would take too much time away from more important or necessary responsibilities. The importance of metadata management should not be underestimated/ undervalued. Metadata collection and management is very important to maintain the value of the organizations wealth, for business continuity and knowledge management. How does a Manager address these issues?

The following are a number of **suggested** approaches that can be used individually or together depending on the type of organisation and its available resources.

a) Build management support through short presentations, during meetings and briefings. Share metadata benefits and success stories.
b) Redesign the map production workflow to simplify metadata collection
c) Create a plan of action for the collection of metadata inclusive of organizational policies and procedures
d) Create additional positions to manage metadata, a "metadata specialist."
e) Organisations that are unable to create additional positions may assign and or redirect GIS Specialist or GIS Technicians time to create, manage, maintain, and distribute metadata. Metadata compliance should be written into job descriptions and performance reviews.
f) Equip the LICJ with resources including personnel to assist agencies with the creation and management of metadata
g) Each implementing organization should create simple templates to collect metadata. Personnel creating the metadata may format the information on the templates into the standard.
h) Ensure that quality control and assurance tests are performed.
i) Require that divisions/departments publish their metadata holdings on a quarterly. Semi-annual or annual basis.
j) Sensitise managers and provide metadata training for all GIS staff.

2. Inventory Data Sets

Spatial data sets have the ability to multiply and fill up all available disk space and proliferate beyond the initial source of creation. This is particularly so for organisations with long history of data creation that will have large numbers of both archival and current data sets. A major task for such an organisation is to first prepare an inventory of existing geospatial data.

The inventory should be done taking into consideration the following:

- establish the value of the data sets to the organisation
- determine the utility of the data sets
- the number of external requests for the data sets and
- the historical significance of the data sets to the organisation.

3. Prioritize Data Sets

With a spatial data inventory, one can begin the task of prioritizing the data most important to the agency (make consistent). These data sets are prime candidates for early documentation, along with those that will be shared with other agencies or sold. There may be other reasons particular to an individual agency for placing a high priority on early metadata creation.

Begin by documenting those data sets that have current or anticipated future use, that form the framework upon which others are based, and data sets that represent your organisation's largest commitment in terms of effort and cost.

4. Selection of Metadata Tool

A metadata collection tool is required for metadata collection. Some tools provide capabilities for quality checking and control and dissemination. A variety of collection tools exist, some are very simple, created within organsiations using a word processor or a database, to the sophisticated commercial software products. The tools may be selected to meet the specific needs of the organisation.

Given the fact that the government has standardized on the ESRI suite of GIS software, it simplifies the selection of the tool to be used for metadata collection. In addition, ESRI provides a set of tools that complies to both the FGDC and ISO standards. ESRI tools facilitate metadata creation, management, publication and discovery. They are:

- A metadata editor
- Style sheets that present the metadata in various report formats
- A synchronizer that automatically records a data set's properties in the appropriate metadata elements for that standard

ESRI has stated in the *Metadata and GIS , October 2002 White Paper* that "ESRI is committed to supporting open metadata standards with appropriate technology."

ESRI TOOLS	FUNCTIONALITY
ArcGIS ArcCatalog	For creating and authoring metadata
ArcIMS	Hosts the metadata service, publishes metadata
ArcSDE	The interface to the relational database that stores metadata documents
ArcCatalog, Metadata Explorer, Web Browsers or Z39.50	Search for metadata

Many other metadata creation, management and publishing applications are available that are integrated into GIS applications, as well as stand-alone and Internet applications. Most create fully FGDC compliant metadata and some offer the ability to extend the FGDC standard with FGDC Profiles or Extensions, and implementations of the ISO 19115 Metadata Standard.

5. Creating Metadata

Database developers often intend to document spatial data shortly after completion of data entry. However, it is human nature to put off technical tasks such as database documentation. Months or years may slip by before metadata creation is undertaken. Key features of the data may be forgotten in the ensuing time. The most efficient strategy for metadata creation is to make it an ongoing process during database development.

