

NSDI Initiatives in Nepal : An Overview

Ganesh Prasad Bhatta

Chief Survey Officer, Survey Department

Phone: +977 1 4 482 713 (O), Fax: +977 1 4 482 957

Web: www.dos.gov.np e-mail: bhatta07954@alumni.itc.ni

Keywords: NSDI, Geo-information, Clearinghouse, Metadata, Partnerships

Abstract

Geospatial data, information and technologies are becoming more important and more common tools throughout the world because of their capacity to improve government and private sector decision making. Geospatial information is developed, used, maintained and shared in a various range of application areas. Sharing geospatial data in various applications helps to improve the management of public infrastructure and natural resources and further, it minimizes the duplication of resources invested in producing geospatial data. Many nations around the world are developing National Spatial Data Infrastructures (NSDI) to help facilitating cooperative production, use and sharing of geospatial information. In Nepal, NSDI initiatives have been taken through the National Geographic Information Infrastructure Program (NGIIP) under Survey Department, the National Mapping Organisation (NMO) of Nepal, since 2002.

Due to various reasons, the NSDI initiatives in Nepal have not come to full functional stage yet. Various issues related to the development of full functional NSDI in the country are to be taken into consideration. This paper tries to give an overview of the state-of-the-art of the initiatives to suggest better way out for full functional NSDI in Nepal.

1. Introduction

Geographic information or Geoinformation or better still Geospatial information (GI) is beginning to provide the common language and reference system to establish linkages and balance between economic, environmental and social capital in order to improve upon the basis for societal response (Adeoye, 2006). Geospatial data, information and technologies are becoming more important and more common tools throughout the world because of their capacity to improve government and private sector

decision making (Lachman, et. all, 2001). The importance of GI to support decision making and management of the impacts caused by environmental deterioration has been recognized at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 (in connection with the implementation of Agenda 21). A landmark effort was made to illustrate the capabilities, benefit and possibilities of using online digital geographic information for sustainable development at the World Summit on Sustainable Development in Johannesburg in 2003 (SDI Cookbook, 2004). It is, indeed, doubtless to advocate in favor of the importance of GI in sustainable development and comprehensive decision making.

Various kinds of GI are required for various purposes. Information is an expensive resource, and for this reason appropriate information and the resources to fully utilise this information may not always be readily available, particularly in the developing world (SDI Cookbook, 2004). As it requires expensive investment, a single organization cannot produce in a given timeframe all sorts of value added geo-products demanded by a user. Global scenario reveals that to solve many different problems, many different organisations are creating GI using different methods and technologies. In most of the cases, GI, created thus, are hard to find, difficult to access, hard to integrate, out of date, undocumented and incomplete (Lance, 2001).

Various efforts have been made in the GI domain to optimize its application. GI is developed, used, maintained and shared in a various range of application areas. Many national, regional, and international programs and projects are working to improve access to available spatial data, promote its reuse, and ensure that additional investment in spatial information collection and management results in an ever-growing, readily available and useable pool of spatial information (SDI Cookbook, 2004). However, the

situation is not the same at every part of the world.

2. Why National Spatial Data Infrastructure?

If the benefits of the wider usage of GI within countries are to be realised then good quality and current geo-spatial information must be widely available to all stakeholders, easily accessible and interoperable with business information, applications and services. The most recognizable technique to make geo-spatial information more readily available in spatially enabled business applications and services is through a Spatial Data Infrastructure (SDI) (McLaren, 2006).

SDI is the relevant base collections of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data that provide a basis for spatial data discovery, evaluation, and application for users and providers within all levels of the government, the commercial sector, the non-profit sector, academia and citizens in general. SDI activities may be based on local, national, regional and global level.

Many nations around the world are developing National Spatial Data Infrastructures (NSDI) to help facilitating cooperative production, use and sharing of GI (Beth E. Lachman, et. all, 2001). NSDI encompasses the technology, policies, standards, and institutional arrangements necessary to acquire, process, store, distribute, and improve the utilization of spatial data from many different sources and for wide group of potential users at national level. It is a mechanism in which organisations and individuals are cooperating, using electronic technology to help finding and sharing of GI, following mutually accepted standards, and establishing policies and plans that ensure the flow of the data between different agencies (Lance, 2001).

