



# AFRICAN GEOSPATIAL DATA - CHALLENGES

**“HIGHER PRODUCTIVITY BY LOWERING COST” – A VERY COMMON AND OFTEN HEARD STATEMENT THROUGHOUT MANY MARKETS, TOUCHING ALL ASPECTS OF BUSINESSES.**

Governments at the local, regional and national levels require current, accurate geographic information to make better decisions in multiple areas. Geospatial data are an underlying, horizontal layer and can help government organizations better manage:

- Border security, primarily at the national government level
- Emergency management, involving prevention planning, civil protection, monitoring and analysis of natural disasters and large public events
- Infrastructure management for water and wastewater systems, transportation systems, city services (garbage, snow, parks), field equipment and some utility systems
- Land information management, including cadastre, forestry, agriculture, natural resources, urban planning, environmental protection and economic development
- Mapping and cartographic production, primarily at the regional and national government level
- Public services (e-government), including businesses and citizens purchasing government information, accessing government information and requesting services

Today, spatial data available in Africa is very fragmented and of varying quality. However, spatial data is key to building a solid infrastructure in the different regions in Africa. Spatial data infrastructures (SDIs) catalogue the datasets that are available, their level of quality and the owning institution. They also help to reduce the effort required for data integration by using industry standards. Europe's establishment of the Infrastructure for Spatial Information in Europe (INSPIRE) initiative has also assisted projects in Africa such as the Census GeoPortal in Nigeria (detailed below).

## Overall SDI Background

According to one of the German SDI initiative Web sites (gdi.initiative.sachen), the components of an SDI include:

- Geospatial data resources as the repository for all spatial-related data
- Networks as the physical and logical infrastructure component
- Geographic information system (GIS) services for communicating the different elements
- Standards ensuring interoperability

Figure 1, taken from an Intergraph SDI white paper, shows the relationship between the different components. From a software technology point of view, services are the heart of the infrastructure.

Geospatial data is an expensive resource, and many organizations do not have access to the appropriate resources needed to fully leverage this data, particularly in the developing world. Many national, regional and international programs and projects are working to improve access to available geospatial data, promote its re-use and ensure that additional investment in geospatial information collection and management results in an ever-growing, readily available pool of information. These initiatives include an emphasis on harmonizing standards for spatial data capture and exchange, the coordination of data collection and maintenance activities and the use of common data sets by different agencies.

assess conditions of the country and judge performance; they can provide the means for accountable and transparent governance. SDI is one piece of the challenge of having a national monitoring mechanism to measure the progress of the promises made by those who govern and to build trust and participation of citizens.

## Challenges in Africa [1]

At the moment, there are a number of factors influencing the development of SDI in Africa. First of all, policies of governments in developing countries are somewhat different from that of their counterparts in the developed world partly due to the differences in political and institutional frame works, and economic constraint.

The big challenge is the sustainability of the SDI, due to the following risk areas:

- reduction of financial resource allocation by the government,
- end of donor support where SDI was initiated as a "project",
- risk of low interest if developed as a sub-component of the National Information and Communications Technology (NICT) program.

Another important challenge inherent to the African context is the capacity of the local populations to make widespread effective use of the SDI facilities, due to the limitation of the NICT coverage, combined with the deficiency of expertise.

## SDI Providers

Intergraph is one of the providers of geospatially powered solutions, and is ready to help customers implementing an SDI by offering:

- a complete suite of geospatial services within an SDI, all based on industry standard interfaces (OGC, ISO),
- an SDI application via COTs products built on our GeoMedia platform,
- deep domain knowledge of government and transportation business workflows to ensure successful SDI implementations.

Intergraph also provides a couple of products that are specifically designed for SDI. GeoMedia SDI Pro goes even further in providing advanced server-side production of OGC/ISO web services. It provides more advanced web services and allows for configuration, customization, security, and monitoring. GeoMedia SDI Portal is a product that will be released early next year that provides a modern, powerful, web browser-based application that can consume the content or results of OGC/ISO web services in a single integrated application. It is fully configurable and customizable with multiple web service connectors to meet the needs of our many customers who need to stand up a thin-client SDI Portal application.

## Geoportal in Nigeria Helps Political and Business Leaders Make Decisions

Nigeria is the most powerful country in West Africa. The presidential democracy, organized as

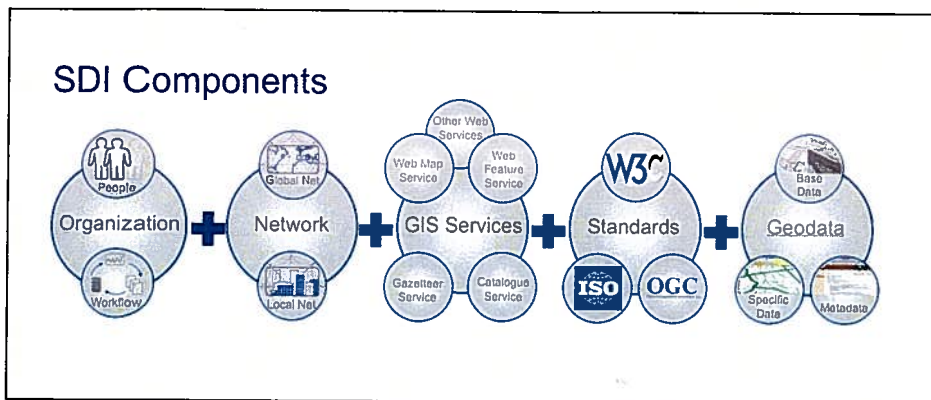


Figure 1. The components of a Spatial Data Infrastructure.