Time
Ideally metadata records should be created at the time the data is collected or even earlier if possible, in the planning stage.

People
The process of creating the metadata should involve personnel with a detailed knowledge of the data. Personnel should be trained and their work acknowledge. If possible incentives and wared should be provided.

Duties for all stages of the metadata management process can be assigned to persons within the GIS unit. For example:

- Managers should be responsible for coordinating the overall collection of metadata,
- Technicians for documenting the metadata at the processing stage,
- Analysts for documenting metadata mapped at the analysis stage
- System Manager for maintaining the collection and distribution tools and
- Data Stewards for quality assurance, maintaining and distributing metadata records.

Dataset
The organisations should also decide what constitutes a dataset. A dataset is an "identifiable collection of data", a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. A hardcopy map or chart may be considered a dataset. Metadata can exist at the collection level (e.g. map series) at the data product level (e.g. an aerial photo mosaic), at dataset level (e.g. a vector dataset), a group of features of a certain type (e.g. roads, bridges) or a specific feature (e.g. the Flat Bridge).

SAMPLE WORKPLAN
METADATA IMPLEMENTATION

TASK	TIME	PERFORMANCE MEASURE
1. Sensitization of people - Report (verbal/written) - Workshop	1 month	Greater awareness from feedback
2. Identify and list - Dataset - Hardware - Software - Personnel	1 month	List of each component
3. Conduct training of staff in creating metadata	2wks	Certificate
4. Create metadata	3 month	100% metadata
5. Upload metadata to clearing house - web link - diskette	1wk	Link on clearing house

Prepared by Hopeton Ferguson, June 2005

6. Sample Metadata Style Sheet/Report

River

Metadata also available as
Metadata:

Identification_Information:

Citation:
Citation_Information:
Originator: Water Resources Authority
Publication_Date: Unpublished Material
Title: River
Geospatial_Data_Presentation_Form: vector digital data
Online_Linkage: None
Description:
Abstract:
River shape file of Jamaica showing the general drainage pattern
Purpose: Identifying surface water drainage and distribution
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: unknown
Currentness_Reference: 1989
Status:
Progress: In work
Maintenance_and_Update_Frequency: Continually
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate:
REQUIRED: Western-most coordinate of the limit of coverage expressed in longitude.
East_Bounding_Coordinate:
REQUIRED: Eastern-most coordinate of the limit of coverage expressed in longitude.
North_Bounding_Coordinate:

REQUIRED: Northern-most coordinate of the limit of coverage expressed in latitude.
South_Bounding_Coordinate:
REQUIRED: Southern-most coordinate of the limit of coverage expressed in latitude.
Keywords:
Theme:
Theme_Keyword_Thesaurus: Drainage
Theme_Keyword: Rivers
Place:
Place_Keyword: Jamaica
Access_Constraints:
No restrictions or legal prerequisites for accessing the data set.
Use_Constraints:
No restrictions or legal prerequisites for using the data set after access is granted.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Water Resources Authority
Contact_Voice_Telephone: (876) 927-0077
Contact_Facsimile_Telephone: (876) 977-0179
Contact_Electronic_Mail_Address: wra@colis.com
Hours_of_Service: 8:30am - 5pm
Browse_Graphic:
Browse_Graphic_File_Name: River
Browse_Graphic_File_Description: River shape file for Jamaica
Browse_Graphic_File_Type: Vector
Data_Set_Credit: Water Resources Authority
Security_Information:
Security_Classification_System: None
Security_Classification: Unclassified
Native_Data_Set_Environment:
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 1; ESRI ArcCatalog 9.1.0.722
Cross_Reference:
Citation_Information:
Originator: Water Resources Authority
Publication_Date: Unpublished Material
Title: River

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
100% accurate compared to the 1:50,000 topographic map sheet and The Water Resources Authority database
Logical_Consistency_Report:

