

SPATIAL DATA INFRASTRUCTURE (SDI) DEVELOPMENT AND STANDARDIZATION ACTIVITIES

BY

DR WILBER K. OTTICHILO

Regional centre for mapping of Resources for Development (RCMRD)

P.O. Box 632-00618 Ruaraka, Nairobi

E-Mail: Ottichilo@rcmrd.org

Website: www.rcmrd.org

INTRODUCTION

The first section of this paper provides brief historical background on the evolution and development of Spatial Data Infrastructure (SDI). This is followed by descriptions of key components of SDI. Lastly the current status of SDI development and standardization activities in the world and Africa is highlighted.

DEVELOPMENT OF SDI CONCEPT

The development of Spatial Data Infrastructure (SDI) concept has been promoted by rapid development in new Information and Communication Technologies (ICTs) which have greatly revolutionized the way data and information is acquired, analyzed, used, stored and disseminated. These technologies include Remote Sensing (RS), Geographic Information System (GIS), Global Positioning System (GPS), Digital Mapping (DM), Digital Photogrammetry (DP), and Internet etc. The importance of geo-information and rapid development in new information and communication technologies has led to the need to develop what has come to be popularly known as Spatial Data Infrastructure (SDI). **SDI can be defined as an “umbrella” of policies, standards and procedures under which organizations and technologies interact to foster more efficient use, management and production of geo-spatial data.** It is an enabling framework for the cooperative and participatory production, management and dissemination of geographic information. It enables planners and decision makers and the general community to find what spatial information products exist, where they exist, how to get access to them and how to use them. Therefore the goal of a spatial data infrastructure is to ensure that users will be able to acquire and use adequate, complete, reliable, and consistent data sets when they need them. It provides an ideal environment in which all stakeholders (both users and producers of spatial information) can cooperate with each other cost-effectively to better achieve their targets.

By the early 1990s, the concept of spatial data infrastructure development was being

proposed in support of accelerating geographic information exchange standards and establishment of nation-wide spatial information networks in the U.S, United Kingdom, Canada and the European community. The signing and publication of the Executive Order concerning the coordination of geographic data acquisition and access in the United States federal Government by President Clinton in 1994 elevated the issue of SDI from technical subject to one being essential for the social and economic development of the country. The development of National SDI in the U.S.A. attracted other countries (Canada, Australia, New Zealand, European Commission etc to embark on their own SDI. The excellent effort of keeping the world up to date with US developments through the Newsletter and publications of the Federal Geographic Data Committee (FGDC) and availability of their national standards documentation further promoted the development of SDI in other countries. The current SDI development initiatives focus at local, national, regional and global levels.

KEY COMPONENTS OF SDI

The key components of an SDI are standards, base and thematic maps, metadata, services (data discovery, access and processing), communication network, information policy and legal/institutional framework.

Standards

Through standardization, one facilitates the use of a wider range of data. The crucial aspects of standardization are geographic referencing, data content, resolution and metadata. In developing standards for geographic data, one should look beyond the immediate information community of which one forms part, to standards in place or in development in other sectors, neighbouring countries or even regions. The development of formal standards through national standards bodies as well as through international standards organisations (e.g. ISO, FGDC, OGC) is achieved through a consultative process, generally requiring the honing of consensus on the nature of the standard under development.

The implementation of new standards may take some time, as there is a cost associated with implementation, and actual changes may need to be made to data or information adhering to “old” standards.

To encourage the adoption and implementation of standards, the process needs to be made as easy as possible. For example, the supply of software, which “forces” adherence to a standard, can accelerate the uptake of a standard. The best example here relates to the widespread adoption of the FGDC’s Content Standard for Digital Geospatial Metadata (see <http://www.fgdc.gov/metadata/metadata.html>, checked 28 October 2003): the main driver for this was the availability of free, easy-to-use capturing tools. Another example is the widespread use of ZIP software for compressing files.

Metadata

Metadata is defined as data about data. Information about a dataset may be necessary in order to

- ♦ locate appropriate data,
- ♦ evaluate whether the dataset meets one's requirements,
- ♦ extract the relevant data and
- ♦ make full use of the data in an application.

The capturing of metadata relating to geospatial datasets is necessary, but not sufficient on its own, to ensure wider knowledge of a dataset, and hence wider usage. This metadata needs to be made available to potential users, together with search facilities, which enable a user to identify the datasets that most closely match their requirements.

Communication Network

Since SDI has concept developed out of the rapid development in ICT, its development and use is dependant on availability of reliable and appropriate communication network-mainly Internet.

Information Policy and Institutional Framework

The development of SDI requires right policies and legislation as well as institutional framework. It is therefore important to formulate an information policy or legislation relating to right to access to information, use of spatial data, copyright, data pricing

Building SDI Capacity and Capability

The development of SDI requires human capacity building as well as ICT infrastructure. Also partnership is an important component of building an SDI since a single agency is unlikely to have all the resources, or even skills and knowledge required to undertake the development of all aspects of SDI.

CURRENT SDI DEVELOPMENT AND STANDARDIZATION ACTIVITIES

The commencement of the implementation of the development of SDI in U.S.A led to the formation of various global, regional and national initiatives to promote the establishment of SDI. Among the initiatives are:

Global Spatial Data Infrastructure (GSDI) Initiative

Global Spatial Data Infrastructure (GSDI) was formed to promote the SDI concept and the first GSDI conference with the theme "The Emerging GSDI" was held in Bonn, Germany, September 1996. Since then the GSDI conferences which are held annually have promoted the SDI concept globally.

