Development and Implementation of Metadata Structure in Nigeria – A Case Study of Federal Survey Department

Olaide Suraj ONABAJO, Olasunkanmi Olatunde AKERELE and Solomon Babatope OLUKOTUN, Nigeria

Key words: Metadata, Standard, Clearinghouse, Geospatial

SUMMARY

Metadata has been described as a data about existing data and its existence will define nature and quality of the data for a specific usage. The aim of the paper is to put in place a metadata structure for Federal Surveys as the National Mapping Organisation in Nigeria. This metadata structure will enhance the implementation of the newly constituted 27 member Presidential committee on National Geospatial Data Infrastructure (NGDI) by the Federal Government of Nigeria.

With the above aim, the following objectives would be achieved:
(i) What data exist i.e available data
(ii) Usage of the data
(iii) Information on means of accessing the available dataset
(iv) Avoids duplication of efforts through awareness campaign
(v) Encourage data exchange and data sharing

The paper will also focus on the implementation using ISO standards and U.S. Federal Geographic Data Committee's content data for Geospatial data as a guide while relational database will be created with the following fields as records.
(i) Scale of the data
(ii) Structure and format of the data
(iii) Geographical coverage or location
(iv) Quality of data

In conclusion, the paper and the realization of its objectives would be a motivating factor for other organization/stakeholders in the Geospatial community in Nigeria. This will in turn accelerates the implementation of NGDI and accord core Geospatial data as an 'asset' that plays a significant role in the economy of a developing nation.

Development and Implementation of Metadata Structure in Nigeria – A Case Study of Federal Survey Department

Olaide Suraj ONABAJO, Olasunkanmi Olatunde AKERELE and Solomon Babatope OLUKOTUN, Nigeria

1. INTRODUCTION

Geospatial data /information are in most cases products of maps either in analogue or digital format. In Nigeria today, apart from Federal Survey Department that has the mandate as the National Mapping Organisation to produce maps for varying purposes, there are growing numbers of other producers that produced specialized for their own usage. Atypical example is the solid mineral sector where Mineral maps are produced. These maps contain Geospatial data about all-important minerals available in Nigeria, its distribution, its geological formation etc. All these data are geared towards encouraging development of solid minerals based industries with an over-all benefit of attracting potential investors in the economy.

In addition, Nigeria has witnessed growing increase of commercial firms/consultants offering services in Geospatial data capture, conversion from analogue to digital, database creation, implementation and management. With the present phenomenon, there is a great need to have a metadata structure in place as advocated in the National Geoinformation Policy in Nigeria. Metadata would help people who use Geospatial data to find the data they need and determine how best to use the data .It also on the long run benefits the data producing agencies as well.

Table 1: SOME SECTORAL USAGE OF GEOSPATIAL DATA

Sector	Typical Usage of Geospatial Data
Agriculture	Cultivation inventory, vegetation cover, soil study, River dams and irrigation, land use monitoring, crop yield monitoring, marine resources.
Forestry	Forest Mapping, forest inventory, change detection, timber production for export and domestic uses.
Political/Administration	International, Interstate and Local Government Administration boundary demarcation, development of boundary settlements.
Transports and Aviation	Roads and airports runway design, railways design, Aeronautic charts for navigation, search and rescue operation.
Petroleum Resources	Oil and gas exploration, exploitation, distribution, marketing and monitoring
Geology and solid minerals	Photo geology, reconnaissance, soil study, solid mineral exploitation, distribution, marketing and monitoring
Planning	Urban and regional planning, urban renewal and change studies, feasibility study, land use mapping, land administration, location of industries.
Environment	Risk zone mapping, environmental inventory and monitoring, desertification, flood and erosion monitoring, land degradation, environmental impact assessment.
Security	Defense, crime prevention and monitoring, search and rescue operations
Population	Census planning, delimitation of enumeration areas, demographic studies.
Tourism	Road network maps and street guides, tourist centres and hotel locations
Local Government	Taxation, land use, new town development, utility services.
Health	Epidemic location, prevention and forecasting, facilities planning and distribution, orthopedic measurements.
Education	Facilities planning, instructional/learning aids (e.g. school atlases), location of institutions.
Sports Development	Facilities planning, development and management.
Archeology	Geo-referencing of historical locations, research study, etc
Finance	Revenue generation, customs and Immigrations, Tax

Source: National Geo-Information Policy in Nigeria

1.1 Responsibility and activities of Federal Survey Department

In 1954, Nigeria became a Federation of three regions. Thus under the 1960 Federal constitution, trigonometrical, cadastral and topographical surveys were placed on the concurrent legislative list. By this arrangement, both the Federal and Regional (later States) governments had joint responsibility for the items on the list .In practice, however, the