## Why is SDI so important for everybody?

Data is often trapped in departmental silos due to different data structures, formats, and systems. Current organizational boundaries and policies make it difficult to communicate and collaborate on operational workflows involving multiple departments, other government agencies, commercial businesses, and the public. In fact – we often see Data trapped in these departmental silos within different data structures, formats, operating systems, software. Data is passed around through translations currently and some enterprise governments have embraced centralized databases, but there is still too much independent effort which hampers operational efficiency, communication, collaboration, and distribution.

With a SDI implementation, data is no longer trapped in silos. Data is now available to all departments around the enterprise due to the use of common data structures, access standards, and process standards. Access security is available as well. People can easily find, access, and use with appropriate security the required information from other departments, other government agencies, outside commercial businesses to support business workflows efficiently. No physical data exchange will be necessary in order to do spatial analysis throughout multiple levels of data from different entities! No time consuming, technically complex, physical transformation will be done in order to involve other department's geodata for making decisions! Thus, communication, collaboration, and distribution are optimized.

For Europe, the European Commission recognized that the availability of relevant and standardized geospatial information is a vital prerequisite for efficient political action. The commission established the INSPIRE initiative (<http://inspire.jrc.ec.europa.eu>) to coordinate activities and improve utilization of geographic information in Europe.

This initiative provides a legal standard, which took effect in 2007, and regulates the structure of the European spatial data infrastructure with existing data from European Union members. The commission started these measures in 2001 in the European area of environmental responsibility and will extend them step-by-step to other relevant areas.

In Africa, the establishment of national SDIs have been pioneered by a number of organizations and groups, encompassing UN organizations, professional associations and the private sector. For several years, a number of awareness-raising and capacity-building seminars and workshops have been organized regionally and nationally to understand what these infrastructures are, how they are built, how they work and why they are important.

Partnership and communication are at the heart of SDI. As civil servants, local communities, universities, non-governmental organizations (NGOs) and private companies in Africa adopt geographic information system (GIS) technology as a tool, they can collectively increase pressure on government agencies for improved functions, products and services. Information and statistics establish a basis with which to



a federal republic, is the sixth largest crude oil producer worldwide. The complex mix of ethnicities, languages and religions resulting from the roughly 400 ethnic groups present in the country is considered one of its major strengths but at the same time represents a big domestic challenge.

Africa's most populated country relies on census data as a trusted basis for creating national development plans. Aside from traditional items such as age, nationality and occupation, the census also includes questions such as level of education, child mortality, housing situation and hygienic standard.

In 2008, Nigeria began its Census GeoPortal project. The goal was to publish the results of the census based on maps for internal and external parties including citizens, aid agencies, the European Union and United Nations.

Beta Systems Software AG and Intergraph were commissioned with processing and structuring the data gathered through Nigeria's last census. Beta Systems is considered an expert on the West African country and has been active there - especially in the banking sector - for many years, providing various solutions such as scanning and automated check clearing systems. Intergraph is the leading global provider of enterprise engineering and geospatial software.

The European Union funded this project - the largest individual EU project in Africa - through the EuropeAid development aid program. Beta Systems used its FrontCollect document management solution to process more than 50 million census sheets under highly challenging social, structural and geographic conditions. Using technology from

Intergraph, the captured census data was then transferred into a central database, linked to geo coordinates and imported into a comprehensive GIS environment. The central interface for research, visualization and analysis is a geoportal that makes the geo-referenced census data available in an intuitive manner according to the user's access privileges. The open interfaces also allow the census data to be analyzed in a global context, making them highly applicable for activities carried out by the United Nations.

### Conclusion

SDI in Africa is in development, and despite its challenges, there are many opportunities. Africa is following the lead of Europe in adopting initiatives like INSPIRE to facilitate the seamless transfer of spatial data between entities. As the success of flagship SDI projects in Africa like the Census GeoPortal in Nigeria is realized, it is only a matter of time before more African regions and organizations follow suit.

[1] Based on the implementation guide of *SDI in Africa* compiled as a cooperative effort of the Economic Commission for Africa (ECA), the Global Spatial Data Infrastructure Association (GSDI) and EIS-Africa, with the collaboration of the International Institute for Geoinformation Science and Earth Observation (ITC).

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