



United Nations Economic Commission for Africa (ECA)

# A Review the Current Status of NSDI Implementation in African Countries

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*(Part I: Main Text)*

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## **Executive Summary**

The review and assessment of the status of NSDI development and implementation in African countries is based on the assessment of the level of maturity of geospatial information (GI) development in the countries. The maturity of GI development, in the context of readiness for NSDI implementation, is defined as a measure of the level of maturity of NSDI components to meet the requirements of a successful NSDI implementation.

The NSDI components identified for adoption in this regard are the five product based NSDI components and an additional strategic management component as listed here below:

1. Strategic Plan
2. Policy and Legal Frameworks,
3. Fundamental Data,
4. Standards,
5. Access Networks, and
6. People

20 key indicators have been identified and selected to assess the level of maturity of each component in the context of African countries. The six components and the corresponding 20 indicators are summarized here below.

### **1. Component 1: Strategic Plan**

#### **Indicators:**

1. *Inspiring Vision*
2. *Clearly Articulated Mission Statement*
3. *Specific, Measurable, Achievable, Realistic, and Time-bound (SMART) Objectives*

### **2. Component 2: Policy and Legal Frameworks**

#### **Indicators:**

1. *NSDI Proclamation*
2. *Lead Organization*
3. *Data Policy*
4. *Funding*

### **3. Component 3: Fundamental Data Sets (FDS)**

#### **Indicators:**

1. *Official List of FDS*
2. *Availability of Digital FDS*
3. *Metadata Creation*

### **4. Component 4: Standards**

#### **Indicators:**

1. *Dataset Standards*

## 2. Metadata Standards

### 5. Component 5: Access Network

#### Indicators:

1. *Access to Electricity*
2. *ICT Development Index*
3. *Internet Penetration*
4. *Availability of Geoportal*

### 6. Component 6: People

#### Indicators

1. *GI/NSDI Awareness*
2. *Knowledge and Skills*
3. *Capacity and Capability*
4. *Partnerships*

A questionnaire was developed on the basis of the components and indicators identified above to enable primary data collection from ECA Member States to enable a meaningful assessment of the implementation of NSDI in the respective African countries. 16 countries out of the 54 ECA Member States (~30%) responded to the questionnaire, and the assessment is based on the responses received from these countries.

The Capability Maturity Model (CMM) was used to measure the level of maturity of each indicator in the countries that responded to the questionnaire. The CMM as adopted for the assessment of NSDI in African countries categorizes the maturity level of the NSDI components and their respective indicators into five levels of maturity. These five levels of CMM level are:

**Level 1:** Initial/Immature,

**Level 2:** Basic/Underdeveloped,

**Level 3:** Defined,

**Level 4:** Managed, and

**Level 5:** Optimizing.

The assessment based on the CMM shows that only four (4) countries from among the assessed 16 countries scored a weighted average of more than 50% (between Level 2 & Level 3 on the CMM scale) with South Africa scoring the highest score of 64% (Level 3). The average for the assessed 16 countries is 33.3% (somewhere between levels 1 & 2 on the CMM scale).

## 1. Introduction

The review and assessment of the status of NSDI development and implementation in African countries is based on the assessment of the level of maturity of geospatial information (GI) development in the countries. The maturity of GI development, in the context of readiness for NSDI implementation, is defined as a measure of the level of maturity of NSDI components to meet the requirements of a successful NSDI implementation.

The NSDI components identified for adoption in this regard are the five product based NSDI components and an additional strategic management component as listed here below:

1. Component 1: Strategic Plan
2. Component 2: Policy and Legal Frameworks,
3. Component 3: Fundamental Data,
4. Component 4: Standards,
5. Component 5: Access Networks, and
6. Component 6: People

A total of 20 key indicators have been identified and selected to assess the level of maturity of each component in the context of African countries.

To make an objective assessment of the status of NSDI development and implementation in African countries based on the identified NSDI components and indicators, it is essential to gather primary data that reflects the as-is situation vis-à-vis the identified components and indicators. To facilitate data collection in this regard, a questionnaire was developed and sent out to the Geospatial Information Management (GIM) focal organisations of all the 54 Member States of the United Nations Economic Commission for Africa (ECA). Accordingly, this review and assessment is based on the responses received from African countries for the questionnaire.

The assessment methodology adopted for this study is based on the Capability Maturity Model (CMM), originally developed by the Carnegie Mellon University's Software Engineering Institute, for evaluating and improving software development process.

The outcome of this assessment has depicted that NSDI implementation in all the countries assessed in this study is at an immature to basic level of development.

## **2. Brief Overview of the Approaches Recommended for NSDI Implementation in African Countries**

### **2.1. The Mandatory Model of NSDI Development Approach**

There are two broad alternative models that are being adopted for NSDI implementation in the various countries of the world. The first is the mandatory model, i.e., NSDI based on formal mandates, and the second is the voluntary model, i.e., NSDI based on existing spatial data coordination activities.

The mandatory model of NSDI implementation is normally backed up by legislation, regulation or some other type of government decree or directive that requires geospatial information providers to make their data sets discoverable and accessible via the NSDI.

The alternative to NSDI implementation under some loose type of enforcement mechanism is the voluntary model.

In the case of developing countries, mainly African countries, an appropriate policy framework that encourages and facilitates easy access to geospatial data is considered a key for the success of any NSDI initiative. In addition, legal issues pertaining to intellectual property rights, copyrights, ownership, liability, etc. should be clearly defined. This calls for the adoption of the mandatory model of NSDI implementation in African countries.

### **2.2. Product Based NSDI Components Approach**

There are two alternative approaches that can be considered for NSDI implementation as identified by Rajabifard and Williamson (2001); i.e.,

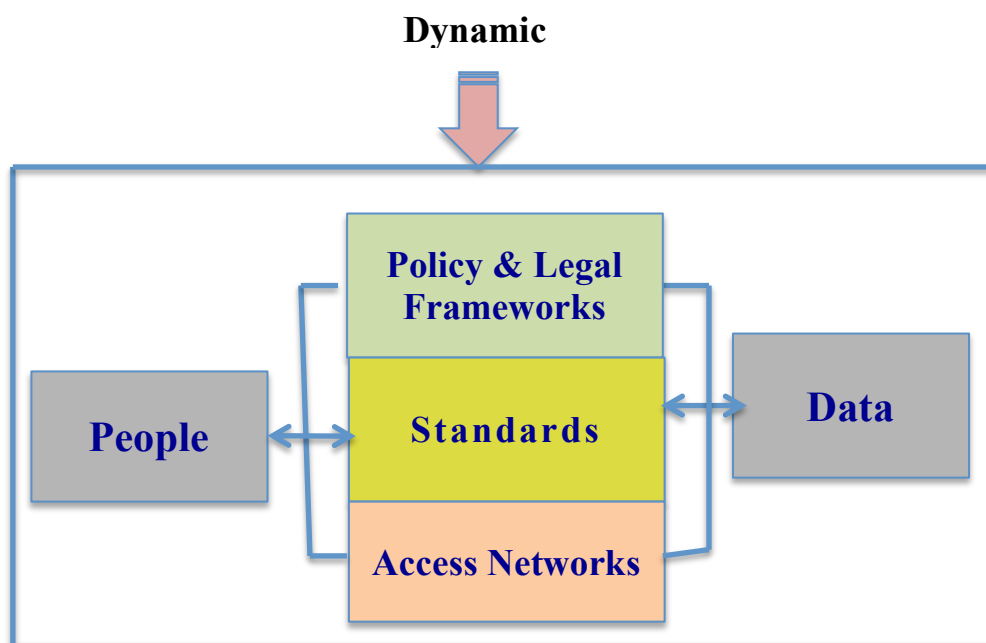
1. The Process-based approach, and
2. The Product-based approach.