Barriers on using Geoinformation identified by (NGII Finland, 1996) as following are also the most significant barriers restricting the use of geographic information in Nepal:

- geographic information technology is not well known
- geographic datasets are not known or the coverage of them is not satisfactory
- benefits are not explained in a concrete manner

- data cannot be reliably combined
- data is out of date or of poor quality
- clear principles for pricing, copyright and privacy protection are missing

These barriers have further restricted the availability of adequate geoinformation required for national development. One of the weaknesses of the Nepalese management process is lack of adequate geographic information in decision making thus resulting in poor management. To support this gap, the Government of Nepal initiated National Geographic Information Infrastructure (NGII) Program since 2002 (Chhatkuli, 2003). Survey Department, the National Mapping Organisation (NMO) of Nepal, is responsible for this initiative. NGII is the SDI initiative in the country at the national level (Chhatkuli and Kayastha, 2005).

3. State of the Art of the Nepalese NSDI Initiatives

As mentioned above, NSDI initiatives in Nepal have been taken since 2002. The initiatives were taken through NGII Program with one of the pronounced objectives of avoiding duplication in spatial data creation and usage through the networking of different GI Systems in the country. The overall objective of the initiatives is "To strengthen planning and resource management through the availability of geographical information necessary for decision making"(Chhatkuli, 2003). The initiatives are being handled as a project National Geographic Information Infrastructure Project (NGIIP) under Survey Department, since the beginning. Due to various reasons, the initiatives have not come to full functional stage yet.

Like many SDI initiatives, the approach undertaken in Nepal is rather a bottom-up approach, with an initiation for making the best use of already available resources: framing policies to accommodate already available data, technology and the intuitional framework (Kayastha and Chhatkuli, 2005).

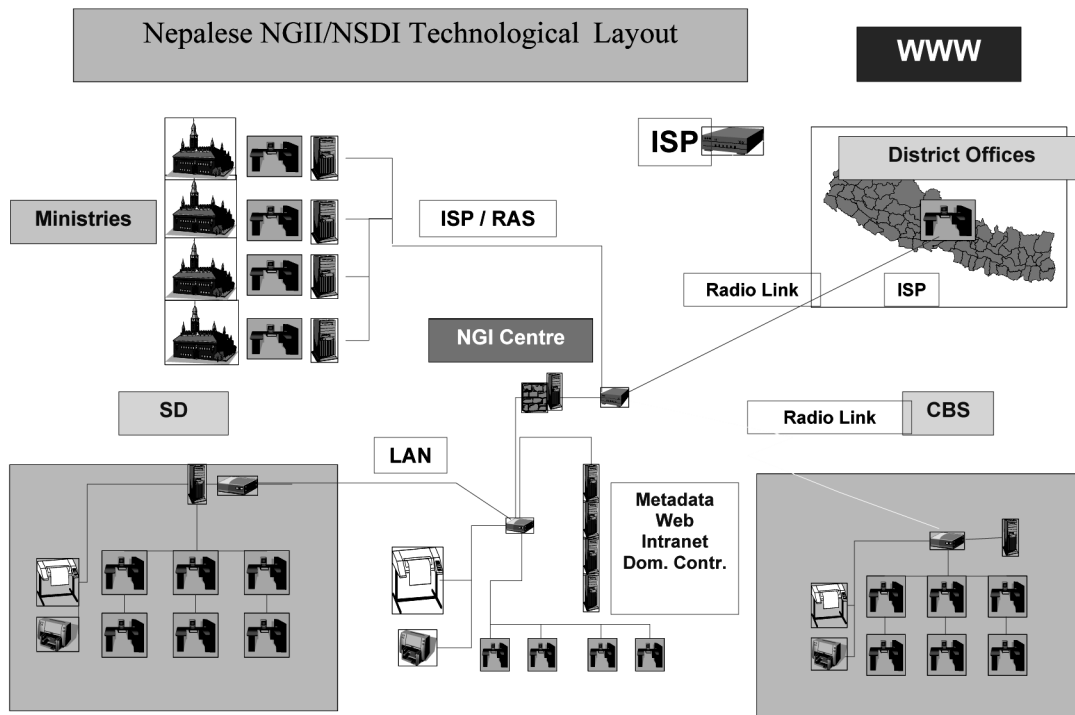


Figure 1: Technological Layout of Nepalese NGII/NSDI (Source: NGIIP Presentation Slides)

The achievement of the initiatives in terms of the core components of NSDI (as shown in figure 3) can be listed as follows:

Framework data: Framework data is also referred to a fundamental data or core data or reference data. It is a base on which other themes of data can be compiled. It includes base layer, which is a foundation to which spatial information and attributes can be added. It also includes mechanisms for identifying, describing and sharing the data using features, attributes and attribute values.

