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**NGDI DEVELOPMENT IN NIGERIA: POLICY ISSUES ON
INFORMATION ACCESS AND INFORMATION DISSEMINATION**

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1.0 INTRODUCTION

Realisation of the objectives of a national's socio-economic development programmes depends on availability and speedy access to Geospatial Information (GI) through provision of relevant infrastructures for data acquisition, processing, standardisation and sharing. Geospatial Information (GI) are much a part of a nation's infrastructure as its other elements such as the transportation network, health care system, telecommunication and should therefore be accorded the same level of support and priority because they provide information on the geography of the country in terms of her assets and potentials (Kufoniyi, 2004, GSDI, 2004). Increase in sharing and better access to high quality GI data would lead to efficient management of a nation's natural resources and environment, resulting in the improvement of the quality of life of the people.

Information Communication Technologies (ICT) is a major driving force in the implementation of an efficient National Geospatial Data Infrastructure (NGDI) as it permits GI sharing and growth. However data sharing is difficult as data created for an application may not be easily translated into another application. Efforts are now on to ensure interoperability between systems (e.g. OpenGISConsortium), but the problem of data sharing goes beyond technical, as organisations/institutions are not accustomed to working together and hence not willing to share data. Non-availability of metadata (i.e. information about data on 'who owns what, when, where, and how') databases inhibits data sharing among organisations/institutions and lost of millions of dollars on reproducing/duplicating already existing data.

The NGDI Project in Nigeria under the National Space Research and Development Agency (NASRDA) has as its main objectives, the discovery, harmonisation and standardisation of geospatial data production and management, and the provision of a platform for data sharing thereby eliminating data duplication and conserving cost and time spent in producing already available data. The paper examines the institutional arrangements in place to facilitate GI sharing among organisations in Nigeria as contained in the national Geospatial Information Policy. Issues such as data access and data security, and steps to ensure partnerships among producers of GI will be discussed. The paper further examines the progress made so far in the implementation of the GI Policy since its completion in September 2003. The NGDI national Committee has been

inaugurated with relevant sub-committees to facilitate data sharing and data access. The task of these various committee and sub-committees and the laid down strategies for achieving easy access to information and information dissemination are discussed in the paper. When analyzed against the developments at regional level in Africa, the Nigerian approach may serve as one of the best practices for the development of SDI at national levels.

2.0 NATIONAL GEOSPATIAL INFORMATION POLICY OF NIGERIA

2.1 Preamble

“The importance of developing a supporting policy/organisational environment should not be underestimated. Potential stakeholders will only become active participants if they see advantages for their organisations and if they do not feel threatened by the infrastructure. The buy-in and commitment from senior management of all stakeholders is critical to the success of the infrastructure as a whole and to that of access element in particular” (GSDI, 2004: pg. 70).

Government agencies are the main sources of geo-information (GI) in Nigeria and hence the major stakeholders in the development of the infrastructure (NGDI). Each of these agencies has statutory mandate and business plan with subject-specific strategy of production, quality control and dissemination of their datasets. Therefore their role in the development and operation of the data access component of the infrastructure will depend on government policy that will ensure that these agencies collaborate with each other, interact with the private sectors and the GI users in order to make these disparate datasets more widely available. Identifying these agencies and their roles in the development of the infrastructure are important steps toward achieving this.

Due to increasing awareness of the use of GI for decision-making over the past years, coupled with the expected availability of primary dataset from the Nigerian Satellite (NigeriaSat-1), the country has realized the need to adopt policies for promoting greater awareness and public access to standard and coordinated geo-spatial data production, management and dissemination by all sectoral institutions. It is essential to note that most of the SDI initiatives in African countries usually commence without paying attention to the issue of policy to guide proper implementation. In many cases, problems are then encountered after the commencement of the initiative raising the need to then formulate a guiding policy. When possible, it is advised that the policy issue be put in the forefront of any GDI implementation. In the case of Nigeria, the on-going implementation of the country’s NGDI started by first providing a GI policy.

2.2 The Geo-Information Policy on *Information Access and Dissemination*

The GI Policy aims to facilitate coordinated production and utilisation of Geospatial data which are common to multiple applications to eliminate duplication of efforts and wastage of resources. This will be achieved through the promotion of relationships among organisations and encouraging them to use NGDI-endorsed standards in order to create and maintain data at a high level of quality and consistency, which can improve value of the data in decision-making and thus serves as economy resource for wealth creation.