The emphasis of the Process-based NSDI implementation approach is to enhance the communication channel as a framework for linking users with providers of spatial information. In other words, the objective behind the Process-based NSDI implementation is to provide better communication channels for the community for sharing and using geospatial data assets.

Hence, the Process-based NSDI implementation is considered a better option in a situation where the main components (GI products and services) of NSDI are well developed, as is the situation in the developed countries.

However, in the case of African countries, all the components of NSDI are still at a very basic or rudimentary level of development, and hence, the Process-based NSDI implementation approach is not compatible with the situation in African countries.

On the other hand, the emphasis of the Product-based NSDI implementation approach is based on ensuring that all the five main components of NSDI, as indicated in figure 1 below, are given due consideration to facilitate NSDI development and implementation. This is the recommended approach for NSDI implementation in African countries.



**Figure 1: Product Based NSDI Components (Source: Rajabifard A.)**

The main challenge for a successful NSDI implementation in African countries to date is believed to emanate from the Process-based NSDI implementation approach that was adopted/copied from the developed countries, without giving due consideration regarding the status of the development of the NSDI components in African countries.

Hence, with a view to overcome the aforementioned misguided approach in NSDI implementation that was previously attempted in African countries, it is recommended to adopt the Product-based approach, taking the specific conditions of individual African countries into account.

### **2.3. Adopting the AFI Step-wise Implementation Methodology**

In order to facilitate the successful implementation of NSDI in African countries based on this revamped methodology, it is recommended to adhere to the following steps based on the AFI strategy framework that is the result of the following three strategic management tasks:

- 1) Analyse the Environment (A),
- 2) Formulate Strategy (F), and
- 3) Implement Strategy (I)



### **3. Key indicators based on the Recommended Approaches for NSDI Implementation in African countries**

Based on the recommended approach for NSDI implementation in African countries as briefly discussed above, 6 (six) components and 20 (twenty) indicators have been identified and used for the assessment of the status of NSDI implementation in African countries. The six components and their corresponding indicators are briefly described below.

#### **3.1. Component 1: Availability of Strategic Plan/Roadmap**

Strategic plan or roadmap is an instrument that helps to formulate a medium to long-term view that describes where we want to take an organization, and how we plan to get there. Hence, in the dynamic GI environment, by extension NSDI environment, a strategic plan is considered as very essential to formulate a long-term view that describes the desired future state for the NSDI in a country. Otherwise, as the often quoted strategic management adage goes; “if you don't know where you're going, how will you know when you've got there?”

The strategic plan should be based on a thorough analysis of the external and internal environment relevant to the specific country, and the derived strengths, weaknesses, opportunities and threats (SWOT) within the country's GI environment. The three key indicators of a comprehensive strategic plan are summarized as follows:

##### **3.1.1. Shared Vision**

A vision is generally defined as an organization's desired future state if one does the best to attain the goals and objectives set out in the strategic plan, and provides guidance and energy for the journey ahead. Such a vision should be discussed and communicated to all, so that it becomes a shared vision by all relevant stakeholders.

In the context of NSDI, a shared vision is intended to inspire, motivate and align the activities of those people interested in seeing the successful and sustainable implementation of NSDI in the concerned country. Hence, the articulation of shared vision is a primary indicator for the availability of a strategic plan component of NSDI.

##### **3.1.2. Mission Statement**

A mission statement is a short statement of why an organization exists. It gives guidance to crafting overall goals for the organization regarding its products or services, and its principal customers.

In NSDI context, the mission statement describes what the NSDI initiative seeks to achieve in the long term and provides guidance to all stakeholders involved in working together to achieve the vision. Hence, a well articulated mission statement is another key indicator for the availability of a strategic plan.

##### **3.1.3. SMART Objectives**

All sensible organizations devise goals that are high-level, qualitative statements that describe what needs to be accomplished in order to achieve the vision in broad terms. Objectives are steps that, taken together, lead to the achievement of

goals. In order to be effective, objectives need to be specific, measurable, achievable, realistic and time-bound (SMART).

Hence, the availability of SMART objectives for the development and implementation of NSDI is a key indicator to assess the status of NSDI implementation in African countries.

## **3.2. Component 2: Policy and Legal Frameworks**

Policy is the key component of National Spatial Data Infrastructure (NSDI), and hence, policy development should be a priority activity in NSDI implementation. This is more relevant in African countries, as the recommended model for NSDI implementation in African countries is the mandatory model that requires the laying down of rules and regulations aimed at the establishment of NSDI in the country.

Policies should be developed at a national level to encourage consistency and commonality. Considering that Policy and Legal Frameworks are the most critical component of NSDI implementation in the context of the mandatory approach recommended for African countries, this component is considered critical. The key NSDI indicators related to this component are the following:

### **3.2.1. Availability of NSDI Proclamation/Directive**

NSDI is national in scope that must meet the needs of a wide range of geospatial data producers and data users across government, NGOs, academia, the private sector, and the general public. Hence, a clear NSDI proclamation/directive is necessary to lay down general rules aimed at the establishment and maintenance of the infrastructure for spatial information nationally.

Such a proclamation/directive can be enacted through one or a combination of the following instruments:

- Act of Parliament at the legislative level,
- Council of Ministers' Regulation at the executive level,
- Executive Order by Head of State/Government,
- Executive order by responsible Minister.

Thus, the availability of NSDI Proclamation/Directive is considered an important indicator of the Policy and Legal Frameworks component in the assessment of the status of NSDI in African countries.

### **3.2.2. Availability of NSDI Lead Organization (Institutional Arrangements)**

Distributed geospatial Information (GI) Management systems serve primarily the needs of the entities owning the GI, without concern for the needs of other potential users. This leads to the duplication of efforts and, hence, inefficient use of resources, both financial and human. One of the core objectives of NSDI implementation is to overcome this wastage and inefficient use of resources.

Hence African countries need to have a well-defined lead organisation that facilitates and leads the NSDI effort in a country. Accordingly, the availability of a lead organisation is identified as a key indicator of the Policies and Legal Frameworks component of NSDI.

Successful NSDI implementation in African countries requires a lead organization structured with the following main bodies with appropriate powers:

- High Level/Ministerial Champion,
- NSDI Executive Council,
- NSDI Secretariat, and
- Working Groups.

### **3.2.3. Existence of Data Policy**

Data sharing in African countries is a major challenge. Hence, policies should be developed at a national level to encourage consistency and commonality so as to:

- Encourage once collected data to be used many times (data sharing);
- Ensure data interoperability (common standards);
- Ensure that metadata is a mandatory accompaniment to any data collected (data accessibility);

In the NSDI context, spatial data policy constitutes legal frameworks defining some basic principles specific to geospatial data, to be observed by individuals and institutions when generating, collecting, transforming, disseminating, preserving, and making use of geospatial data.

