

National Geographic Information Infrastructure Programme to Support National Geographic Information System in Nepal

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Abstract

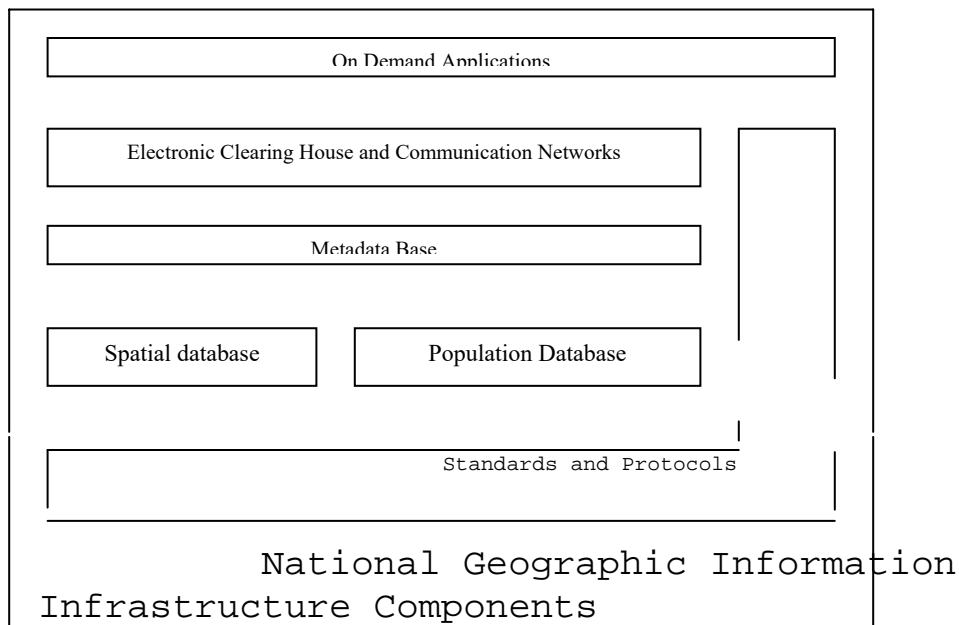
GIS are effective tools for the planning and monitoring of different development projects like engineering, socio-economic, and environmental projects. Due to lack of proper spatial data and geoinformation infrastructure in the past, all GIS projects spent very significant share of their projects on the development of such framework data. Recently the Survey Department of His Majesty's Government of Nepal has launched a national geoinformation infrastructure programme (NGIIP) to support sectoral GISes with spatial data and. The rationale and the objectives of the programme in the context of the open data dissemination policy undertaken in Nepal are outlined.

Introduction

Geographic Information System (GIS) and Remote-sensing (RS) are very effective tools for the study, monitoring and management of different engineering, socio-economic and environmental projects. In any GIS project there are two types of data necessary. Firstly the general framework data and secondly the application-specific data. GIS become versatile, efficient and cost-effective due to the possibility for multifarious applications and usages of general framework spatial and attribute data. In Nepal, due to unavailability of such digital data, each GI Systems had to spend a lot of resources in its development as part of the GIS project. That meant a lot of duplication and loss of resources, which would eventually affect the time, budget and the efficiency of the system. The current national geographic information infrastructure (NGII) initiative undertaken by the Survey Department of His Majesty's Government of Nepal will help in the development of a National Geographic Information System (NGIS) in the country and thereby on the efficiency and cost/time effectiveness of individual GI systems. The NGII initiative to support the proposed NGIS in Nepal is outlined in this paper.