Some of the Policy implementation strategies that will ensure easy data access and dissemination are:

- Establishment of Clearinghouse in the NGDI node agencies and loading of certified metadata of data producers.
- Creation of metadata for existing dataset(s) by the custodian(s) of the dataset(s) and making the metadata available to the NGDI clearinghouse.
- Define the metadata content and structure for the NGDI and produce detailed metadata implementation guidelines, including practical advice on maintenance and use of metadata
- Develop ISO-compliant geospatial data standards for the NGDI.

The GI Policy sets out to achieve an NGDI administrative/organisational framework that is multidisciplinary, inter-agency and inter-sectoral network of institutions coordinated by the lead Agency – NASRDA. The Coordinating /Lead Agency shall work in close collaboration with the relevant National, State and Local Government Legislative Committees and Geospatial data producing organisations. This arrangement will remove the institutional barriers that have in the past inhibited GI sharing among the producers and users. Full policy document and further information can be found at www.rectas.org; www.nasrda.gov.ng; and in Kufoniyi, 2004; NASRDA, 2003 and UNECA, *et al.* 2003.

2.3 International Workshop of NGDI Stakeholders/Users

The GI Policy which is expected to guide the realisation of the NGDI in the country was drafted by a 10-member GI experts from the academia, stakeholder Ministries, and GI related community in the private sectors. The draft GI Policy was circulated to stakeholders for comments and was a subject of an international workshop of NGDI stakeholders/users held in Abuja, Nigeria in February 2003. The Workshop serves as a major strategy to bring GI stakeholders together and began the process of partnering on GI related matters. The workshop can be seen as a watershed in the history of our collective aspiration to establish NGDI in Nigeria as it brought together over 300 participants working in related areas: Surveyors, Scientists, Planners, Policy and Decision-makers, and business executives from national and international organisations.

In general, the Workshop was meant to create greater awareness of and promote public access to standard and coordinated geo-spatial data and the establishment of Geo-spatial Clearinghouses at various levels in the country. It also provides the opportunity to identify and recognize major stakeholders and users in the production, management and utilization of geo-spatial data and information products in Nigeria. Hence it marks the foundation for partnering in information sharing among stakeholders.

The NGDI initiative aims at enhancing geo-information (GI) harmonisation, access and use by government, universities, non-government organisations, private sector and civil society. While still expecting the passing into law the NGDI implementing agency in the country – National Space Research and Development Agency (NASRDA) has already embarked on the implementation of the recommended strategies in the Policy. One of such is the inauguration of the NGDI Committee and Sub-committees.

3.0 THE NGDI COMMITTEE

The NGDI can only become a reality through the cooperation among all the stakeholders organisations/institutions at all levels. On the 9th September 2004 a 27-member NGDI Committee that will guide the establishment and implementation of the NGDI in line with the GI Policy was inaugurated by the Hon. Minister of Science and Technology. 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. The Committee members are well spread in terms of stakeholders and geographical distribution across the country in order to enforce partnership and create an enabling environment for data access and dissemination.

No	Representation	Remarks
2	NASRDA	Lead agency
2	Universities	Universities selected in rotation
2	Poly/Monotechnics	Poly/Monotechnics selected in rotation
6	Six Geopolitical zones – States nodal agencies	States within each geopolitical zone 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

3.0.1 Functions of the NGDI Committee

The functions of the Committee can be summarized as follows:

- Develop the phases of implementation of the NGDI project
- Coordinate the GI-related activities of all NGDI node agencies
- Develop, streamline and enforce standards and policies for the infrastructure
- Appraise the manpower potentials of the nation in all sectors for a successful realization of the NGDI
- Mobilize local funding as well as foreign assistance whether technical or financial
- Create Sub-Committees within it for specific tasks as necessary
- Co-opt any person (s) it considers relevant in its function
- Sustain at all times, the tempo or momentum of change that will remain a necessary tonic for the realisation of the NGDI project

3.1 NGDI Sub-Committees

At the inaugural meeting of the NGDI Committee, the following six sub-committees were created in line with the recommendations of the NGDI Stakeholders/Users meeting of February 2003:

- (i) Geospatial Datasets Sub-Committee - The activities of this sub-committee cover both fundamental and thematic datasets as defined in the policy. Their activities include the following:
 - a) Development of a framework/strategy for the production of NGDI recognized fundamental datasets (accompanied by the dataset's metadata) and promotion of their use.
 - b) Review at intervals the list of recognized fundamental datasets for possible modification of the list, based on user needs assessment.
 - c) Determination of the minimum content of these datasets.
 - d) Identification of approved custodian for each dataset.
 - e) Identification/inventory of existing geospatial data resources
 - f) Upgrading, densification and harmonization of the national geodetic control network, which must be AFREF/ITRF-compliant
 - g) Promotion of synergy with international mapping programmes such as the Global Mapping, Global Land Cover Network and Mapping Africa for Africa.
 - h) Creation of relevant working groups

- (ii) Standards Sub-Committee - The activities of the sub-committee on standard will include:
 - a) Inventory and review/evaluation of existing national standards
 - b) Review of existing international standards e.g. Africover's Land Cover Classification System (LCCS).
 - c) Development of national standards in conformity with ISO
 - d) Registration of the standards with SON and ISO
 - e) Development or adoption of standard terminologies
 - f) Linkages with related standards working groups and organizations locally and internationally, e.g. Standards WG for ICT if available, Standards WG of CODI-Geo, ISO/TC211, GSDI, OGC (Open GIS Consortium) ISCGM, etc.
 - g) Publication of NGDI supported standards
 - h) Development of best practice guidelines providing advice on the application of standards
 - i) Development of a model for standards services (operational, technical, systems, information model)
 - j) Facilitation of the creation of preliminary standards services to help users understand and apply standards
 - k) Promotion of interoperability
 - l) Promotion of the benefits of using the NGDI supported standards.

(iii) Clearinghouse and Metadata - This sub committee will among other relevant issues focus on metadata standard development; metadatabase design; compilation of data dictionaries; recommendation of a common (i.e. to be used by all) metadata software through adaptation of existing ISO-compliant metadata software; mechanism for conformance monitoring; data exchange mechanism; data security measures; establishment of clearinghouse at NGDI nodes; access protocols; Public-Private-Partnership (PPP) for data sharing; etc. Some of the objectives of the sub committee are to:

- a) Produce detailed metadata implementation guidelines
- b) Develop best practice guidelines giving practical advice on maintenance and use of metadata
- c) Identify, catalogue and evaluate information sources
- d) Obtain commitment from existing service providers and data producers for the metadata infrastructure
- e) Establish a preliminary metadata services
- f) Promote the metadata services to the existing and potential GI community
- g) Target information providers and encourage and advise on how they can make their metadata available
- h) Develop conformance and testing clauses for metadata
- i) Investigate and establish appropriate conformance mechanisms for the metadata

(iv) Capacity Building and Awareness: Capacity building is very essential to the success of NGDI. It is crucial to ensure that policy makers and the general populace are made aware of the importance of GI and NGDI to all facets of the national economy. The policy has provided the ingredients to ensure that capacity building receives the priority attention that it deserves. This sub-committee will ensure that the policy items are translated to implementable activities. Among other activities, the sub committee will:

- a) Encourage basic training on NGDI and its components – metadata development, data exchange protocols and transfer formats, development of clearinghouse, etc.
- b) Promote research on GI application success stories as well as on resources and development opportunities being lost, due to absence of GI and NGDI and disseminate findings on them.
- c) Promote awareness on importance of GI to development and sensitise policy/decision makers and end-users on the importance of NGDI.
- d) Encourage development/review of Geoinformatics curricula in our higher institutions of learning.
- e) Promote institutional reforms in GI organizations to facilitate assimilation of NGDI by the organizations
- f) Promote mandatory continuous development programme on NGDI concepts and Geo-information Science by relevant professional bodies.
- g) Promote activities that will build mutual respect and trust among NGDI stakeholders.