Federal Survey division (as it was known then) took responsibility for National Frameworks surveys (including primary triangulation and leveling), National Topographical map series, surveys of National importance e.g (International and Inter-state boundaries) and Aerial photography. The state surveys primarily concerned themselves with cadastral surveys and urban mapping. In the recent past, the Federal Survey had to undertake even those responsibilities assigned to State surveys under constitution.
Under the above arrangement, the division has extended the Geodetic network inherited at Independence; it has almost completed the Aerial photography and 1:50 000 basic Topographical mapping and produced a number of derived maps, Utility maps and National Atlas. About 60% of the Topographical Mapping was undertaken under technical assistance from United Kingdom and Canada. These maps are based on Aerial photography taken between 1962 and 1974. These are now out of date (supposed to be revised every 10 years).
The 1:50 000 topographic maps covers about 90% of the entire Country and in a bid to up-date the maps and they are under-going conversion from analogue to digital. However, this effort of the Federal Survey Department has not yielded much result due to lack of adequate fund to facilitate the conversion to digital. It is a known fact that the best mapped nations are more planned and developed than the less mapped countries hence accounted for the highly developed nations from Europe, Asia, and United States of America etc

2. METADATA STRUCURE

2.1 Development

The value and concept of metadata ought to be known to people who deal with spatial issues because a map legend is pure metadata. The legend contains information about the publisher of the map, the publication date, and type of map, a description of the map, map's scale and its accuracy. However metadata helps people who use Geospatial data to find the data they need and determine how best to use them. It is a well known fact that personnel change in an Organisation therefore un-documented data may lose their value because later workers may have little understanding of the contents and uses for a data. It is pertinent therefore that the cost of generating or producing metadata be added to the cost of data collection because the initial expense of documenting data clearly outweighs the potential cost.
An important component of maintaining and archiving metadata is the development of a comprehensive inventory of the geographic information existing in each institution .In Federal Surveys, some of the compilation include the Topographical map series, Administrative maps, Gazetteer of Place Names, Nigerian Road Network map are in digital format. This Geospatial data can be geo-referenced. The following is a sample list of information that is valuable for the creation of a geographic inventory and for the eventual documentation of metadata.

(i) Map Title: The title of the map (in published form)
(ii) File Name: The name/title/of the map or table as it appears in the computer directory
(iii) Original source: The original source of the data –it is possible that the Department is not the original source of the data but that they digitalized it from its paper source in which case, the original source needs to be documented.

(iv) Format: The digital format of the data: - Whether a table in Excel (.xls), a database file (.dbf), an Arc View shape file (.shp), Arc Info (.arc) – as well as whether the geographic information is in raster or vector format.
(v) Scale: The scale of the map in meters or kilometers.
(vi) Projection: The map projection used with specifications
(vii) Publication Date: The data of publication of the map
(viii) Map Image: An example of the map in (jpg) format.

The above sample list can be applicable to Government projects or Departments once the Departments and projects are identified. At the moment, Federal Survey Department has no metadata structure emplaced but hope that soonest as a major Geospatial data producer she would ensure that a development of metadata is implemented.

2.2 Implementation

In Nigeria, Federal Survey Department (Federal Ministry of Works) is one of nodal identified agencies. Others include:
(i) Federal Ministry of Science and Technology
(ii) Federal Ministry of Environment
(iii) Federal Ministry of Solid Minerals
(iv) Federal Ministry of Water Resources
(v) Ministry of Defense
To fully realize the objectives of this paper is to ensure that practical implementation guidelines are set for the entire stake holders identified above as part of the strategies to attain adequate implementation of metadata structure in Nigeria. They include the followings:
(i) Ensure that every project awarded on contract/consultancy jobs be added as an investment a small amount of time and resources at the beginning will pay dividends in the future. Metadata will help protect the value of organization's intellectual assets.
(ii) Identify and contact the departments and projects that manage or develop geographic information within each of the participating institution.
(iii) Visit each department or project with geographic information to identify those that working directly with GIS, view their data, explain the information needed to write the inventory as well as the metadata.
(iv) Complete the geographic inventory and begin metadata documentation (according to the priotization of each institution) using a software programme.
(v) Collect map images from each department.
(vi) Capacity building of identified GIS expert from each department or project who will receive instruction in the development and documentation of metadata.
(vii) Identify someone from each Organisation to act as the coordinator of metadata who's role would be to coordinate the updating of the metadata files and who would also be the link between the node agencies and the main clearinghouse.