Different layers of Digital Topographic Database and nationwide geodetic control network are available at Survey Department that can be used as framework data.

Geo- Data (Geospatial / Geographic) data: Geo-data is also referred as thematic data. It includes georeferenced data and information that is used for specific purpose.

Other geo-data or thematic data produced by different organisations for their specific uses, can be regarded as geo-data in this context.

Metadata: It is a data describing the existing data in terms of holding, content, quality, condition, and other characteristics. This permits structured searches and

comparison of data in different clearinghouse nodes and gives the user suitable information to find data and use it in an appropriate way.

Metadata of the National Digital Topographic Database, produced by Survey Department, has been published the NGII Web-portal or clearinghouse. Some other governmental agencies are requested to make available the metadata of their products for publishing. However, none of other organisations have made it available. The metadata, whatever is published is in FGDC, ESRI and XML format. The clearinghouse has also provided the facility of digital application for publishing the metadata.

Clearinghouse: It is a web enabled system or an interface facilitating discovery, evaluation and downloading of geospatial data or information. It usually consists of a number of servers on the internet that contain information about metadata.

An NGII Web-portal constituting an electronic clearinghouse has already been launched. It can be accessed through . Following functionalities are made available:

- Metadata System: The metadata system incorporates the facilities to metadata entry and metadata search.
- Interactive Mapping Application: Under this

functionality, interactive mapping applications can be performed. The administrative maps produced by Survey Department and Census data produced by the Central Bureau of Statistics are used for this purpose.

- Downloadable data: At present, sample data is downloadable in .jpg format
- Census Atlas: Population and Socioeconomic Atlas of Nepal produced out of the census result of 2001 is available in digital form.

Partnerships: Partnership is an important component of developing SDI in the country. It can contribute in avoiding duplication of efforts and the cost of production of geo-data/ information. It permits sharing and exchange of geo-data / information. The partnerships can include institutions in the government, industry, academia, societies and individuals.

In the beginning of NSDI initiatives in Nepal, six governmental agencies participated the program: Survey

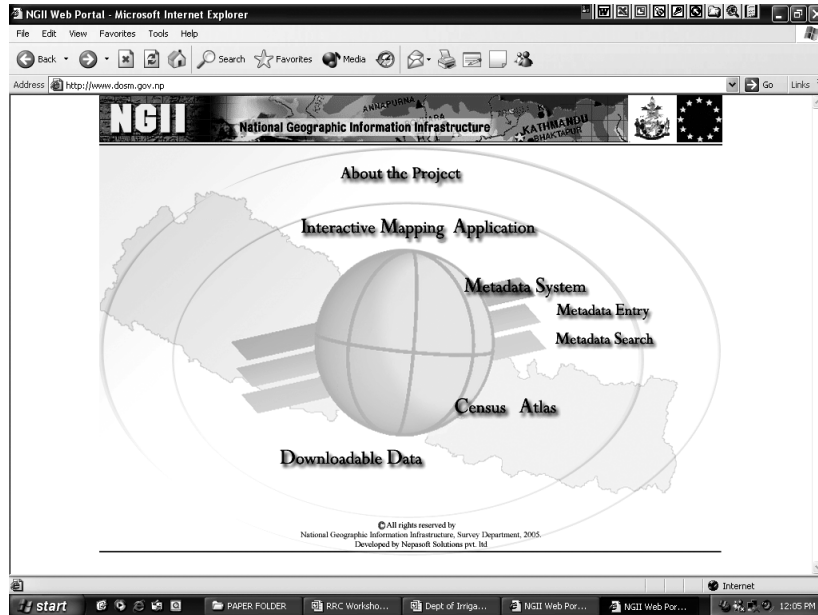


Figure 2 : NGII Web portal of Nepal / Nepalese Clearinghouse

Department, Central Bureau of Statistics, Ministry of Local Development, the then Ministry of Population and Environment, Ministry of Agriculture and Co-operatives, and Ministry of Health / Department of Health Services. It was expected that other agencies would slowly participate the initiatives but none of other organisations have shown their interest yet. Central Bureau of Statistics (CBS) has strongly supported the initiatives since the beginning.