NGII: The Nepalese Perspective

GIS activities were initiated in Nepal during the Eighth Plan period. Due to lack of a national perspective, the major activities have been the sporadic database creation and mushrooming of isolated systems. The National Geographic Information Infrastructure (NGII) initiative undertaken in Nepal now will be the development of a national spatial data infrastructure (NSDI) and in addition to the fundamental datasets it will assist in developing electronic clearing house, communication network and on-demand applications. A schematic representation of the various components of the Nepalese NGII is as following:



Fundamental data coverage:

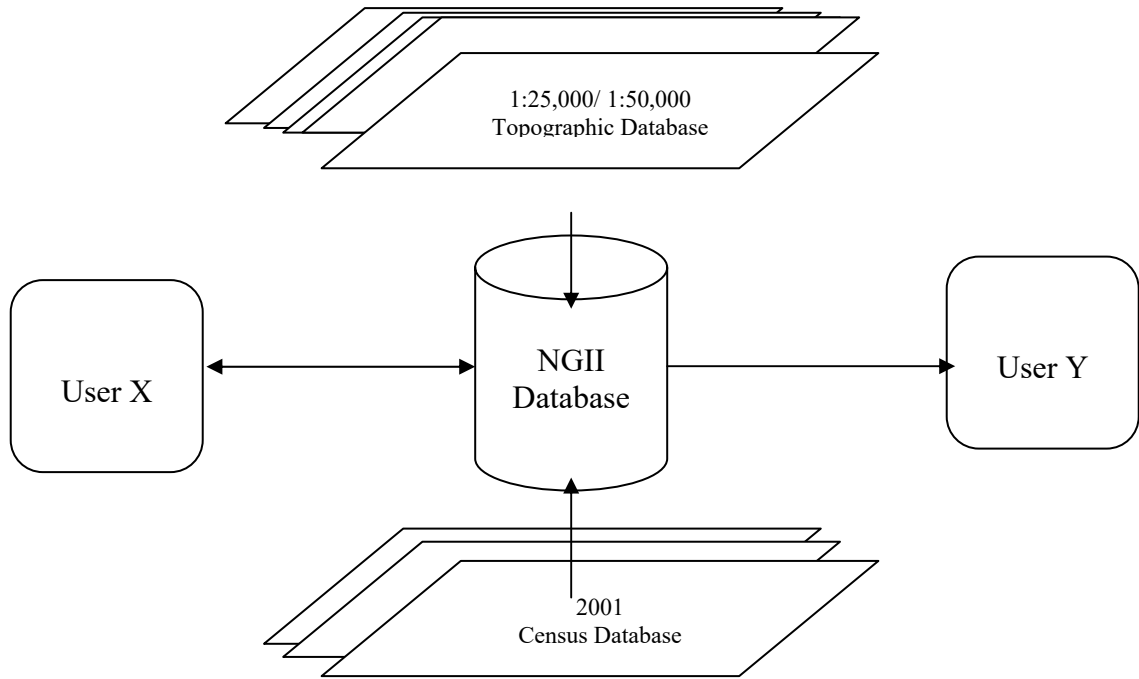
The fundamental dataset in the NGII in Nepal are the National Topographic Database (NTDB) and National Census Database (NCDB). The NTDB will have a horizontal coverage covering the whole country and vertical coverage at the scales of 1:25,000/ 1:50,000; 1:100,000; 1:250,000; 1:500,000 and 1:1M. The primary data input in the NTDB is the digitalization of the 1:25,000/ 1:50,000 topographic basemaps produced by the Survey Department between 1992- 2001. The base data are generalized for the reduced scales and separate data layers are archived in the database. So far out of the proposed 671 map sheets at 1:25,000/ 1:50,000 nearly 90% map sheets have already been digitalized. Generalization for the scales 1:100,000 and 1:250,000 and preparation of data layers on such scales are under research now.

In addition 1:5,000 scale orthophoto database for all the densely populated urban areas and 1:10,000 scale orthophoto database for all the less-densely populated semi-urban areas will also for part of spatial database coverage of NGII.