3. METADATA STANDARDS

The standards provide a common set of terminology and definitions for the documentation of Geospatial data which include:-

(i) Identification information-basic information about the dataset e.g Title geographic area covered, correctness and rules for acquiring or using the data.

(ii) Data Quality Information – an assessment of the quality of the data sets example include positional and attribute accuracy, completeness, consistency, sources of information, and method used to produce the data.

(iii) Spatial Reference Information – description of the reference framework, coordinates in the dataset. Examples include grid coordinates system.

(iv) Spatial Data Organisation Information- the mechanism used to represent spatial information in the dataset. Examples include the method used to represent spatial positions directly (such as raster or vector) and indirectly and the number of spatial objects in the dataset.

(v) Entity and Attribute Information-Information about the content of the datasets. Examples include the names and definitions of features, attributes, and attribute values.

(vi) Distribution Information – Information about the obtaining the dataset. Example includes a contact for the distributor, available format, information about how to obtain data sets online or physical media like CD-ROM and fees for the data.

(vii) Metadata Reference Information – Information on the current ness of the metadata information and the responsible party

Invariably, the standards provide a methodology and process for data producers or user community. However, the standard does not specify how this information is organized in a computer system or in a data transfer nor the means by which this information is transmitted or communicated to the user.

With special reference to United States Federal Geographic Data Committee (FGDC) has been actively involved in the International Organisation for Standardization Technical Committee 211 in the development of International metadata standards. Within this scope, the National Geoinformation Policy in Nigeria also emphasizes the need to register the metadata standards with the nation's Standards Organisation of Nigeria (SON) and the International Standards Organisation.

3.1 Clearinghouse

The clearinghouse is a distributed, electronically connected network of Geospatial data producers, managers and users. At the clearinghouse each data producers expected to describe available data in electronic form and prepare these description (the metadata) for clearinghouse using a variety of software tools. The National Space Research and Development Agency (NARSDA) is the lead agency in the development of National Geospatial Data Infrastructure (NGDI) therefore an apex clearinghouse would be in NARSDA wherein other node agencies would link electronically.

4. CONCLUSION

Development of a metadata structure is a worthwhile investment which has been tested and proved to have answers /solutions to many questions being asked today:

(i) What data available
(ii) Where to find the data
(iii) How to access the data
(iv) Whether the data meet the specific needs

With the answers to the question above Geospatial community would be able to exchange data through the clearinghouse, avoid duplication of Geospatial data and accelerate the completion period of projects, which has a direct link to the economy of the country with its multiplier effect on the populace.

REFERENCES

Akerele, O.O. and Lawal, A.M.- 2003 The Relevance of Up-to –Date Digital Maps in the Realization of New Partnership for African Development (NEPAD) Objectives On Infrastructure. A paper submitted to Global Mapping Forum in Okinawa, Japan (GMFO3)

Ayeni, O.O.- 2001 The Relevance of Geospatial Information to Sustainable Economic Development. A paper presented at 2001 Survey Coordination and Advisory Board on Survey Training Conference

Federal Geographic Data Committee-2001 National Spatial Data Infrastructure Federal Geographic Data Committee-2001 Volume 5, No 2. Newsletter

Margaret Vivian Buck and Kate Lance- 2001 Sample Work Plan for Start-up Metadata Development Project. A Spatial Data Infrastructure Workshop. Palais des Nations Geneva.

National Geoinformation Policy in Nigeria (2003).

Ryttersgaard Jes – 2001 Spatial Data Infrastructure Developing Trends and Challenges. A paper presented at the United Nations Economic Commission for Africa. (UN-CODI II)

BIOGRAPHICAL NOTES

ONABAJO, O.S

CAREER – TO – DATE

- Employed as a Technical officer (Training) into the Federal Civil Service of Nigeria 1972 after completing the West African School certificate in 1971.
- Attended In-service training at the Federal school of surveying Oyo, between 1973 and 1976 leading to Basic Certificate in Surveying and Advanced Technical certificate in surveying respectively.
- Attended University of East London (former North East London polytechnic) from 1977 to 1980 with a B.Sc (land surveying sciences).
- Completed the National Youth service corps in 1981.
- Advanced to the post Technical officer in 1981.
- Converted to Surveyor Grade II in1985.

- Upgraded to the post of Surveyor Grade I in 1986.
- Promoted to Senior Surveyor in 1986.
- Promoted to Senior Surveyor in 1989.
- Promoted to Assistant Chief in 1993.
- Promoted to Chief Surveyor in 1996.
- Promoted to Assistant Director in 1999.
- Promoted to Deputy Surveyor General of the Federation in 2003.