- h) Promote general awareness on NGDI using various media: print and electronic media, newsletter publication, synergy with NITDA, Internet website, geo-kiosk at conferences, etc.
- i) Identify and promote (use of) existing applications of NGDI compliant information.
- j) Identify parallel initiatives to NGDI and integrate with them where beneficial.
- k) Market and promote the use of GI.
- l) Identify what advisory services are required.
- m) Ensure linkage with international organizations and bodies in the area of GI/GDI capacity building

(v) Legal Sub-Committee: The activities of this sub committee include:

- a) Promotion of early approval of the GI policy and its enactment
- b) Provision of mechanism for implementation of all legal aspects of the policy
- c) Identification/inventory of existing related legislation and regulations at national and international levels
- d) Review of existing copyright and privacy laws
- e) Review of right-to-public-information
- f) Provision of laws for copyright and intellectual property rights
- g) Development of mechanism for implementation and monitoring of copyright and other legal provisions of NGDI (e.g. on local content, local implementation of project and supporting of EIA report with GI data).
- h) Prescription of appropriate disciplinary measures for non-conformance with the provisions of the GI policy and related regulations.
- i) Provision of relevant regulations to guide full realization of NGDI and amendment of existing ones where necessary.
- j) Promotion of synergy among related policies and amicable resolution of areas of conflict.
- k) Development of mechanism for the implementation of PPP.

(vi) Sustainability and Funding Sub-Committee

NGDI will be a success only when the initiative can be sustained. It calls for initial focused funding by Government at various levels. However, as it will be very unlikely to get the required funding from Government for all aspects of NGDI, the NGDI Committee will have to prepare a strategy for the implementation by prioritizing the activities. However, for sustainability and funding in general, this sub-committee will work towards successful implementation of the NGDI Fund. The activities of the sub committee will include:

- a) Development of funding strategy for every NGDI activity: data production/update, clearinghouse, funding of activities of NGDI Committee and every sub committee and working group, etc.
- b) Identification of funding sources
- c) Formulation of pricing policy – data fee, access fee, etc.

- d) Identification of the aspects of NGDI in which public-private-partnership (PPP) will be feasible and encouragement of its implementation.
- e) Liaising with the relevant organs of Government (Ministries of Finance, relevant committees of the national and state assemblies, etc.) to attract funding.
- f) Development of mechanism to ensure that donor-driven NGDI projects are effectively and efficiently executed in the national interest.

Each sub committee was given approval to have a number of working groups as may be deemed necessary after obtaining the NGDI Committee's clearance.

4.0 NGDI ADMINISTRATIVE/ORGANISATIONAL FRAMEWORK

The NGDI administrative/organisational framework is as shown in Figures 1 and 2. Working with geospatial data producing organisations the lead agency – NASRDA, shall have powers to enforce rules and standards.