Hence, the existence of a data policy is another key indicator of the Policy and Legal Frameworks component of NSDI. The data policy encompasses the following:

- Data Creation/Sharing
- Data Ownership/Custodianship
- Data Security
- Copy Right/IPR
- Pricing

### **3.2.4. Funding**

NSDI implementation requires substantial amount of financial resources, particularly during its establishment (development and implementation) phase. Regular funding is also essential for the operation and maintenance phase to ensure the sustainability of the NSDI once it is established. Hence, if NSDI is to be implemented effectively and efficiently, funding mechanisms must be in place to address the entire life cycle — establishment phase, and operation/maintenance phase — of the NSDI.

Hence, funding is an important indicator of the Policy and Legal Frameworks component. Clearly specified funding policy helps to establishing the pricing policy for GI/geospatial data, and also to layout the funding sources for the NSDI effort.

## **3.3. Component 3: Data**

Accurate and authoritative digital Fundamental data are essential component of NSDI. Data also includes Metadata that accompany the geospatial Data sets produced.

Thus, the availability of Fundamental geospatial datasets and their accompanying Metadata, as elaborated here below, are critical indicators for NSDI implementation in African countries.

### **3.3.1. Determination of Official List Fundamental Datasets**

Fundamental data sets are the minimum primary sets of data that cannot be derived from other data sets, and that are required to spatially represent phenomena, objects, or themes important for the realization of sustainable development consistently at the national, regional or global level.

In order to be able to collect, update and manage Fundamental data, it is essential to determine and agree upon the minimum list of Fundamental data sets. Hence determination of fundamental data sets is an important indicator for the data component of NSDI in African countries.

### **3.3.2. Availability of Digital Fundamental Data Sets**

Following the determination of the Fundamental datasets, each African country needs to examine what Fundamental data sets are available in the country and how the missing data can be provided. The available datasets should be reviewed for completeness/scope, quality/accuracy, and currency/maintenance.

The advantage of having a digital geospatial dataset, can be summarized as follows:

- Easy storage,
- Easy dissemination,
- The facilitation of data exchange/sharing,
- Faster and easier updating and correcting information,
- The ability to integrate data from multiple sources, and
- The customisation of products and services.

### **3.3.3. Availability of Metadata**

Metadata is data about data. It includes such details as the geographical extent of data, quality of data, currency of data and the supplier of the data. These details are described in a metadata structure and they enhance the use of GI (Geospatial Information) in making appropriate decisions.

Therefore, as the value of a dataset is dependent on its documentation, the availability of Metadata is an essential indicator of the Data component of NSDI.

## **3.4. Component 4: Standards**

Standards are the component of NSDI that provide consistent specifications for creating, reproducing, updating/maintaining, and sharing geospatial information, such as how data should be structured to represent geographic features and how the information is exchanged between systems. Standards facilitate geospatial information interoperability across systems and users.

As the key purpose of NSDI is to provide the mechanisms that facilitate geospatial data sharing, the specification and adoption of a compatible suite of standards is a critical means of NSDI implementation. The key indicators for this NSDI component are the following.

### **3.4.1. Data Content Standards**

To ensure interoperability, NSDI will need to rely on a set of common Spatial

Data standards and protocols, the use of which should be mandated and compliance monitored and enforced.

It is recommended that African countries adopt international standards developed collaboratively by the International Organization for Standardization (ISO) and the Open Geospatial Consortium (OGC) to facilitate NSDI implementation in their respective countries.

When data content is standardized, information can be accessed, exchanged and used by people and computers more effectively. Hence data content standards are key indicator of the data component of NSDI.

#### **3.4.2. Metadata Standards**

Metadata availability is a serious issue in the development and implementation of NSDI. The lack of metadata creates problems to users who want to use the data, as without metadata, they do not know the detailed data contents. Thus, the creation of metadata must be given priority and should be done along the data creation activities.

There has been a wide range of metadata standards proposed. ISO 19115 became an international metadata standard for geographic information. In addition, most of the countries and international organisations have proposed different metadata profiles. Thus, African countries need to consider the internationally recommended Metadata standards to be able to have adequately defined metadata standards for effective NSDI implementation.

### **3.5. Component 5: Access Network**

Access Network provides a means to access a data set. Information Communication Technology (ICT) Infrastructure provides the Technological backbone to facilitate access to the Internet and the World Wide Web (WWW). Although the Internet architecture is global in theory, the reality on the ground is different. Lack of access to electricity, a telephone line, a computer and a modem (ICT Infrastructure) exclude the majority of Africans from accessing the Internet.

Hence, access to technologies and infrastructure that facilitate geospatial data sharing and dissemination is very critical for NSDI implementation. Without this critical Information Communication Technology (ICT) backbone infrastructure, NSDI implementation will be inconceivable.

This makes access network a critical component of NSDI. The key indicators of this component are further elaborated below.

#### **3.5.1. Access to Electricity**

Access to electricity refers to the percentage of people in a given area that have relatively simple, stable access to electricity. Not all African countries have equal access to electricity, and the level of access can be indicative of the development level of the country in question.

This means that access to electricity serves as a good measure for other indicators of development in a country, including NSDI development.

Without access to electricity, there can be no functional ICT, and by extension no functional Internet. Thus, access to electricity is an important key indicator for the access network component of NSDI, particularly in the case of African countries.

### 3.5.2. ICT Development Index

The ICT Development Index (IDI) is a composite index used to monitor and compare developments in information and communication technology (ICT) between countries over time. As ICT provides the backbone to facilitate access to geoportal via the Internet, it is a key indicator of the access network component of NSDI.

The main objectives of the IDI are to measure:

- The *level and evolution over time* of ICT developments within countries and the experience of those countries relative to others;
- Progress in ICT development;
- The *digital divide*, i.e. differences between countries in terms of their levels of ICT development; and
- The *development potential* of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

### 3.5.3. Internet Penetration

Internet penetration refers to the portion of the population that has access to the Internet. As the Internet is the highway for data dissemination, it is a key indicator of the access network component of NSDI.

### 3.5.4. Availability of Geoportal

A Geoportal is a type of web portal used to find and access geospatial information (GI) via the Internet. Geoportals are important for effective use of GI and a key element of NSDI. GI providers, including government agencies and private sources, NGOs, and Academia use Geoportals to publish descriptions (metadata) of their GI, and Consumers of GI, professional or casual, use Geoportals to search and access the information they need.

Thus, the availability of Geoportals plays an increasingly important role in the sharing of geographic information and can avoid duplicated efforts, inconsistencies, delays, confusion, and wasted resources. This makes the availability of Geoportals an important key indicator of NSDI.

## 3.6. Component 6: People

‘People’ or ‘human capital’ component is specifically valid for African countries. It is the main and central component among the five NSDI components for developing countries, particularly for African countries, as the capacity for geospatial data production and utilization in African countries is still at its rudimentary stage.

This component includes geospatial data producers and users, and any value-adding agents in between, who must interact to drive the development and implementation of NSDI. This implies that priority should be given to develop and strengthen the knowledge and skills that organizations and citizens require to produce, maintain, utilize, and share geospatial information for strategic and day-to-day evidence based decision-making.

The key indicators of this component are the following:

### 3.6.1. GI/NSDI Awareness

Lack of awareness about the role of Geospatial Information (GI) in sustainable

development by government officials, non-governmental organizations as well as the private sector and the citizens in general means, that the use of GI systems will be limited or non-existent. To raise awareness in GI and NSDI, it is necessary to demonstrate the benefits, obtain support and promote investment for implementation of the NSDI within the producer and user communities.