Consistent with the Jamaica 1:50,000 topographic metric edition map sheet
Completeness_Report:
100% graphically completed as compared to the 1:50,000 topographic map sheet
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
95% accurate compared to the accuracy of the 1:50,000 topographic sheet
Quantitative_Horizontal_Positional_Accuracy_Assessment:
Horizontal_Positional_Accuracy_Explanation: Digitized from the 1:50,000 topographic map (metric edition)
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Survey Department
Publication_Date: 1989
Publication_Time: Unknown
Title: Topographic Map Sheet of Jamaica
Geospatial_Data_Presentation_Form: map
Source_Scale_Denominator: 1:50,000
Type_of_Source_Media: disc
Source_Time_Period_of_Content:
Source_Currentness_Reference: publication date
Source_Citation_Abbreviation: Scanned topographic map sheets of Jamaica
Source_Contribution: Survey Department of Jamaica
Process_Step:
Process_Description: Scanned, Georeferenced, then digitized
Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Water Resources Authority

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: String
Point_and_Vector_Object_Count: 15217

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Geographic:
Latitude_Resolution: 18
Longitude_Resolution: -77
Geographic_Coordinate_Units: meters

Geodetic_Model:
Horizontal_Datum_Name: WGS84
Vertical_Coordinate_System_Definition:
Altitude_System_Definition:
Altitude_Distance_Units: meters

Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: river
Entity_Type_Definition: Drainage Pattern
Attribute:
Attribute_Label: FID
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: Shape
Attribute_Definition: Feature geometry.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Coordinates defining the features.
Attribute:
Attribute_Label: ID
Attribute:
Attribute_Label: WMU
Attribute:
Attribute_Label: RIVER_NAME
Attribute:
Attribute_Label: STRAIHLA_O

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Water Resources Authority
Resource_Description: Downloadable Data
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: shape
Format_Specification: Arcview shapefile
Transfer_Size: 5.484
Fees: $500.00/ basin

Ordering_Instructions: Written request to the Managing Director

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Metadata_Reference_Information:

Metadata_Date: 20050627
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: Water Resources Authority
Contact_Person: Hopeton Ferguson
Contact_Position: GIS Specialist
Contact_Address:
Address_Type:
REQUIRED: The mailing and/or physical address for the organization or individual.
City: REQUIRED: The city of the address.
State_or_Province: REQUIRED: The state or province of the address.
Postal_Code: REQUIRED: The ZIP or other postal code of the address.
Contact_Voice_Telephone: (876) 927-0077
Contact_Facsimile_Telephone: (876) 977-0179
Contact_Electronic_Mail_Address: wra@colis.com
Hours_of_Service: 8:30am - 5pm
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Access_Constraints: No access constraint
Metadata_Use_Constraints: No use constraint
Metadata_Security_Information:
Metadata_Security_Classification: Unclassified
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

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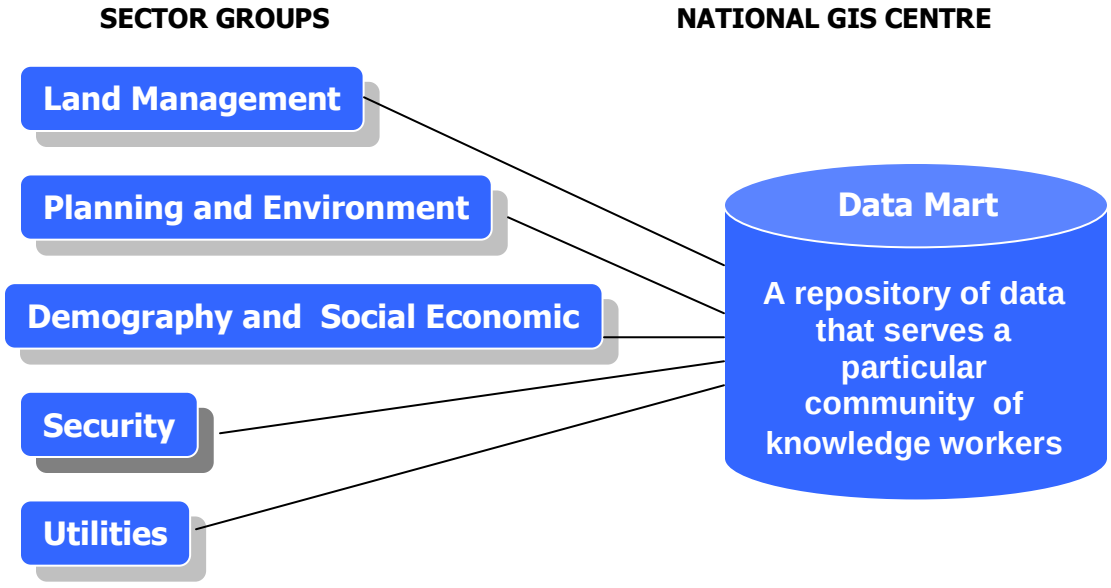
APPENDICES