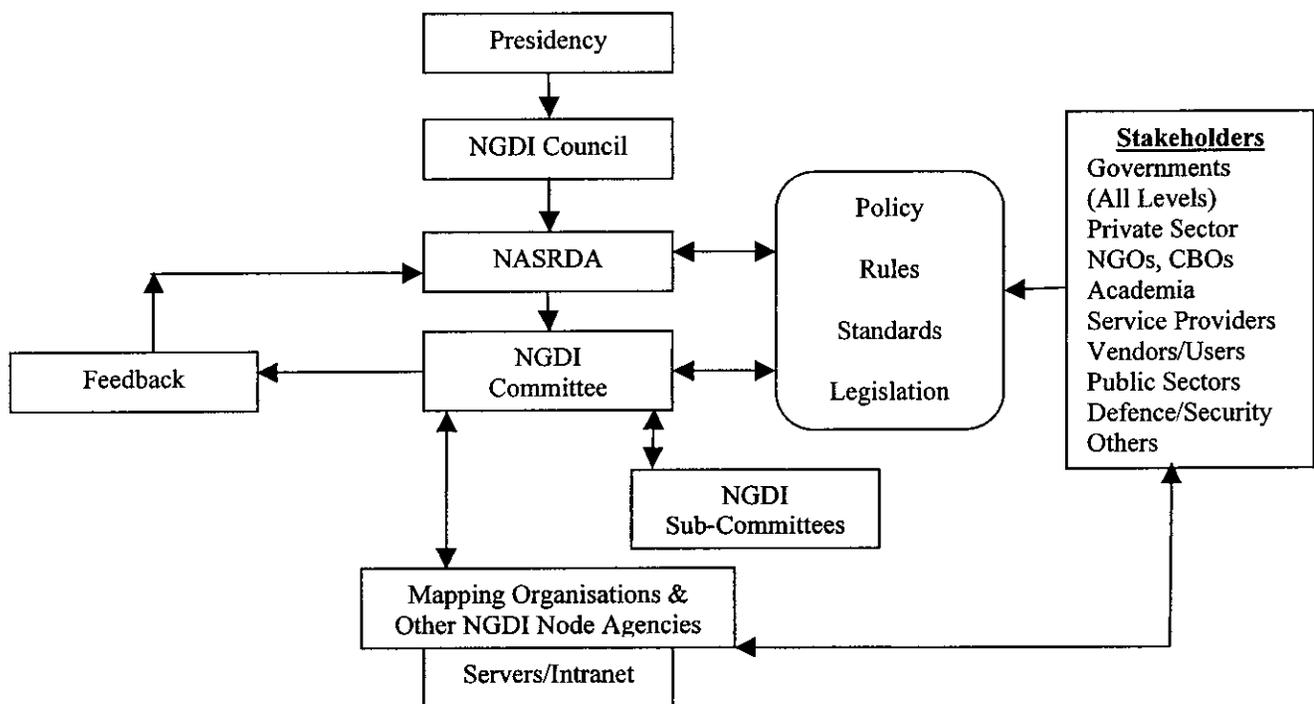


Figure 1: NGDI Organisational Framework

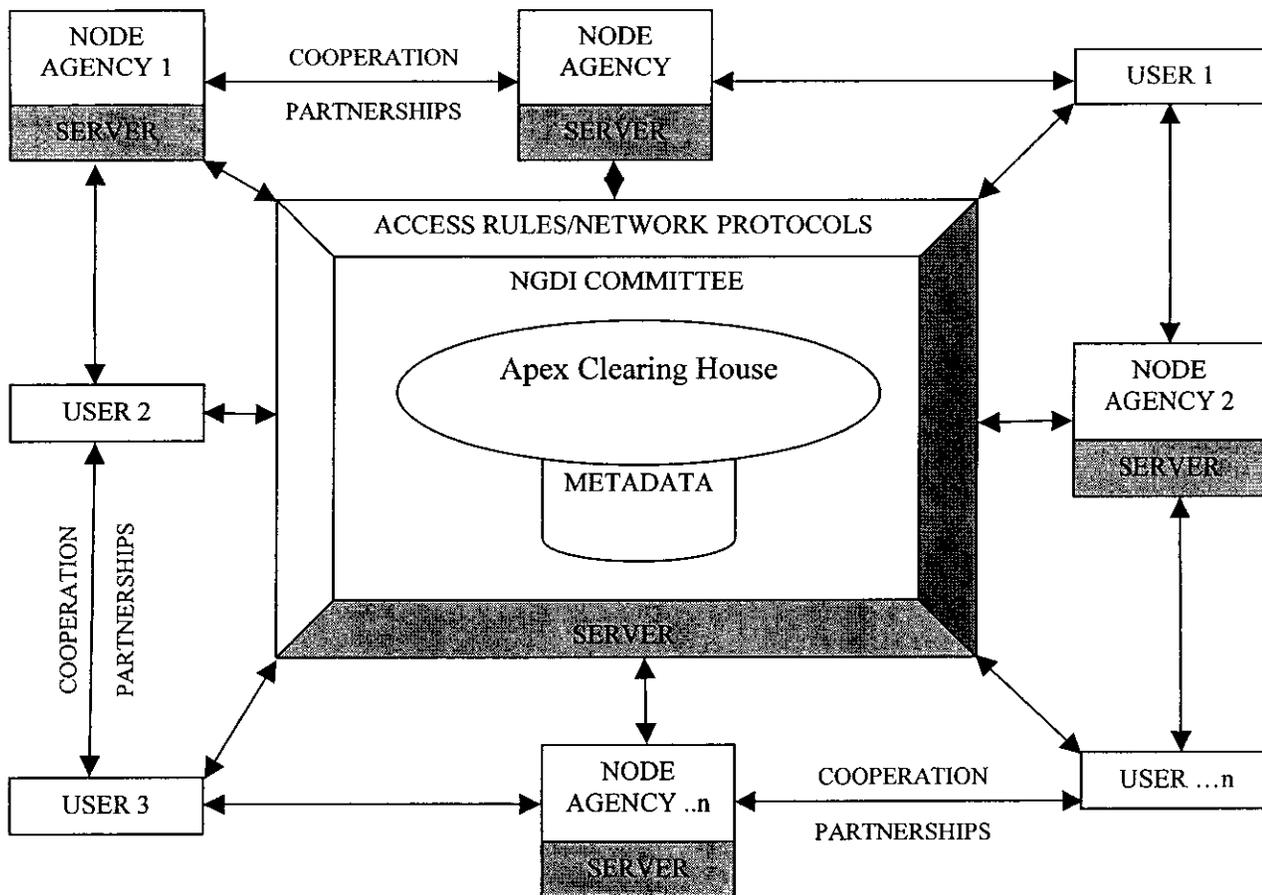


Figure 2: Nigerian NGDI Technical Framework to ensure access to and dissemination of GI data.

One of the goals of the NGDI is to build relationships among GI data producers to support continuing development of the project.

The NGDI Council (yet to be inaugurated) has the Vice-President as the Chairman and seven Ministers of major stakeholders' ministries as members (see GI Policy for full list). Their function shall be to develop all policy guidelines on NGDI. The multidisciplinary, inter-agency and inter-sectoral network of institutions that forms the administrative/organisational framework shall focus on the production, management, sale, and use of geospatial information. The stakeholders would collectively ensure the successful realisation of the NGDI vision.

5.0 DATA ACCESS AND DATA SECURITY

Transparent access to a wide variety of geospatial data can provide relevant information for countless applications leading to value-added services and market opportunities in a deregulated economy (NASRDA, 2003). Data sharing is facilitated through a coordinated and structured access to geospatial data owned by public and private sector organisations within a legal framework in order to ensure the rights of all parties (owners, custodians and users).

In the GI Policy, data access has been divided into two categories – i) Restricted access and ii) Community access. Restricted access will be granted to geospatial data related to national security projects while community or free access is granted to other datasets taken cognisance of the protection of copyright. Data can be changed from one category to another as circumstances change over time. Data providers shall disclose or make available, their dataset on request unless prevented by law.

To achieve easy accessibility to data, an apex Clearinghouse shall be established in NASRDA – the NGDI lead agency and a metadata database server linked to the apex Clearinghouse in each geospatial data producing agency and they will also be designated as Clearinghouses. The owner/custodian of the geospatial data shall be responsible for accessibility of the data through supply of the metadata to the Clearinghouse.