Hence, the level of GI/NSDI awareness among High-level Policy decision makers, other government officials, non-government organisations, the Private sector, and Citizens is a key indicator of the ‘people’ component of NSDI.

### **3.6.2. Status of GI Knowledge and Skills**

Design and management of an appropriate NSDI is crucial to ultimate integration of geospatial information into the organization. The development process must incorporate the organizational aspects of NSDI initiation, development, and operationalization. Successful handling of all the components of the NSDI development process requires skill and knowledge.

Hence, the assessment of NSDI implementation requires the understanding of the skills and expertise required and the level present in the country, as well as how much outside assistance must be obtained.

### **3.6.3. Capacity and Capability Development**

NSDI implementation in developing countries, mainly in African countries, is often dependent on a small number of critical staff that have the necessary technical and managerial skills in the production, analysis, and management of geospatial information. For this reason, NSDI development and implementation in these countries is seriously hampered.

Hence, the availability and access to Capacity Building institutions that provide Degree level courses and/or Diploma/certificate level courses to overcome the shortage of skilled and knowledgeable GI/NSDI professionals is considered to be a key indicator of the NSDI ‘people’ component.

### **3.6.4. Partnerships**

All the components of NSDI depend on a partnership or the cooperation between the people that are involved in the process of NSDI development and implementation in a country. Such relationships help to build an NSDI that facilitates the ability of sharing GI, and developing and maintaining standard datasets in a spatial data community.

Therefore, partnerships are considered as key indicators of the ‘People’ component of NSDI.

## **3.7. Summary of the Identified Components and their Corresponding Key Indicators**

A summary of the components and their corresponding indicators are indicated in Table 2 below. Weights have also been assigned to each of the components as indicated in the table. All the indicators have been assigned equal weights of 5% each.

<b>NSDI Component</b>	<b>Assigned Component Weight (%)</b>	<b>Indicators</b>
<b>1. Strategic Plan</b>	15	7. Shared Vision
		8. Well articulated Mission statement
		9. SMART Objectives
<b>2. Policy and Legal Frameworks</b>	20	10. NSDI Proclamation/Directive
		11. Lead Organization
		12. Data Policy
		13. Funding
<b>3. Data</b>	15	14. Defined List of FDS
		15. Availability of Digital FDS
		16. Metadata Creation
<b>4. Standards</b>	10	17. Data Content Standards
		18. Metadata Standards
<b>5. Access Network</b>	20	19. Access to Electricity
		20. ICT Development Index
		21. Internet Penetration
		22. Geoportal/Clearing House
<b>6. People</b>	20	23. GI/NSDI Awareness
		24. Knowledge and Skills
		25. Capacity & Capability
		26. Partnerships

**Table 1: Identified NSDI Components and their respective Key Indicators**



## **4. Assessment Data**

In order to be able to make a sound comparative assessment in any area of study, it is essential to have a reliable, timely and comparable data. Accordingly, the review of the status of National Spatial Data Infrastructure (NSDI) implementation in African countries requires adequate, timely and comparable data that can be used to evaluate the status of NSDI in each of the 54 African countries.

It is to fulfill this requirement that a questionnaire that is deemed to enable a factual assessment of the status of (NSDI) implementation in African countries was developed. The questionnaire is based on identified key indicators that can be used to assess countries readiness in developing and implementing NSDI. Much effort was made to ensure that the questionnaire covers all aspects to enable the objective assessment of National Spatial Data Infrastructure (NSDI) development and implementation in African countries.

### **4.1. The Questionnaire**

The questionnaire consists of six parts covering each of the six components of NSDI identified for this study, as briefly discussed here below:

#### **4.1.1. Component 1: Strategic Planning**

In order to be able to measure the level of maturity of the Strategic Planning component and its identified three (3) indicators, i.e., Vision, Mission, and SMART Objectives, a total of five (5) questions have been developed.

#### **4.1.2. Component 2: Policy and Legal Frameworks**

A total of ten (10) questions were developed to measure the level of maturity of the Policy and Legal Frameworks component and its identified four (4) indicators, viz., NSDI Directive, Lead Organization, Data Policy and Funding.

#### **4.1.3. Component 3: Fundamental Data**

A total of thirteen (13) questions were developed to enable the assessment of the level of maturity of the Fundamental Data Sets (FDS) components and its identified three (3) indicators, namely, List of FDS, Availability of Digital FDS, and Metadata creation.

#### **4.1.4. Component 4: Standards**

To facilitate the assessment of the level of maturity of the Standards component and its two (2) indicators, namely, Data Content Standards and Metadata Standards, a total of four (4) questions have been developed.

#### **4.1.5. Component 5: Access Network**

Five (5) questions have been developed to assess the level of maturity of the Access Network component and its four (4) components, i.e., Access to Electricity, ICT Development Index, Internet Penetration and Availability of Geoportal.

#### **4.1.6. Component 6: People**

Six (6) questions have been developed to assess the level of maturity of the People component and its four (4) components, i.e., GI/NSDI Awareness, Knowledge & Skills, Capacity & Capability, and Partnerships.

In summary, a total of 41 questions were posed in such a way that is believed to enable a comprehensive assessment of the level of maturity of each of the six (6) identified NSDI components and the twenty (20) identified indicators. (Questionnaire is attached as Annex I to this report).

## 4.2. Response to the Questionnaire

The questionnaire was sent out to the GI/NSDI focal organizations of all the 54 Member States of ECA. However, only 16 countries (~30%) responded by completing and returning the questionnaire. The countries that responded and their respective Sub-Regions are indicated in Table 2 below.

<b>ECA Sub-Region</b>	<b>Country</b>
<b>Northern Africa</b>	-
<b>Western Africa</b>	1. Burkina Faso
	2. Ghana
	3. Niger
	4. Senegal
	5. Togo
<b>Central Africa</b>	6. Cameroon
<b>Eastern Africa</b>	7. Comoros
	8. Ethiopia
	9. Madagascar
	10. South Sudan
	11. Uganda
<b>Southern Africa</b>	12. Lesotho
	13. Malawi
	14. Mozambique
	15. Namibia
	16. South Africa

**Table 2: List of Countries that Responded to the Questionnaire**

As can be seen from the table above, no response was received from the Northern Africa Region. Otherwise, response was received from all the remaining four ECA Sub-Regions of Africa.

The responses to the questionnaire have been compiled to enable the review of current status of the development and implementation of NSDI and to identify existing national strategies aligned with NSDI in the countries that responded to the questionnaire.

(The responses received from the 16 countries are incorporated as Part II of this report.)

## 5. Assessment Methodology

The assessment methodology adopted for this study is based on the Capability Maturity Model (CMM) adapted by Lamprou et al (2018) to assess the geomaturity of a country's NSDI, as depicted in Figure 2 below.