Publications

- Cost benefits analysis of multipurpose data information system- July 1980 (London).
- Significance of survey data in combating flood erosion (1985, Lagos, Nigeria).

Membership of Societies

- Member of Nigerian Institute of surveyor.
- Member of the Nigerian Association of Geodesy.
- Member of the Nigerian Union of Planetary & Radio Sciences
- Member of Special Road Safety Corps (as Special Marshal)

AKERELE, O. O

CAREER – TO – DATE

- Employed as a Surveyor Grade II into the Federal Civil Service of Nigeria in 1988 after graduating from Federal School of Surveying as a land surveyor.
- Attended University of Ibadan between 1982 and 1985 where I obtained a B.Sc Degree in Geography.
- Attended Federal of Surveying, Oyo between 1986 and 1988 where I obtained Postgraduate Diploma in Land Surveying.
- Attended University of Ibadan between 1997 and 1998 where I obtained M.Sc in Geographic Information System.
    - Advanced to Surveyor Grade I in 1989.
    - Promoted to Senior Surveyor in 1993.
    - Promoted to Principal Surveyor 1998.
    - Promoted to Assistant Chief Surveyor 2001.

PUBLICATIONS

- Analysis of Rural Water Supply and Utilization in Erunmu Area of Egbeda Local Government of Oyo State. - Unpublished, July 1985.
- GIS and Utilities: A case study of Water Supply Network in Oluyole Estate, Ibadan – Unpublished, 1998.
- The Relevance of Up-to-date Digital Maps in the Realization of New Partnership for African Development (***NEPAD***) Published 2003.

CONFERENCE ATTENDED**.**

- United Nations Economic Commission for Africa Committee on Development Information (*CODI -II*) at Addis-Ababa Ethiopia. September 2001

MEMBERSHIP OF SOCIETIES.

- Member of Nigerian Institution of Surveyors (*NIS*).
- Member of Geoinformation Society of Nigeria (*GEOSON*)

OLUKOTUN, S. B

CAREER – TO – DATE

- Employed as a Pupil Surveyor into the Federal Civil Service of Nigeria 1987 after Graduating as a Geographer from Ahmadu Bello University Zaria 1982. Worked as Geography Teacher in Kwara State from 1983-1986.
- Attended In-service training at the Federal school of surveying Oyo, between 1987 and 1989 leading to Post Graduate Diploma in Surveying.
- Attended Regional Centre in Training in Aerospace Surveys (RECTAS) from September 1995 to October 2996 at Ile-Ife leading to award of Post Graduate in Remote Sensing & GIS Applications.
- Attended University of Ibadan in 1999 leading to the award of M.Sc GIS.
- Advanced to the post Surveyor Grade II in 1989.
- Promoted to the post of Senior Surveyor in 1994.
- Worked in various Field Headquarters as Surveyor including Kaduna from 1989 to 1995
- Worked in various Divisions at the Headquarters, Lagos including Planning, Photogrammetry and Remote Sensing, Computer Centre from 1995 to 1999
- Worked in GIS Laboratory at the Headquarters Abuja from 1000 to Date

Publications

- Industrial Impact Analysis: A case study of Ilorin and environment-Unpublished (1982)
- Calibration of EDM instruments: -Unpublished (1989)
- Land Information for Housing Environment Evaluation for Sustainable Development of Ibadan Metropolis: Unpublished (1996)
- Application of GIS in Determination of Erosion Risk Areas in part of Abuja: Unpublished (2000)

Academic honour

- Best overall student in professional land surveying course 1988/89 session
- Best overall student in Remote Sensing and GIS Applications Unit 1996

Membership of Societies

- Member of Nigerian Institution of Surveyor.(Abuja Branch PRO)
- Member of Geoinformation Society of Nigeria (GEOSEN).

CONTACTS

Surv. Olaide Suraj. Onabajo
Federal Ministry of Works, Survey Department
P.M.B.111 Garki Abuja
Mabushi.Abuja, Federal Capital Territory
Nigeria
+234 8023585864
olaideonabajo@yahoo.com

Surv. Olasunkanmi Olatunde. Akerele
Federal Ministry of Works, Survey Department
P.M.B.111 Garki Abuja
Mabushi.Abuja, Federal Capital Territory
Nigeria
+234 8034517924
kanmiakerele@hotmail.com

Surv. Solomon Babatope Olukotun
Federal Ministry of Works, Survey Department
P.M.B.111 Garki Abuja
Mabushi.Abuja, Federal Capital Territory
Nigeria
+2348037879880
sbolukotun@yahoo.com