The strategies outlined in the GI Policy to achieve easy accessibility to geospatial data are as follows (NASRDA, 2003: p.34):

- Develop and implement the access rules and protocol including pricing rules and a flexible, easy to use search request form.
- Develop and implement a standard request authentication system for use in the Clearinghouse of all NGDI node agencies.
- To put in place high-speed and high-bandwidth backbone carrier in the apex Clearinghouse as the main gateway and master server.
- Implement a database server at each NGDI node using the access protocol and linked to the master server.
- Design and implement appropriate network linkage mechanism among the NGDI node agencies.

The GI Policy also provides for copyright/intellectual property. A data owner shall own the copyright of the data produced and for value-added data, the producer shall own the copyright of only the value-added component of the data. Confidentiality, privacy and liability issues are also dealt with in the GI Policy. For example geospatial data are to be collected only by the organisation that is legally recognised to do so and they shall be accountable for the integrity of their unmodified data.

The development of a sustainable business model for the operation of the access component of the NGDI is critical to the long term success of the entire infrastructure. In the light of this, Chapter 9 of the GI policy dealt with the commercial aspects of the infrastructure. To facilitate sustainable development of the NGDI and promote development of GI on a cost recovery basis, a pricing mechanism shall be adopted for providing access to data (i.e. data search), apart from the data cost.

The GI Policy is to ensure accessibility of the information and provide a recognised contact point for the distribution, transfer or sharing of the information.

7.0 THE POLICY IMPLEMENTATION SO FAR

The holding of an International Workshop of the NGDI Stakeholders/Users (see Section 2.3), the setting up of the NGDI Committee and Sub-Committees (see Section 3) are some of the steps taken towards achieving geospatial information sharing/access in the country.