The Global Spatial Data Infrastructure (GSDI) community endeavors to develop a global spatial data infrastructure backed by international standards, guidelines and policies to

enhance data management and access, which will in turn support global economic growth, along with its associated social and environmental objectives. The GSDI community is engaged in a myriad of activities all aimed at realizing a truly Global Spatial Data Infrastructure. The GSDI promoted its activities during World Summit on Sustainable Development (WSSD) in Johannesburg, South Africa in 2002. The GSDI is guided by Steering Committee and its secretariat is funded by Federal Geographic Data Committee (FGDC) of the US.

Open GIS Initiative

Open GIS Consortium's (OGC) core mission is to deliver spatial processing interface specifications that are openly available for global use. OGC envisions world in which everyone benefits from geographic information and services made available across any network, application or platform.

Currently Open GIS is involved in the development and provision of Open GIS specification, development of strategic business opportunities and promotion of demand for interoperable products.

Global Mapping Initiative

The Global Mapping Initiative, which aims to produce generalized digital global map, which will be readily available for free through the Internet. The Government of Japan spearheads this initiative. Our Centre participates in this initiative through joint conducting of short training courses and workshops for the African region.

Regional Initiatives

There are a number of regional initiatives that aim at the promotion of the formation of regional geographic information networks. Examples of these initiatives are:

- Euro-Geographical and European Umbrella organization for Geographic Information (**EUROGI**) and Geographic Information Network in Europe (**GINIE**)
- Permanent Committee on GIS Infrastructure for Asia and the Pacific (**PCGIAP**)
- Permanent Committee on SDI for the Americas (**PCIDEA**)

- Committee on Development Information (CODI) for Africa. This is coordinated by UNECA and our Centre is a member of the Committee.

- Geographic Information for Sustainable Development (GISD): An Alliance Promoting Geo-information Cooperation and Capacity building in Africa.

National Initiatives

Various countries world wide have embarked or are in the process of developing own National Spatial Data Infrastructure (NSDI). In Africa the promotion of SDI is being spearheaded UNECA (Committee on Development Information-CODI), USGS (SDI Newsletter for Africa), Global Mapping, GSDI, Regional Economic Groupings and Regional Centres- mainly RCMRD and RECTAS etc.

The promotion of SDI mainly entails creation of awareness among decision makers and planners and introduction of SDI concepts and development process through workshops.

SDI DEVELOPMENT IN AFRICA

The concept of SDI is least promoted and developed in Africa. However, many countries in Africa such as South Africa, Botswana, Zimbabwe, Namibia, Zambia, Uganda, Nigeria, Ethiopia, Lesotho, Swaziland, Egypt, Algeria, Morocco and Tunisia are on their way to developing spatial data infrastructures (SDI) to better manage and utilize their spatial data assets. A number of publications have documented the various aspects of the development of national SDIs in recent years [Onsrud 1998; Bassole 2000; Ezigbalike 2000; 2001]. In several of these countries, initiatives to develop SDIs are already underway notwithstanding the terminology used in different countries to describe them.

The promotion of the establishment of SDI at a continental level is spearheaded by UNECA through the CODI Initiative while at sub-regional level is promoted by political and economic groups like NEPAD, SADC, IGAD, CLISS, COMESA etc. At a national level it is mainly spearheaded by National Mapping Organizations. UNECA under CODI Initiative has developed dynamic and on line **SDI Cook Book for Africa**.

Current progress in national SDI initiatives in Africa shows that after many years of effort these initiatives still do not receive support from the highest level of government because of the low level of awareness of the importance of spatial data and information in decision-making [Ezigbalike 2001]. This means that, despite all the interest and activities, SDI development in Africa and other developing countries remains very much an innovative concept among different user communities. This problem can be observed in specific SDI initiatives in African countries. Some reasons suggested for the limited support from most African national governments and other relevant institutions are:

1. Lack of awareness of the value of SDI
2. Confusion surrounding the definition or composition of SDIs
3. Lack of policy and coordinating arrangements
4. Lack of capacity (human and physical resources)
5. Complexity of national issues such as the political, cultural and economic positions of most countries

It has been recommended that the following short-term activities are required to prepare Africa for national SDI development:

1. Introduction of the concept of information budgeting
2. Identify a lead agency or person to coordinate the development of SDI including the establishment of formal coordinating mechanisms
3. Use workshops and seminars to increase the level of awareness of SDI
4. Perform national reviews of spatial data needs and available data
5. Develop online learning materials on SDI

CONCLUSION

There is an urgent need to support the SDI development process in Africa. This is important because the rational and successful implementation of UN Millennium Goals depend largely on the availability of geo-information. The previous support approach by various development partners including UN Agencies was mainly project based. This approach has led to fragmentation and uncoordinated development of SDI (GIS) at sectoral or project level. It has further inhibited the development of NSDI due to rivalry and competition among various national institutions.

It is therefore important that the development of NSDI must be well coordinated at a national level and be based on clearly formulated national geo-information policy as well established international procedures and standards.