Country Report of Nigeria *

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National Geospatial Data Infrastructure (NGDI) - an Overview

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1.0   Preamble

The road of the leading NGDI of the world was never smooth; there existed ups and downs throughout the process of institutionalization of NGDI. When liken to organization development, it can be said that the process of institutionalizing NGDI is a process of learning where errors are committed to be corrected. Most of the time, organizations are kept together with one focus, the prospects of which makes way for development of solutions for the challenges faced. At the end of every struggle, series of success stories about NGDIs were told in literature, most of which are from developed countries in Europe and North America.

However, African NGDIs like many developing regions are now in their learning stages, facing both the practical and theoretical challenges of SDI concepts. Many African countries are adopting various approaches, trying different implementation plans. Some are moving ahead with their strategies despite adversaries faced, while some others try to omit errors and fashion way round the prevailing problems. Like many other countries in Africa, Nigeria has initiated the implementation of NGDI as far back as 1999 at the beginning of a new democratic era in the country.

1.1   SDI Coordinating Body

The coordination of the NGDI programme The National Space Research & Development Agency [NASRDA] is the NGDI Coordinating Agency in Nigeria since 2002.

1.2   Collaborating Ministries/Agencies

NASRDA is collaborating with key fundamental geospatial data producing ministries/Agencies in different sectors of the economy namely:

i.   Office of the Surveyor General of the Federation- OSGOF
ii. Nigerian Geological Survey Agency – NGSA
iii. Federal Ministry of Environment
iv. National Population Commission
v.   Federal Ministry of Transport
vi. Federal Capital Development Authority
vii. Federal Ministry of Agriculture and Water Resources
viii. Nigerian National Petroleum Corporation: Dept. of Petroleum Resources (DPR)
ix. National Planning Commission : Bureau of Statistics

2.0 GI Policy Drafting Committee

A step forward in NGDI in Nigeria came when a National Committee was established and inaugurated by the Hon. Minister of Science and Technology in September 2002 to draft a GI policy for the country, which was submitted in September 2003. The Policy is expected to guide the realization of the NGDI in the country. Also there have been series of steps taken toward achieving a successful implemented NGDI, these steps include:

- NGDI Stakeholders Workshop
- Establishment of NGDI Committee and Six Sub-Committees
- Users' Requirement Survey and Analysis
- Provision of Fundamental Dataset
- Capacity Building

2.1 NGDI Vision Statement

To ensure that Geospatial Information (GI) permeates every aspect of the society and that they should be available to people who need them, when they need them, and in a form that they can use them to make decisions with minimal pre-processing.

2.2 NGDI Committee

A 27-member NGDI Committee that will guide the establishment and implementation of the NGDI in line with the GI Policy was inaugurated in September 2004. The Committee members are drawn from the academia, public organizations, and GI related NGOs, IGOs and private sectors. The NGDI Committee composition is as depicted in Table 1.

No	Representation	Remarks
2	NASRDA	
2	Universities	Universities selected in rotation
2	Poly/Monotechnics	Poly/Monotechnics selected in rotation
6	Six Geopolitical zones – States nodal agencies	States selected in rotation
4	Private Sector, Inter-governmental & Non-governmental organisations	GI related sectors
11	Federal Ministries/Agencies	(See GI Policy for full list)

Table 1: Composition of the NGDI Committee

Based on the recommendations of the NGDI Stakeholders meeting held in February 2003, the NGDI Committee created six sub-committees viz:

- (i) Geospatial Datasets
- (ii) Standards
- (iii) Clearinghouse and Metadata
- (iv) Capacity Building and Awareness
- (v) Legal, and

(vi)   Sustainability and Funding.

Each subcommittee was given opportunity to have Working Groups which will work on the task given to these sub-committees.

2.2.1 NGDI Sub-Committees:
   i.   *Capacity Building & Awareness [2 Working Groups]*
   - Develop GI Capacity Database of existing institutional, technological and human resources.
   - Ensure improved awareness of NGDI and GI applications for accelerated development.
   - Prepare Best practice Case Studies for awareness programmes
   - Facilitate revision of the GI curricular in the country's higher institutions of learning
   - Encourage education, training/retraining of GI human personnel at all levels
   - Facilitate institutional reforms in GI organisations to ensure assimilation of NGDI initiative

   ii ***Geo-Spatial Dataset [4 Working Groups]***
   - Carry out inventory of the existing fundamental and thematic datasets (by the working groups)
   - Liaise with the standard subcommittee to assess and verify the standards of the datasets against the NGDI-endorsed standards
   - Facilitate modalities to update and upgrade the datasets in compliance to the NGDI standards
   - Encourage the immediate production of non-existing dataset
   - Ensure that metadata are included as part of every new data (or updated) produced
   - Ensure that custodian updates their datasets when considered old

   iii.   *Legal Sub-Committee (Working Group - 1)*

   - A review of the international Legal Instrument relevant to the implementation of NGDI in Nigeria.
   - Initiate and undertake the preparation of Legal Instrument for NGDI on legal issues relevant to the implementation of Space Programme in Nigeria
   - To also advice the Honourable Minister on all international protocol agreement as they relate to Nigeria's Space Programme
   - To advice the Honourable Minister on liaison with International Organizations on legal issues.