Standards: Standards allow NSDI to function and ensure compatibility/interoperability of GI. It facilitates the sharing of information, created and accepted at Local, National, and Global levels.

As per the Land (Survey & Measurement) Act, 1963 (8th Amendment, 2000) and Land (Survey and Measurement) Regulation, 2001 Survey Department is the responsible organisation to develop and implement norms, standards and specification of surveying and mapping activities in the country. Based on this provision, Survey Department has also developed certain standards and specifications for producing GI in digital form. The department expects these specifications and standards to be followed by all the organisations involving in GI business in the country. It would be better for such organisations to consult with Survey Department for the standards to be followed so that it would be compatible with the GI produced by other organisations.

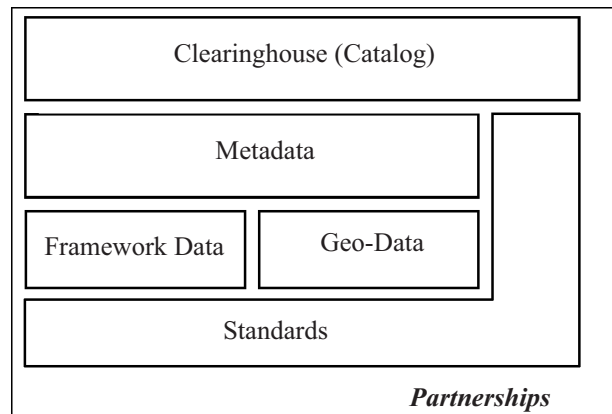


Figure 3 : Core components of NSDI

4. Efforts of Survey Department for developing NSDI

Survey Department is making its best efforts to develop appropriate NSDI set up in the country to support the activities of national development. Timely initiation through NGIIP itself is an admirable effort. Some of the major efforts in the line to develop appropriate NSDI in

the country are given below:

Programs for Awareness:

NSDI initiatives have been evolved through consultations with stakeholders, high level decision makers / policy makers / bureaucrats. Various talk programs, discussion programs and interaction programs have been conducted inviting high level personalities from stakeholder organisations. These programs had two main objectives; one to aware the organisations about the essence of NSDI in the country and the other to acquire valuable suggestions for developing effective NSDI in the country. Some of the major programs can be listed out as follows as an example of the efforts:

- Discussion forum on National Geographic Information Infrastructure (NGII) (March 7, 2002)
- Workshop on the Role of Survey Department in the Context of National Geographic Information Infrastructure (NGII) in Nepal (October 20-21, 2003)
- Colloquium on the Role and Functions of Survey Department in the Context of Broader Technological Development (March 4-5, 2005)
- Consultative meeting on Metadata, Clearinghouse and National Geoinformation Infrastructure Networking (March 31, 2006)

In spite of these programs, radio programs have been broadcasted many times, through the quarterly radio program "*Hamro Jamin, Hamro Napi*" of Survey Department to aware user community on the essence and potential benefits of NSDI in the country.

Request for Participation

Stakeholders, mainly from government organisations, are being requested formally and informally for participating

the initiatives from the very beginning. Especially, the stakeholder organisations are requested to make available the metadata of the GI they possess to publish on the Clearinghouse.

Exposure at International forum

Survey Department is affiliated with many international professional organisations like International Federation of Surveyors (FIG), International Steering Committee for Global Mapping (ISCGM), Asia Pacific Regional Space Agency Forum (APARSAF), Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP), Group on Earth Observation (GEO), Asian Association on Remote Sensing (AARS) and most importantly Global Spatial Data Infrastructure Association (GSDIA). Affiliation with such organisations provides opportunities to expose the initiatives in the international forum of experts so that international support in many aspects related to NSDI could be achieved. Further, with this exposure the department is, some how, in the state to introduce innovative approaches and technologies in this field.

Institutional Model Proposed:

The NSDI initiatives are under progress through NGII Project of Survey Department till the date. As the activities cannot be effectively launched through a project approach, like NGIIP, Survey Department has proposed an Institutional Model as following (figure 4). A Three-tier organizational model (Policy executive, Management executive and Implementation Executive) under the umbrella of National Planning Commission (NPC) has been proposed. It is expected that broader coverage of stakeholders could be done with this organizational model.