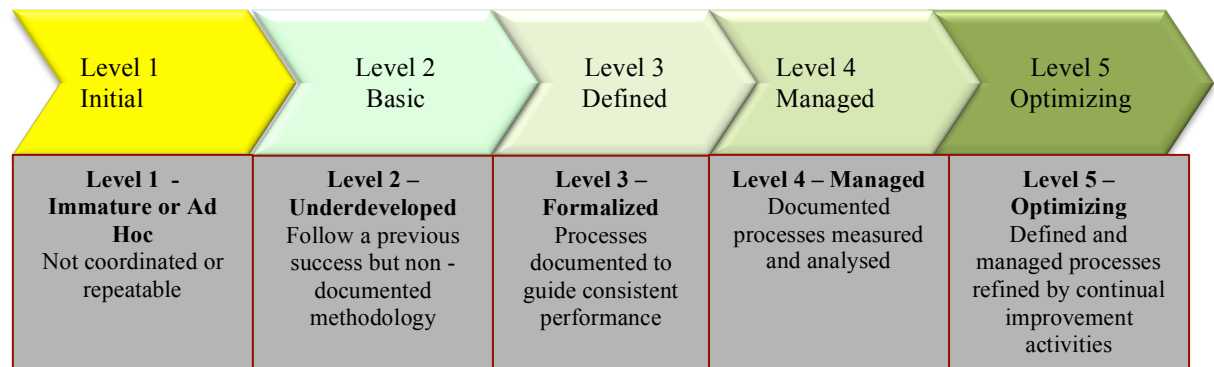


Figure 2: Assessment Methodology (Adopted from Lamprou et al, 2018)

CMM is a maturity assessment framework originally developed for evaluating and improving software development process by the Carnegie Mellon University's (CMU) Software Engineering Institute (SEI). The goal of CMM is to develop a methodical framework for creating quality software that allows measurable and repeatable results (Conrad and et al, 2017).

The five levels of CMM are:

- (1) Initial,
- (2) Repeatable,
- (3) Defined,
- (4) Managed, and
- (5) Optimizing.

These five levels of CMM as adopted for assessing the status of NSDI implementation in African countries are described as follows:

1. *Initial/Immature*: The status of the development of all the components of NSDI in the country is characterized as ad hoc and immature. Some NSDI components are defined, however, GI/NSDI awareness at national level is generally characterized as low.
2. *Underdeveloped/Basic*: Some foundational components of NSDI, such as fundamental data sets and standards are at a basic stage of development in the country. There is some semblance of national capacity and capability for data creation and management, including data sharing, mainly under the auspices of the National Mapping/National Geospatial Information Agency (NMA/NGIA) of the country.
3. *Defined*: NSDI components are at an advanced stage of development. There is a recognized NSDI lead organization that leads the effort to establish NSDI in the country. Stakeholders are communicated and awareness creation about the benefits of implementing NSDI is well articulated.
4. *Managed*: Policy and legal frameworks for the establishment of NSDI (act of Parliament, Council of Ministers' Regulation, or similar) are formally adopted

in the country. A Strategic Plan for the implementation of NSDI is developed and there is a legally mandated organization for the implementation and management of NSDI in the country.

5. *Optimizing*: There is an ongoing national effort to continually improve all the components of NSDI in the country. The effort is adequately funded to ensure the sustainability and optimized usage of NSDI in the country.

## 6. Result of the Assessment

The Capability Maturity Model (CMM) has been used to assess the status of NSDI development and implementation in the sixteen (16) African countries that responded to the questionnaire. Based on CMM, each one of the six components' 20 indicators have been evaluated and assigned values on a scale of 1 – 5 as defined in the CMM and depicted in Figure - below.

Level 1	Level 2	Level 3	Level 4	Level 5
Immature	Basic	Defined	Managed	Optimizing

**Figure 3: The CMM Measurement Scale**

Following the valuation of the indicators, the results have been compiled to assess the maturity level of the high-level components by taking the average of the value of the respective indicators. The weighted average of the maturity level of each of the six components were in turn computed to enable the measurement of the status of NSDI implementation in the respective country.

Despite the relatively qualitative nature of the indicators, an effort has been made to evaluate the status of each indicator objectively based on the data provided in the response to the questionnaire.

The result of the assessment of the six components is summarized here below.

### 6.1. Component 1: Strategic Planning

Out of the 16 countries that responded to the questionnaire, six (6) countries, i.e., Ethiopia, Ghana, Malawi, Namibia, Senegal and Togo, have responded as having a Strategic Plan.

It can be learnt from the responses that Ethiopia, Ghana, Malawi, Namibia and Senegal have developed a comprehensive Strategic Plan. However, even though Togo have responded as having a Strategic Plan, they have not indicated if the Strategic Plan articulated the vision, mission and objectives of the NSDI. On the other hand, South Africa have indicated that they have conducted an external environment - Political, Economic, Social, Technological, Legal and Environmental (PESTLE) analysis, even though they have not fully developed the Strategic Plan. Burkina Faso have indicated that they have a draft Strategic Plan that has not yet been endorsed.

In all the remaining nine (8) countries Strategic Planning does not exist or could be considered immature.

The assessment result of the Strategic Planning component is summarized in the Table 3 below.

Table 3: Summarized Assessment Result of the Strategic Planning Component

UNECA Sub-Region	Country	Assessment Result of Strategic Planning Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	1. Burkina Faso					
	2. Ghana					
	3. Niger					
	4. Senegal					
	5. Togo					
Central Africa	6. Cameroon					
Eastern Africa	7. Comoros					
	8. Ethiopia					
	9. Madagascar					
	10. South Sudan					
	11. Uganda					
Southern Africa	12. Lesotho					
	13. Malawi					
	14. Mozambique					
	15. Namibia					
	16. South Africa					

## 6.2. Policy and Legal Frameworks

Out of the sixteen (16) countries that responded to the questionnaire, five (5) countries indicated in Table 4 below have enacted NSDI Policy/Directives.

Country	Type of Policy Instrument				
	Act of Parliament	Council of Ministers' Regulation	Presidential Decree	Ministerial Decree	Policy Directives
Malawi	Yes	-	-	-	-
Namibia	Yes	-	-	-	-
Senegal	-	-	Yes	-	-
South Africa	Yes	Yes	Yes	-	Yes
Togo	-	-	-	Yes	-

Table 4: Respondent countries with NSDI Policy/Legal Instruments

As can be learnt from the table above, among the 5 countries, South Africa has a comprehensive set of Policies and Legal Frameworks (Act of Parliament, Council of Ministers' Regulation, Presidential Directive and Policies).

The remaining eleven (11) countries do not have formally adopted NSDI Policy, however, out of these 11 countries, seven countries have formal NSDI lead organizations that have drafted or are in the process of drafting NSDI Policy.

The assessment result of the Policy and Legal Framework component is summarized in Table 5 below.

**Table 5: Summarized Assessment Result of the Policy and Legal Framework Component**

UNECA Sub-Region	Country	Assessment Result of Policy & Legal Framework Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	1. Burkina Faso					
	2. Ghana					
	3. Niger					
	4. Senegal					
	5. Togo					
Central Africa	6. Cameroon					
Eastern Africa	7. Comoros					
	8. Ethiopia					
	9. Madagascar					
	10. South Sudan					
	11. Uganda					
Southern Africa	12. Lesotho					
	13. Malawi					
	14. Mozambique					
	15. Namibia					
	16. South Africa					

### 6.3. Component 3: Fundamental Data Sets

With regards to Fundamental Data Sets (FDS), eleven (11) out of the 16 countries that responded confirmed that they have an official/authoritative list of FDS, while five (5), i.e., Comoros, Madagascar, Mozambique, Niger, and Uganda, do not yet have an approved list of FDS.