Appendix 1 Frame Work Data Sets

The diagram is the proposed model of the spatial data infrastructure. The model assumes that a metadata server would be established at each of the 4 selected agencies,
National Land Agency – Land Management,
National Environmental and Planning Agency – Planning and Environment
Planning Institute of Jamaica- Demography, Social and Economic
Security – Jamaica Constabulary Force, Information Department
Utilities – National Water Commission
where digital spatial data are collected, documented and managed. Using high speed connectivity, servers would be then linked to the web server at the National Spatial Data Management Centre where access and query tools are provided for users.



DATA THEMES	NLA	NWA	PC	JUTC	NWC	TA	MWH	JPS	C&W	NIC	WRA	MLGCDS	SDC	STATIN	P&T	EOJ	PIOJ	MEY&S	SDC	MH	NHT	JBI	MBGD	ODPEM	MA-FD	MA-FD	MA-RPPU	RADA	SIRI	NEPA	MNS	MJ	JCF	JDF	JRB
Land Management																																			
Geodetic control	☒																																		
Orthoimagery	☒																																		
Elevation	☒																																		
Cadastral	☒																																		
Valuation	☒																																		
Utilities																																			
Transportation																																			
Roads		☒																																	
Parish Council Roads																																			
Railways																																			
Airports and Airfields																																			
Hydrology																																			
Rivers																																			
Watersheds											☒																								
River Gauging Sites											☒																								
Ground water Monitoring											☒																								
Dams					☒																														
Tanks					☒																														
Water treatment plants					☒																														
Pipelines					☒																														
Sewerage lines					☒																														
Sewerage Plants					☒																														
Marine																																			
Fishing villages																																			
Shoreline classification																																			
Electricity																																			
Power lines																																			
Poles																																			
Power Plants																																			
Transmission lines																																			
Telecommunication																																			
Cable Lines																																			
Geological and Natural Hazards																																			
Landslides																																			
Flood Risk																																			
Geology																																			
Wetlands																																			
Cultural Heritage																																			
Historical Sites																																			
Tourism																																			
Hotels																																			
Guest Houses																																			
Beaches																																			
Agriculture																																			

Appendix 2 Ten Most Common Metadata Errors

10 Most Commom Metadata Errors

10. Defining your data set too finely or too broadly
9. Using incorrect State Plane Coordinate System Zone identifier values
8. Confusing ‘Currentness Reference’ with ‘Publication Date’
7. Misunderstanding resolution
6. Putting too much faith in metadata tools
5. Taking the minimalist approach
4. Understanding assessments of consistency, accuracy, completeness, and precision
3. Glossing over Section 5. Entity and Attributes
2. Thinking of metadata as something you do at the end of the data development process
1. Not doing it!