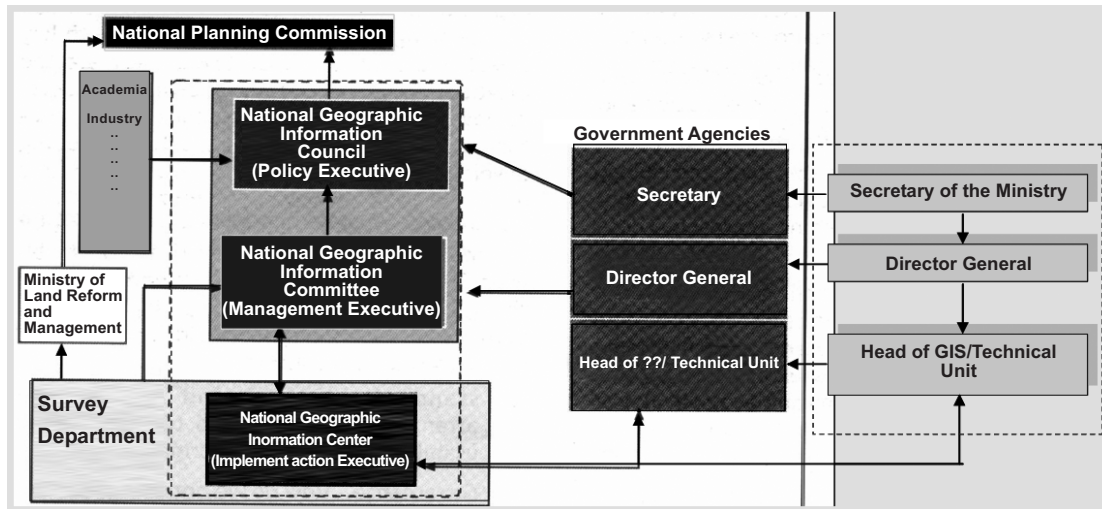


Figure 4: Proposed Institutional Model: (Kayastha and Chhatkuli, 2005)

5. Limitations of Nepalese NSDI Initiatives

Nearly, five years of NSDI initiatives in Nepal have been passed. Due to various reasons, the initiatives have not come to its full functional stage. Various limitations are affecting its timely growth. Some major of them has been identified as follows:

- Proper institutional set up with necessary infrastructure of the coordinating body is lacking. It is not an independent body, rather running as a project under Survey Department.
- Despite various efforts of Survey Department, awareness regarding the essence and benefits of NSDI is negligible among the potential stakeholders and general users.
- It seems that the publicity of the initiatives and the progress whatever has been achieved is less in the country. Vision and roadmap of the initiatives have not sufficiently been advocated.
- Comprehensive policy document and appropriate policy/legislative framework to support the NSDI activities are lacking.
- Participation of stakeholders in the NSDI initiatives is not satisfactory.
- Funding allocated for the initiatives is insufficient.
- Human and technological resources required for NSDI development is not sufficient. Programs for capacity building / development to make the NSDI initiatives sustainable have not been initiated
- Politicians and high level bureaucrats are not fully convinced on the essence of NSDI, which is a must for its timely development.

6. Key Issues of NSDI Development in Nepal

Key issues to be addressed for NSDI development in Nepal have been realized as follows:

Institutional Setup

A strong coordinating body with sufficient infrastructure is required to fully materialize the concept of NSDI. The organizational set up currently existing is not in the state to coordinate all the potential stakeholders to participate the efforts of NSDI development as it is in the form of a project under Survey Department, having limited authority and funding. An independent organisation backed by legal authorities would be the institutional setup for fully developed NSDI in the country. Survey Department must priorities its steps for establishing the proposed institutional model (figure 4) in the days to come.

Standards of GI

Adoption of commonly accepted standards of GI to ensure interoperability is one of the fundamental requirements of functioning NSDI. The stakeholder organisations are not fully adopting the common standards in Nepal, even many of them are not aware about the essence of following standards. Survey Department must develop, if not developed yet, commonly acceptable standards and make the stakeholder organisations to follow them, as the department is legally responsible in this matter.

Partnerships

Partnership is an important component of developing SDI in the country. As 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, the partnership of agencies and organisations is called for. Not only does the establishment of a partnership of organisations working together to create SDI mean that a greater amount and wider range of resources can be brought to bear on its development, but having organisations working together at the outset, is vital to ensuring that SDI develops in a way that will support all the partners in their use of data. It may be appropriate to involve both public and private partners, as well as academia and individual experts in a consortium approach to developing the SDI needed by a country (SDI Africa, an Implementation Guide). NSDI initiatives in Nepal were begun with the partnership of six government organisations as mentioned above. Central Bureau of Statistics remained the strong partner with Survey Department. However, in recent days the response from these organisations is not satisfactory. Survey Department must make further efforts not only to resume the participation of those organisations but also encourage all the potential stakeholders to join the network of partnerships.