   iv.   *Funding and Sustainability [2 Working Groups]*
   - To enable sustainable production, management and utilisation of up-to-date and reliable GI in support of the country's socio-economic developmental needs.
   - To promote, in the public interest, easier and more economic access to GI.

- To ensure adequate funding to maintain the momentum of change towards the NGDI vision and sustain the spirit of cooperation and collaboration.
- To facilitate sustainable development of the NGDI.
- To promote development of GI on a cost recovery basis.
- Continuous engagement with public institutions and private sector organizations to develop and maintain their GI within NGDI;
- Cooperation, coordination and collaboration of NGDI with other GI initiatives on regional features and regional databases;
- Develop and promote the wide commercial use of GI products by Nigerian public and their institutions;
- Projection of Nigeria GI data interest in world fora and promoting the commitment of donor interests in Nigerian geospatial data development; and
- Persuade the leadership of Federal, States, LGAs, Organized Private Sector and Development Partners to provide adequate, stable and continuous annual budgetary funding of GI activities.

v.   *Standard Sub-Committee [5 Working Groups]*
Working Groups on:
    a   Data capture procedure and processes
    b   Hardware/Software
    c   Data presentation
    d   System Administration
    e   Metadata

vi   *Clearing House/Metadata [3 Working Groups]*
- Development of Metadata Standard and Metadata database design
- Compilation Data Dictionary
- Recommendation of standard metadata software (to be used by all) through
- adaptation of existing ISO-compliant metadata software
- Develop data exchange mechanism
- Develop/Promote data security measures
- Establish Clearinghouse at NGDI nodes
- Develop access protocols
- Promote Public-Private-Partnership for data sharing

3.0   Fundamental Datasets
The National Geo-Information Policy (NASRDA, 2003) further identifies the following datasets as fundamental datasets for Nigeria:
    i.   Geodetic control database
    ii.   Topographic database/DEM (at the scale of 1:50,000 and 1:25,000)
    iii.   Digital imagery and image maps
    iv.   Administrative boundaries data
    v.   Cadastral databases
    vi.   Transportation (roads, inland water ways, railways, etc.) data

viii.   Hydrographic (rivers, lakes, etc.) data

viii.   Land Use/Land Cover data

ix.   Geological database

x.   Demographic database

The list is subject to periodic review in accordance with national needs.

4.0   NGDI Structure in Nigeria

The diagram below shows the organizational framework of the Nigeria NGDI. In theframework, mapping organizations and major Geo information (GI) producers are classified as node agencies. These agencies are zonal clearinghouses that are networked to the main NGDI server. The stakeholders on the other hand are various user groups; some are also producers of spatial data but not the framework data.
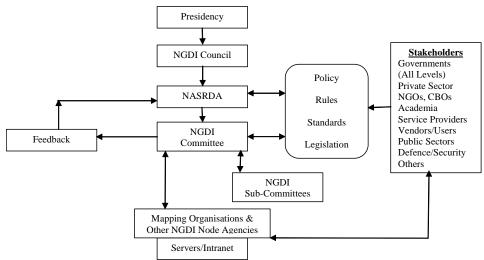

Figure 1: Organizational Framework of Nigeria NGDI

The structure of Nigeria NGDI is built around nodes that are networked and cascaded to the main portal of the NGDI. Registries for metadata are located at every node and the servers are networked with each other and with the main clearing house server.