In summary, basic spatial datasets to be incorporated in NGII are:

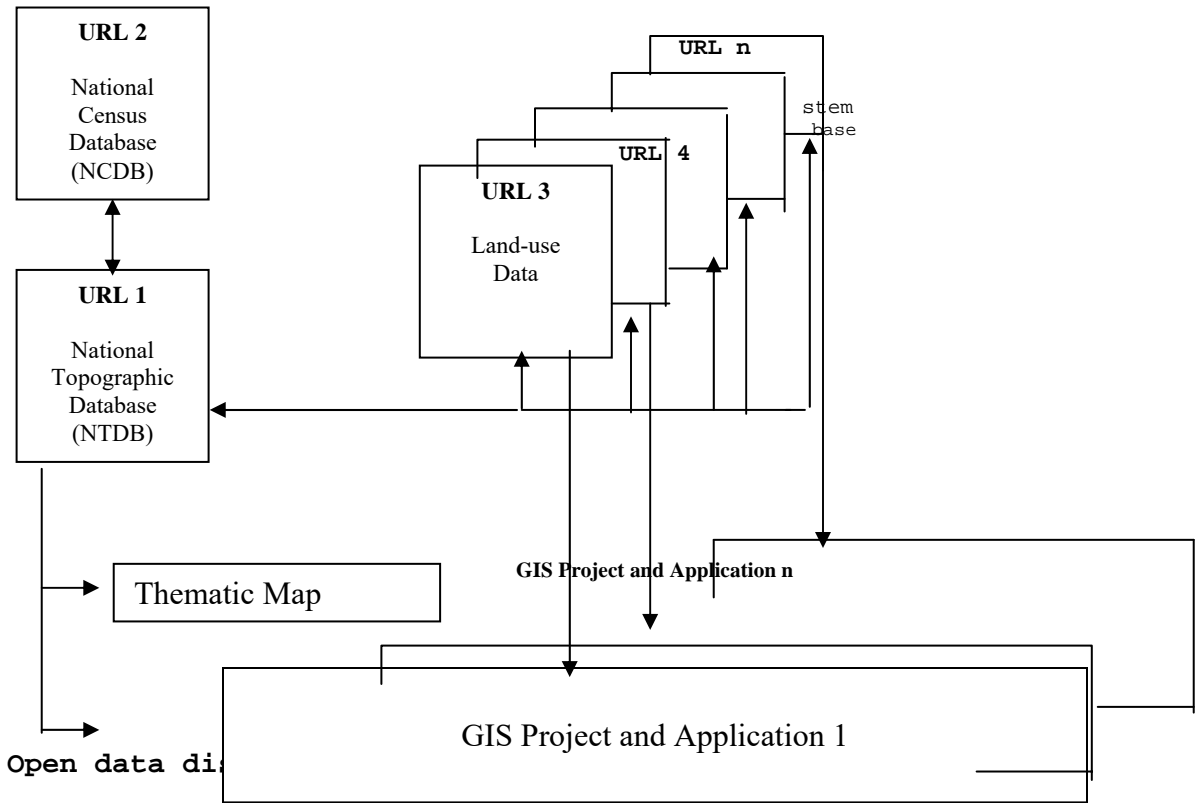
- 1:5,000 scale orthophoto data (for all densely populated urban areas),
- 1:10,000 scale orthophoto data (for all semi-densely populated urban areas),
- 1:25,000 scale (for terai and mountains areas) and 1:50,000 scale (for higher mountains and Himalya areas) topographic database,
- 1:100,000 scale topographic database for whole Nepal,
- 1:250,000 scale topographic database for whole Nepal,
- 1:500,000 scale topographic database for whole Nepal,
- 1:1M scale topographic database for whole Nepal.

The NCDB is based on the results of the decennial national population and housing census. The basic dataset will be that of the National Population and Housing Census 2001. However, the data related to previous censuses will also be incorporated in the database for temporal analysis and trend studies. The NCDB will, therefore have a temporal coverage of decennial interval.