Participation of Private Sector

Private sector can equally contribute in developing NSDI in the country. In Nepal, only a few organisations from private sector are involving in GI business. None of these organisations has come into touch to participate the NSDI initiatives till the date. Duplication of efforts, mainly in publications of maps, has been seen in the market. Integrated information on the capabilities of private sector organisations in GI business is incorporated nowhere. Private sector can contribute in developing NSDI as follows:

- Supporting human resource development required for the development of NSDI
- Developing Software/System required for the organisations involving in GI services
- Conducting awareness programs so that wider range of application areas could be incorporated under the NSDI umbrella.
- Watchdog the state initiatives and pressurize the government to develop the NSDI to full operational phase.

- Supporting the government to overcome the duplication of investment in same kind of data by concentrating on value added GI rather than Framework Data
- Suggesting appropriate mechanism, policies, standards etc. for effective NSDI in the country
- Establishing strong intellectual network as it is the most important in the country like Nepal to promote the use of geospatial information for efficient / effective planning and good governance.

It can be doubtlessly state that participation of private sector in NSDI initiatives optimizes their investment in one hand and significantly contributes in developing NSDI in the country on the other hand. Thus, Survey Department must encourage private sector organisations to participate the NSDI initiatives.

Policy / Legal Framework

Appropriate policy/legal framework to govern the activities of NSDI is an essential component. In Nepal, several policy issues have been discussed at several forums, and many policy decisions have been undertaken. However, a comprehensive policy document regarding NSDI initiatives is still missing. The activities are not included in appropriate policy/framework yet. Survey Department should propose appropriate policy/legal framework incorporating all the aspects of NSDI to the government so that the lacking could be fulfilled.

7. Conclusion

Nepalese NSDI initiative since 2002, led by Survey Department through NGIIP, is an admirable job in the context of widened GI user community. However, it has not been developed as per the need of the time. Duplication of efforts in GI business is still in practice. It is essential to aware GI users and producers about the essence and potential benefits of NSDI to minimize the duplication of efforts. Stakeholder organisations from various sectors should be encouraged to join the network of partnerships. Especially, private sector organisations should be called upon to join the initiatives. An effective environment for sharing / exchanging what ever is available; data, information, technology, skill, resources, etc at stakeholder organisations should be developed. Effective institutional set up providing strong national NSDI leadership with

adequate resources should be established. Appropriate policy/legal framework should be developed and appropriate initiatives should be taken for the sustainability of the system.

*The SDI Cookbook. Version 2.0,
January 2004*

www.dosm.gov.np

References:

Anthony A. Adeoye: The Role of Private Sector Participation in the Development of National Geospatial Data Infrastructure, 2006, Lagos

Beth E. Lachman, Anny Wong, Debra Knopman, and Kim Gavin: Lessons for the Global Spatial Data Infrastructure: International Case Study Analysis, 2001, (Global Spatial Data Infrastructure (GSDI) Secretariat: RAND Science and Technology Policy Institute)

David Rhind: Lessons Learned from local, National and Global Spatial data Infrastructures,, United Kingdom

Durgendra Man Kayastha and Raja Ram Chhatkuli: Survey Department and the Context of Geographical Information Infrastructure, 2005, Nepal

Kate Lance: NSDI Concepts, 2001

National Geographic Information Infrastructure of Finland, The Consultative Committee for Data Administration in Public Administration Publication 2/1996

Raja Ram Chhatkuli and Durgendra Man Kayastha: Towards a National Geographic Information Infrastructure: Overcoming Impediments to the Development of SDI in Nepal, 2005, Nepal

Raja Ram Chhatkuli: National Geographical Information Infrastructure in Nepal for Strengthening Planning and Resource Management, 2003, Nepal

Robin McLaren: How to Avoid National Spatial Data Infrastructure (NSDI) Cul-de-sacs, 2006, United Kingdom,

*SDI Africa, an Implementation Guide
(<http://geoinfo.uneca.org/sdiafrica/default1.htm>)*