Source: Geographic Data Committee Metadata Education Programme and the National Metadata Cadre (Sept. 2000)

Appendix 3 Terminology

One of the most encouraging aspects of metadata is that they serve as a lingua franca, a common vocabulary by which a wide range of GIS users can communicate. Though users' goals, objectives and jobs are diverse, metadata give data providers and users a way to describe aspects that are common across a variety of data themes and types.

Definitions

I. **Clearinghouse / Spatial Data Clearinghouse** can be defined as an electronic facility for searching, viewing, transferring, ordering, advertising and/or disseminating spatial data from numerous sources via the Internet and, as appropriate, providing complementary services.

II. **Dataset**
An identifiable collection of data.

III. **Dataset Series**
A collection of datasets sharing the same product specification.

IV. **Framework Data**
Framework data consists of commonly needed, used and produced data brought into a common standard and made widely accessible to members of the national spatial data infrastructure.

V. **Geolibrary**
A digital library that can be searched for information about any user-defined geographic location.

VI. **Granularity**
The level of detail at which an information object or resource is viewed or described.

VII. **Interoperability**
The ability for two different systems, particularly computer based systems to work together correctly, particularly in the correct interpretation of data semantics.

VIII. **Metadata**
Literally, "data about data", metadata includes structured data associated with either an information system or an information object for purposes of description, administration, technical functionality, use and usage and preservation.

IX. **Metadata Element**
A discrete unit of metadata

X. **Metadata Entity**
Set of metadata elements describing the same aspect of data

XI. **Schema**
The formal machine-readable description of a metadata element set, or the structure of a document.

PARTICIPATING LICJ MEMBER AGENCIES

	ORGANISATION	MEMBER NAME
1.	Institute of Jamaica	Suzanne Davis
2.	Ministry of Economic Growth & Job Creation	Tariq King, Nadisha Poyser
3.	National Irrigation Commission	Kirk Freckleton
4.	Ministry of Transport and Mining	Douglas Pennant
5.	National Environment and Planning Agency	Ranford Campbell
6.	National Land Agency	Milton Saunders, Chaplain Williams
7.	National Water Commission	Andrea Williamson
8.	National Works Agency	Jumaine Remikie
9.	Mines and Geology Division	Maurace Thompson
10.	Planning Institute of Jamaica	Patrine Cole
11.	Statistical Institute of Jamaica	Mirko Morant
12.	Sugar Industry Research Institute	Lancelot White
13.	University of Technology, Jamaica	Jenevy Smith
14.	Water Resources Authority	Tricia-Rae Rodriques
15.	Forestry Department	Thomas Donaldson, Kerry-Ann Mahabeer
16.	Urban Development Corporation	Bryan Austin

REFERENCES

1. International Standard ISO/FDIS19115, **Geographic Information – Metadata**,
2. Nebert, Douglas D., etal.(May 2001) "**Developing Spatial Data Infrastructures, The GSDI Cookbook"** , GSDI Cookbook Version 1.1
3. ESRI White Paper (October 2002), "**Metadata and GIS**"
4. Vermeij, Bert, "implementing European Metadata Using ArcCatalog", ESRI ArcUser, July-September 2001
5. Danko, David M., "**Perspectives in the Development of ISO Metadata Standards**", FGDC Publications
6. Hart, David and Phillips, Hugh, (1989), **Metadata Primer- A How to Guide on Metadata Implementation**", National States Geographic Information Council, USA
7. ANZLIC Metadata Guidelines: Core metadata elements for geographic data in Australia and New Zealand , (February 2001), http://www.anzlic.org.au/asdi/metaelem.htm
8. "**The Value of Metadata**", FGDC Publications
9. Reichardt, Mark, (June 2000),"**Spatial Data Infrastructures, A Local to Global View**", Power Point Presentation, Kingston , Jamaica
10. The CGIAR Consortium for Spatial Information, http://csi.cgiar.org/metadata
11. Metadata Education: Using and Implementing Metadata, University of Wyoming Spatial Data and Visualization Centre, http://www.wygisc.uwyo.edu/metadata