All the 16 countries have indicated that they have some digital FDS, even though in most cases the data is out dated. Four countries, i.e., Malawi, Namibia, Senegal, and South Africa except for South Africa a more comprehensive set of FDS with accompanying Metadata.

Summary of the assessment of the FDS Component is indicated in Table 6 below.

UNECA Sub-Region	Country	Assessment result of Fundamental Data Sets Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	17. Burkina Faso					
	18. Ghana					
	19. Niger					
	20. Senegal					
	21. Togo					
Central Africa	22. Cameroon					
Eastern Africa	23. Comoros					
	24. Ethiopia					
	25. Madagascar					
	26. South Sudan					
	27. Uganda					
Southern Africa	28. Lesotho					
	29. Malawi					
	30. Mozambique					
	31. Namibia					
	32. South Africa					

Table 6: Summary of the Assessment Result of the FDS Component

#### 6.4. Component 4: Standards

Ten (10) countries out of the 16 countries that responded to the have affirmed that they have a National GI Standards/Regulatory body. The remaining six (6) countries, i.e., Comoros, Lesotho, Madagascar, Mozambique, Niger, and Senegal, do not have indicated that the lack National GI Regulatory/Standards bodies.

All the countries that responded, except Comoros, Madagascar, Mozambique, and Niger have indicated that they use standards mainly adopted from ISO and OGC.

Summarized assessment result of the Standards Component is shown in Table 7 below.



**Table 7: Summarized Assessment Result of the Standards Component**

UNECA Sub-Region	Country	Assessment Result of Standards Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	33. Burkina Faso					
	34. Ghana					
	35. Niger					
	36. Senegal					
	37. Togo					
Central Africa	38. Cameroon					
Eastern Africa	39. Comoros					
	40. Ethiopia					
	41. Madagascar					
	42. South Sudan					
	43. Uganda					
Southern Africa	44. Lesotho					
	45. Malawi					
	46. Mozambique					
	47. Namibia					
	48. South Africa					

### 6.5. Component 5: Access Network

Access Network is a challenge in most African countries, as Access to Electricity, ICT Development Index (IDI) and Internet Penetration in African countries is far behind the world average exacerbating the Geospatial-Digital-Divide.

The highest ranked country among the 16 countries that responded to the questionnaire is South Africa with Access to Electricity rate of 84.4% (World Average 88.9%), IDI of 4.96 (World Average 5.11) and Internet Penetration rate of 56.2% (World Average 57.3%). The other 15 countries have much lower values for these indicators.

With regards to the availability of Geoportal, only seven (7) of the 16 countries, i.e., Burkina Faso, Ethiopia, Ghana, Malawi, Namibia, Senegal, and South Africa have affirmed as having established Geoportals.

The summary of the assessment of the Access Network component is indicated in Table 8 below.

**Table 8: Assessment Result of the Access Network Component**

UNECA Sub-Region	Country	Assessment Result of Access Network Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	49. Burkina Faso					
	50. Ghana					
	51. Niger					
	52. Senegal					
	53. Togo					
Central Africa	54. Cameroon					
Eastern Africa	55. Comoros					
	56. Ethiopia					
	57. Madagascar					
	58. South Sudan					
	59. Uganda					
Southern Africa	60. Lesotho					
	61. Malawi					
	62. Mozambique					
	63. Namibia					
	64. South Africa					

## 6.6. Component 6: People

The response to the questions on the People Component of NSDI with its four Indicators, i.e., GI/NSDI Awareness, Knowledge & Skills, Capacity & Capability, and Partnerships have been interpreted as challenges in all the 16 countries that responded. In most of the countries, the awareness levels are low, with low levels of in-country knowledge and skills and capacity and capability.

The summarized assessment result of this component is shown in Table 9.

**Table 9: Assessment Result of the People Component**

UNECA Sub-Region	Country	Assessment Result of People Component				
		Level 1	Level 2	Level 3	Level 4	Level 5
Northern Africa	-					
Western Africa	65. Burkina Faso					
	66. Ghana					
	67. Niger					
	68. Senegal					
	69. Togo					
Central Africa	70. Cameroon					
Eastern Africa	71. Comoros					
	72. Ethiopia					
	73. Madagascar					
	74. South Sudan					
	75. Uganda					
Southern Africa	76. Lesotho					
	77. Malawi					
	78. Mozambique					
	79. Namibia					
	80. South Africa					

### 6.7. Summary of the Assessment Results

The results of the assessments of the components and their respective indicators have been compiled and presented in Table 10 below.

As can be learnt from the table, only four (4) out of the 16 countries that responded to the questionnaire (25%) have scored a weighted average of more than 50%. The highest score is that of South Africa that scored 64%. The remaining three countries that scored above are 50% Malawi (52%), Namibia (56%), and Senegal (52%).

**Table 10: Summary of the Assessment of NSDI Implementation**

UNECA Sub-Region	Country	Key NSDI Components Summarized Assessment Weighted Scores						
		Strategic Plan (15%)	Policy & Legal (20%)	Data (15%)	Standards (10%)	Access Network (20%)	People (20%)	Total (100%)
<b>Northern Africa</b>	-							
<b>Western Africa</b>	<b>1. Burkina Faso</b>	3	4	6	4	8	8	<b>33</b>
	<b>2. Ghana</b>	9	4	6	4	8	8	<b>39</b>
	<b>3. Niger</b>	3	4	3	2	4	4	<b>20</b>
	<b>4. Senegal</b>	9	12	9	2	12	8	<b>52</b>
	<b>5. Togo</b>	6	8	8	4	4	4	<b>34</b>
<b>Central Africa</b>	<b>6. Cameroon</b>	3	4	6	4	4	4	<b>25</b>
<b>Eastern Africa</b>	<b>7. Comoros</b>	3	4	3	2	4	4	<b>20</b>
	<b>8. Ethiopia</b>	9	4	6	4	8	4	<b>35</b>
	<b>9. Madagascar</b>	3	4	3	2	4	4	<b>20</b>
	<b>10. South Sudan</b>	3	4	3	2	4	4	<b>20</b>
	<b>11. Uganda</b>	3	4	4	4	4	4	<b>23</b>
<b>Southern Africa</b>	<b>12. Lesotho</b>	3	4	3	2	4	4	<b>20</b>
	<b>13. Malawi</b>	9	12	9	6	8	8	<b>52</b>
	<b>14. Mozambique</b>	3	4	3	2	4	4	<b>20</b>
	<b>15. Namibia</b>	9	12	9	6	12	8	<b>56</b>
	<b>16. South Africa</b>	6	16	12	6	12	12	<b>64</b>
<b>Average – 16 Countries</b>		<b>5.25</b>	<b>6.5</b>	<b>5.81</b>	<b>3.5</b>	<b>6.5</b>	<b>5.75</b>	<b>33.31</b>

## 7. Conclusion

The result of the assessment based on the Capability Maturity Model (CMM) of the six identified components of NSDI using primary data obtained from sixteen (16) ECA Member States in response to a questionnaire has indicated that NSDI implementation in African countries

The failure in the implementation of NSDI in African countries to date has been simplistically attributed mainly to the lack of capacity and capability in the developing countries in general, and African countries in particular. But the assessment result based on the Capability maturity Model (CMM) analysis indicates that the problem is much more complex and multi-faceted. Based on this assessment model, these multi-faceted problems emanate from the methodology employed in implementing NSDI in most African countries that has been copied from the developed countries of North America (USA and Canada), Europe, and Australia.