7.1 Users Requirement Survey and Analysis (URSA) & Project Document

An understanding of users' needs, operational priorities, related data and database requirements, and stakeholders' participation at each stage of the development are absolutely fundamental to a successful and cost effective NGDI implementation.

The URSA is currently being carried out alongside an awareness campaign to increase the stakeholders buy-in to the NGDI initiative. The URSA is expected to logically review existing NGDI stakeholders and their data and databases that will impact the development and implementation of the project. The URSA will also capture the current use of data within the data producers, co-producers, users and other stakeholders. An assessment of the level of synchronization between existing data and desired data will be carried out.

The URSA will encompass data holdings, data needs, hardware and software capacity, data flow parameters, staffing requirements, and organizational dimensions. The Survey results will identify data needs, systems requirements and budgetary implications.

The results of the URSA will serve as an essential input in the development of the *NGDI Project Document* that will provide a description of the NGDI systems development approach including project architecture and master schedule.

The URSA is expected to be completed in the first quarter of 2005.

7.2 Provision of Fundamental Datasets

NASRDA in line with the National GI Policy is currently collaborating with the Federal Surveys in the provision of a network of GPS geodetic controls all over the country. Apart from being a fundamental datasets for the NGDI, the establishment of these geodetic controls is essential for the processing of NigeraiSat-1 imageries to ortho-rectification level.

The successful completion of the GPS geodetic controls project will be an essential input into the ongoing plan by the Federal Surveys Department, the Surveyors Council of Nigeria (SURCON) and some Nigerian Universities to densify, harmonise and adjust the national geodetic control network as a pre-cursor of an effective NGDI.

Currently the existing analogue 1:50000 topographic map series of the country are being converted to digital format by the Federal Surveys Department. This will be an essential dataset for the NGDI.

7.3 Development of Application-Specific Projects

In order to demonstrate the power of GIS and hence the need for NGDI for efficient planning and good decision making, NASRDA is currently collaborating with National Electric Power Authority (NEPA) and the Nigerian National Petroleum Corporation (NNPC) on NGDI application-specific projects.

The NEPA project is meant to demonstrate the usefulness of the System in the effective planning of energy generation and distribution. On the other hand the NNPC project is the oil/gas pipeline mapping/monitoring project. The updating of the 1995 Land Use/Land Cover map of Nigeria using the NigeriaSat-1 has been incorporated into the projects. Project implementation Committees are already setup for both projects and preliminary work is on-going.

NARSDA is also collaborating with the National Emergency Management Agency (NEMA) in the development of a flood early warning system. The project will make use of NigeriaSat-1 imagery along with other satellite imageries.

8.0 CONCLUSION

The problem of data sharing goes beyond technical, as organisations/institutions are not accustomed to working together and hence not willing to share data. Therefore the participation key stakeholders in the development and operation of the data access component of an SDI depend strongly on Geo-Information policy regarding data distribution, cost recovery etc.

The Nigerian GI Policy was drafted with contributions from stakeholders including an international Workshop in order to give it the necessary credence. The Policy is an essential backbone for the efficient realization of the NGDI. Data sharing is facilitated through a coordinated and structured access to geospatial data owned by public and private sector organisations within a legal framework in order to ensure the rights of all parties (owners, custodians and users). The NGDI Policy as it relates to the institutional arrangements in place that will facilitate GI sharing among organisations in Nigeria was discussed.

In line with the GI Policy NASRDA has embarked on some of the implementation strategies in the Policy such as the inauguration of the NGDI Committee. The associated Sub-committees and Working Groups have also been set up and given set objectives and mandates to supervise the implementation of the GI policy. NARSDA has also embarked on the implementation of the Users Requirement Survey & Analysis, and the NEPA and Oil/Gas pipeline monitoring application-specific projects.

The development of NGDI for the country is seen as a major step towards poverty alleviation and hence sustainable development. The world is in an information age. The information age provides opportunity for countries that have missed out of the agricultural and industrial revolution to catch up with the rest of the world.

When analyzed against the developments at regional level in Africa, the Nigerian approach may serve as one of the best practices for the development of SDI at national levels.

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