5.0   The NGDI System

The developmental strategy for NGDI follows an incremental approach to allow NASRDA effectively address evolving stakeholder needs. This allows the creation of the clearinghouse, the population of the clearing house with base datasets such as a countrywide orthomosaic, and the establishment of a production system for generation and maintenance of geospatial products (Agbaje*et al.,* 2008). Central to NGDI is a Spatial Data Clearinghouse that will contain the overall network's spatial metadata with linkages to each remote node. The Clearinghouse will be hosted at NASRDA's Headquarters, along with image processing capabilities, and implemented during the first phase. In subsequent phases, several remote nodes

will be located at various government ministries. All of these nodes will be linked to the Clearinghouse through a combination of new and established communication links (Figure 2). The Clearinghouse provides visibility into the overall NGDI network's holdings and access to its physical content.
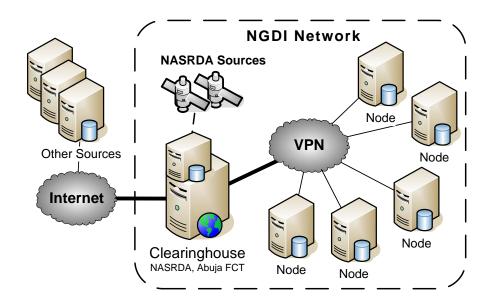

Figure 2: The NGDI Network Supports Distributed Holdings with a Common Clearinghouse.
Source: Agbaje et al. (2008)

6.0   Access and Retrieval.
When fully functional, the NGDI Clearinghouse will have service interfaces for accessing metadata and retrieval of the core data. Many of the access interfaces will be facilitated through the utilization of Open Geospatial Consortium (OGC) standards, primarily through the use of Catalogue Services – Web (CS-W). This catalogue interface will be the primary discovery mechanism for NGDI's metadata and services

7.0   NGDI Implementation
To date the Nigerian Geoinformation Policy that will guide the implementation of the NGDI was developed in 2003 (copy available at www.nasrda.gov.ng). The strategies meant to foster data sharing among geoinformation producers and users are well articulated in the Policy.

7.1   Spread of Operation
The project has a national spread with regional data nodes from various core stakeholders in different sectors of the economy.

7.2   Milestones

Project scope is huge and is a national effective implementation Phased implementation of the project commenced with

- the development of a User Requirement Survey Analysis (URSA),
- the production of a Project Document, the Development of National Geo-information Policy Document,
- the Implementation of the Pilot Project (establishment of a national portal : www.ngdinigeria.gov.ng, acquisition and installation of IT infrastructure, and subscription/payment for broadband fast dedicated internet access, capacity development for staff of NASRDA and core geospatial data generating ministries). See Figure 3
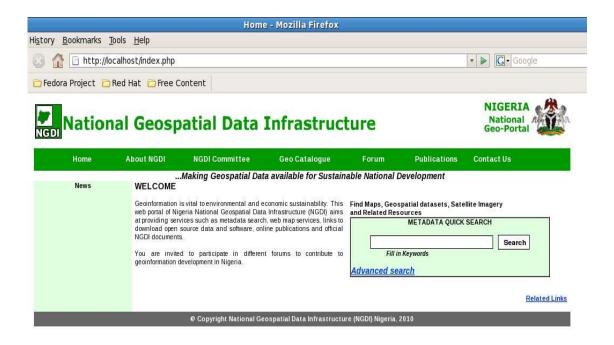

Figure 3: NGDI Web Homepage

Phase I: Design and Development of NGDI System

Phase II: Development of Software and Hardware Integration

Phase III: Integration and installation of System, Testing and Development of NODES

7.3   Progress in NGDI implementation in the last five years.

- 2006: National Geoinformation Policy approved in principle by the Federal Executive Council

- Review of NGDI Funding Mechanism

- 2007/8: 2nd User Requirement Survey & Analysis
- 2008: Commenced the construction of a 4-floor NGDI/Data Centre Building (Now about 80% completed)
- 2009: New NGDI Committee inaugurated (2nd Committee) on completion of 1st Committee terms

    - Development of NGDI Programme Implementation Building Blocks by the Committee

- 2010:   Revision of the National Geoinformation Policy by a special Committee set up by the NGDI   Committee (now reduced to about 11 pages)

    -Demonstration Project:

        i. Development of Clearinghouse

        ii. Harvested metadata of some datasets from 4 major Agencies

iii Development of NGDI website – www.ngdinigeria.gov.ng

        iv Capacity building for Nodal Agencies staff (20)

8.0   Conclusion

A decade into the implementation of Nigeria NGDI, there are still many things to be done and the initiative face several challenges. Some of the problems identified on Nigeria NGDI implementation include funding, capacity building, *awareness*, personnel and technological challenges (Agbaje, 2006).

Awareness being one of the problems faced is an important factor that should be critically examined. Simply because the magnitude of this lack of awareness could be traced to low level of geo-literacy among the general public and difference in knowledge and interpretations giving to SDI by the GIS professionals. The low level of geo-literacy is the causal of lack of use of the system by stakeholders and the general public, - what is not known cannot be used. Also the interpretations among professionals within the framework of Nigeria NGDI will reduce contribution and support of the stakeholder thereby affecting the adoption and implementation of the system.