It is well-known that in the developed countries where NSDI was first initiated, the necessary conditions for NSDI implementation, i.e., the six components of NSDI used for this assessment, are sufficiently developed, and there is sufficient awareness at all levels of government and the private sector about the importance of Geospatial Information (GI) in sustainable development. Hence, the methodology adopted in implementing NSDI in countries with developed economies mainly focused on a process-based approach, as all the components of NSDI that support the NSDI implementation process, were not hindrances in such developed countries.

However, in the case of developing countries, particularly in Africa, all the six NSDI components are poorly developed. This is further exacerbated by the glaring lack of awareness particularly at the top policy decision-making levels of government about the important role GI plays in sustainable development.

Regarding the NSDI components, further to the lack of relevant strategic plan, African countries also lack policy and legal frameworks, human capital; and timely, accurate, and standard compliant authoritative digital base/fundamental data that enable NSDI implementation. This is further exacerbated by the lack of adequate access network.

**Annex I: Questionnaire developed for the  
assessment of the status of NSDI implementation  
in African countries**



United Nations Economic Commission for Africa (ECA)

## Questionnaire for the Assessment of NSDI Implementation in African Countries

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This questionnaire aims to assess the status of National Spatial Data Infrastructure (NSDI) implementation in African countries. The questionnaire is based on identified key indicators that can be used to assess countries readiness in developing and implementing NSDI.

The responses to this questionnaire will be compiled to identify existing national strategies aligned with NSDI, and to conduct a review of the current status of NSDI in the countries. The results will be used to develop a summary report on the assessment results.

The questionnaire is developed by the consultant employed by UNECA with an overall objective of preparing a guideline document on implementation of NSDI in African countries.

The guideline document will further discuss and assess, the challenges and achievements of NSDI implementation in African countries and experiences and best practices in other parts of the world.

The questionnaire is divided into six components: **Strategic Planning, Policy and Legal Frameworks, Data, Standards, Access Network, and People**. The questions are posed in order to gain a comprehensive picture of the status of National Spatial data Infrastructure (NSDI) in your country. Please note that the information provided will be treated in confidence and only aggregated results will be made public.

UNECA is kindly requesting you to complete the questionnaire carefully, to the best of your knowledge, and to return it by August 16, 2019 to: Andre Nonguierma ([nonguierma@un.org](mailto:nonguierma@un.org)) or Aster Denekew ([denekewa@un.org](mailto:denekewa@un.org)) with copy to Sultan Mohammed ([sultan.mohammeda@yahoo.com](mailto:sultan.mohammeda@yahoo.com))

We thank you in advance for your cooperation and assistance in fulfilling this important task on behalf of UNECA.

### Details of Respondent

Name: \_\_\_\_\_

Position Title: \_\_\_\_\_

Name of Organisation: \_\_\_\_\_

Country: \_\_\_\_\_

Email: \_\_\_\_\_

Telephone number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

## 1. Component 1: Strategic Plan

1.1. Does your country have a Strategic Plan for the development and implementation of National Spatial Data Infrastructure (NSDI)?

Yes

No

If 'Yes' to Question 1.1,

1.2. Please indicate which of the following topics are addressed in the NSDI Strategic Plan:

Environmental (External and Internal) Analysis

SWOT Analysis

Vision

Mission

Goals

Objectives

Others; please specify:

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1.3. Which of the following have been considered as government priorities in the preparation of the NSDI Strategic Plan for your country?

Land Administration

Climate Change/Environmental Protection

Population and Housing census

Medium/Long Term National Development Plan

AU Agenda 2063: The Africa We Want

UN Sustainable Development Goals (SDGs)

Others; please specify:

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1.4. Which of the following have been identified as Strategic Issues (challenges) in NSDI implementation in your country.

Lack of NSDI Directive/Policy regarding Data creation, Data sharing, Data security, copyright, IPR, etc.)

Unavailability of updated Fundamental Digital Data Sets

Lack of Standards

Inadequate Access Network (ICT Infrastructure, Geoportal, Clearing House, etc.)

Lack of skilled manpower

Lack of GI/NSDI Awareness



- Lack of Funding
- Others; please specify:

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1.5. If ‘No’ to Question 1.1, do you plan to prepare a NSDI Strategic Plan and when?

- Yes**
  - in the next 12 months
  - in the next 2 to 3 years
- No,** (Please provide reasons for not having a plan to prepare a NSDI Strategic Plan.)

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## 2. Component 2: Policy and Legal Frameworks

2.1. Does your country have a National Spatial Data Infrastructure (NSDI) Policy/Directive?

Yes

No

2.2. If 'Yes' to Question 2.1, please select which instrument(s) is/are used and indicate year of enactment:

Type	Year of Enactment
<input type="checkbox"/> Act of Parliament	
<input type="checkbox"/> Council of Ministers' Regulation	
<input type="checkbox"/> Executive Order/Directive by Head of State (President/Prime Minister)	
<input type="checkbox"/> Ministerial Executive Order/Directive	
<input type="checkbox"/> Other; please specify: _____	

2.3. Which of the following Policy issues related to Geospatial Data are addressed in the NSDI Policy/Directive?

- Spatial Data Creation
- Spatial Data Sharing
- Spatial Data Security
- Spatial Data Ownership/Custodianship
- Copy Right
- Intellectual Property Rights (IPR)
- Spatial Data Pricing
- Others; please specify:

\_\_\_\_\_

2.4. How are the NSDI Policies linked/related to other GI related National Policies; such as: e-Government, National Information and Communication Infrastructure (NICI), National Strategy for the Development of Statistics (NSDS)?

- Coordination mechanism
- Standardisation
- Interoperability
- Common Geographies
- Data sharing
- Other; please specify: \_\_\_\_\_

2.5. What is the status of the NSDI Policy implementation?

- Fully implemented (Since - year \_\_\_\_\_)
- Partially implemented
- Not implemented

2.6. If the Policy is only partially implemented, or not implemented, what are the main reasons?

- Lack of Capacity (Knowledge and Skills)
- Lack of Funding
- Others; please specify:

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2.7. Does your country have a legally mandated NSDI Lead Organisation (Coordinator)?

- Yes**
- No**

2.8. If **‘Yes’** to Question 2.7 above, which organisation is assigned with this responsibility?

- National Mapping (Geospatial Information) Agency or equivalent
- National Space/Remote Sensing Agency or equivalent
- National Statistics Agency or equivalent
- National Cadastre Agency or equivalent
- Other; please specify: \_\_\_\_\_

2.9. How are your NSDI activities funded?

- Budget allocated by National Government
- Foreign Government/Donor
- NGO
- Private Sector
- Other; please specify: \_\_\_\_\_

2.10. If **‘No’** to question 2.1: Was there any effort in the past to enact NSDI Policy in your country?

**Yes** (How?):

.....  
.....  
.....

**No** (Why?):

.....  
.....  
.....

### 3. Component 3: Fundamental Data Sets

3.1. Does your country have an officially declared list of Fundamental Geospatial Data Sets (FGDS)?

**Yes**

**No**

3.2. If 'Yes' to Question 3.1 above, which of the following does the FGDS list include?

Geodetic Control Network

Elevation/Depth (DSM/DTM)

Topography (National Base Map)

Ortho-imagery (Aerial photographs and/or Satellite images)

Geographic Names

Addresses

Administrative Boundaries (Functional Areas)

Buildings/Settlements

Transport Networks

Land Parcels (Cadastré)

Population Distribution

Land Cover/Land Use

Geology/Soils

Water Bodies

Others; please specify: \_\_\_\_\_

3.3. Based on the official list of FGDS, please identify the authorized FGDS that are available in your country?

<b>Data Description</b>	<b>Format (Digital/Analogue)</b>	<b>Scale/Resolution</b>	<b>Metadata Available (Yes/No)</b>	<b>Coverage (% of country)</b>
<input type="checkbox"/> Geodetic Control Network				
<input type="checkbox"/> Elevation/Depth (DSM/DTM)				
<input type="checkbox"/> Topography (National Base Map)				
<input type="checkbox"/> Ortho-imagery				
<input type="checkbox"/> Geographic Names				
<input type="checkbox"/> Addresses				
<input type="checkbox"/> Administrative Boundaries (Functional Areas)				
<input type="checkbox"/> Buildings/Settlements				
<input type="checkbox"/> Transport Networks				
<input type="checkbox"/> Land Parcels (Cadastral)				
<input type="checkbox"/> Population Distribution				
<input type="checkbox"/> Land Cover/Land Use				
<input type="checkbox"/> Geology/Soils				
<input type="checkbox"/> Water Bodies				

3.4. What is the average age of the FGDS available?

- Less than 5 years  
 5 – 10 years

10 – 15 years

>15 years

3.5. Which types of the following Software are used for the production, maintenance, and dissemination of FGDS in your country?

Proprietary; please specify: \_\_\_\_\_

Open Source; please specify: \_\_\_\_\_

A combination of Proprietary and Open Source

Other: please specify: \_\_\_\_\_

3.6. If ‘No’ to Question 3.1 above, does your country plan to prepare an official list of Fundamental Geospatial Data Sets, and when?

**Yes**

in the next 12 months

in the next 2 to 3 years

**No**, (Please provide reasons for not having a plan to prepare an official list of Fundamental Geospatial Data Sets.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3.7. Do you have Continuous Operating Reference Stations (CORS) in your country?

**Yes**

**No**

If ‘Yes’,

3.8. Please provide the number of CORS in your country: \_\_\_\_\_

3.9. How many of the CORS are recognised International GNSS Service (IGS) sites? \_\_\_\_\_

3.10. How many of the CORS in your country have been established by your National Geodetic Agency/National Mapping Agency for the purpose of defining and maintaining national geodetic reference frames?

\_\_\_\_\_

3.11. Which of the following communications systems are used for data transmission between a CORS site and a network control centre?

- ADSL (Asymmetric Digital Subscriber Line);
- Mobile phone network;
- WAN (Wide Area Network) between sites;
- Very Small Aperture Terminal (VSAT) satellite link
- Other; please specify: \_\_\_\_\_

3.12. Who provided the funds for the CORS establishment in your country?

- National government budget;
- Foreign government assistance (Bilateral Development Partner); please specify: \_\_\_\_\_
- Multilateral Development assistance; please specify:  
\_\_\_\_\_
- Non-governmental organisation (NGO) assistance; please specify:  
\_\_\_\_\_
- Other; please specify: \_\_\_\_\_

3.13. If 'No' to Question 3.7 above, does your country plan to establish CORS, and when?

- Yes**
  - in the next 12 months
  - in the next 2 to 3 years
- No,** (Please provide reasons for not having a plan to prepare an official list of Fundamental Geospatial Data Sets.)  
\_\_\_\_\_



#### 4. Component 4: Standards

- 4.1. Does your country have a national standards body that oversees the creation and/or adoption of geospatial (data and metadata) standards?
- Yes
- No
- 4.2. If 'Yes' to Question 4.1 above, which one of the following is the responsible standards body?
- National Standards Authority
- National Mapping/Geospatial Information Agency
- National Space/Remote Sensing Agency
- National ICT Agency
- Other, please specify: \_\_\_\_\_
- 4.3. Which of the following standards are actively used for the acquisition, maintenance and dissemination of Fundamental Geospatial Data Sets (FGDS) in your country?
- Standards developed by the International Organization for Standardization (ISO)
- Standards developed by the Open Geospatial Consortium (OGC)
- Standards developed by the International Hydrographic Organization (IHO)
- Standards adopted from donor countries: please specify: \_\_\_\_\_
- Standards adopted from NGOs: please specify: \_\_\_\_\_
- Standards adopted from Software suppliers: please specify: \_\_\_\_\_
- Nationally developed Standards
- 4.4. Which Geodetic Reference System is in use in your country?
- Local Datum
- WGS 84
- ITRF
- Other; please specify: \_\_\_\_\_

## 5. Component 5: Access Network

5.1. Does the NSDI Lead organisation in your country have Geospatial portal services?

**Yes**

**No**

If 'Yes' to Question 5.1,

5.2. How was your country's Geospatial portal developed?

Using in-house capacity/resources

With the support of external development partners; please specify:

\_\_\_\_\_

5.3. Which of the following software type has been used to develop your country's Geoportal?

Proprietary; please specify: \_\_\_\_\_

Open source; please specify: \_\_\_\_\_

Other; please specify: \_\_\_\_\_

5.4. Which of the following Geospatial portal services are provided?

Data upload

Data download

Search and discovery

Query

View

Metadata

5.5. Does your country's ICT infrastructure (Hardware, Software, Telecommunication infrastructure, etc.) satisfy your country's NSDI operational requirements?

**Yes**

**No**

## 6. Component 6: People

- 6.1. How do you rate the available numbers (quantity) of the following categories of Geospatial Information (GI) professionals adequate to develop and implement NSDI in your country?

Category	Number of available man-power		
	High	Medium	Low
<b>Managers</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Technical Experts (University Degree Level)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Technicians (Diploma/Certificate Level)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 6.2. How do you rate the knowledge and skills (quality) of the available GI professionals in your country?

Category	Level of Knowledge and Skills		
	High	Medium	Low
<b>Managers</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Technical Experts (University Degree Level)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Technicians (Diploma/ Certificate Level)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- 6.3. What are the national GI capacity building mechanisms in your country?

- In-house Training by the National Mapping/Geospatial Information Agency; NSDI Secretariat
  - In-country Institutes of Higher Learning (Universities)
  - In-country Technical and/or Vocational Training Schools
  - External/Foreign Institutes of Higher Learning (Universities)
  - In-country Technical Workshops
  - External/Foreign Technical Workshops
  - Others; please specify:
- 
- 

6.4. How are the GI capacity building efforts in your country funded?

- National Government Budget
- Donors (Bilateral and/or Multilateral); Examples: \_\_\_\_\_
- NGO; Examples: \_\_\_\_\_
- Private; Examples: \_\_\_\_\_
- Others; Examples: \_\_\_\_\_

6.5. How do you rate the level of GI awareness in your country?

Category	Level of Awareness		
	High	Medium	Low
High level policy decision makers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Government Officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Private Sector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Citizens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.6. The Government in my country does not consider NSDI a priority. Please tick the box that best matches this statement.

- Strongly agree
- Agree
- Disagree
- Strongly disagree
- Not sure

**Additional Comments:**

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*Thank you for completing the questionnaire.*

*United Nations Economic Commission for Africa*