Data-sharing technology via internet and intranet:

The NTDB database maintained at the Survey Department (SD) and the NCDB database maintained at the Central Bureau of Statistics (CSB) are at the moment being separately developed. One of the basic characteristics of the Nepalese NGII is that they will be fully integrated and available as fundamental NGII dataset for different application GISes. A generalized schema of the National Geographic Information System (NGIS) will be as following:



The fundamentals of the data production and dissemination policy of Survey Department are the availability, accuracy and affordability. Data and information are worthless, however best they are, when they are not available. In the same

time, it is better to have no data or information than to have inaccurate or wrong data/ information. Thirdly, it is worthless to have the data accessible but the users can not afford them. These matters have been well taken in the data dissemination policy of Survey Department of Nepal. The following are the salient features of data and their dissemination policy in Nepal:

- The data are created with the best quality control as possible within the available technology in-house,
- Quality information are provided as metadata,
- All maps and data are made available to users irrespective of whether they are individual users or institutional/ organizational users. All organized/ unorganized sectors or national/ international users can access data unless they are notified as restricted by His Majesty's Government of Nepal,
- To cater for the affordability of non-commercial or non-profitting users and applications, a policy of categorization of users and categorization of pricing has been adopted.

Status of NGII Programme in Nepal

Digitalization of topographic base maps were initiated at the Survey Department was initiated as pilot project already since 1996. Since 1999 a systematic map digitalization and digital mapping project was launched. The NGII Programme of His Majesty's Government of Nepal Survey Department has been launched since June 2001 as an extension of the same project. The NGIIP as such is only six months old at the beginning of its infancy. Many details on design specifications and policy agreements are still to be worked out; so more to say on the mobilization and implementation of the project. Not only the technology, necessary organizational and institutional setups are still to be framed out. Once operational, the NGIIP will be at the hub and provide support in terms of fundamental data needs and on-line communication support to all other GISes in Nepal who join the NGIS. However already, it has started providing fundamental data, off-line, to different users.

The main activities of the NGII programme being undertaken by Survey Department for which the financing have been assured and their current progress status are as following:

- a) NTDB data production
 - 1:5,000 (Approx 7,500 km²) and 1:10,000 (Approx 25,000 km²) orthophoto data production for urban and semi-urban areas under progress. To be completed by the end of 2002.
 - 1:25,000/ 1:50,000 scale topographic database production: 90% of the country covered, to be completed by middle of 2002.
 - 1:100,000 and 1:250,000 scale topographic database compilation under progress, to be completed by 2002.
 - 1:500,000 and 1:1M database production under planning.
- b) NCDB data production
 - Population and Housing Census 2001 database to be integrated in the system by middle of 2002.
 - Incorporation of previous census data in the database: under planning.
- c) Development of NGIS Master Plan by middle of 2002.
- d) Preparation of population maps and atlas (paper and CD edition) by end of 2003.
- e) Training and expertise for SD, CBS, and participating user agencies by middle of 2003.
- f) Integration of user organizations in the NGII by internet/ intranet by end of 2003.

NGII to support NGIS

The population database in the NGII will be the most reliable data based on national census conducted based on extensive household survey every ten years. More important, the spatial database of NGII will have the following major fundamental datasets, which are essential framework data for all GIS and RS applications:

- Control points,
- Administrative Boundary,
- Designated Areas,
- Transportation network,
- Buildings,
- Landcovers,
- Hydrography,
- Topography,
- Utilities,
- Toponymy.

As is evident, the main objective of NGII is to support NGIS and therefore it can support in one way or other every study and project which applies GIS. Few of the major applications, which can benefit from NGII are following:

- NGII will provide fundamental spatial dataset over which all other data can be related,
- NGII provides for electronic data clearing and communication network for retrieving and sharing other requisite data,
- All secondary data will be based on national standards thereby providing opportunity for a better compatibility,
- Lot of time, efforts and resources are saved due to availability of secondary data,
- Less duplication, less extravagance and more economy.

Possible Support Areas of NGII facilities in NGIS

The products and the hardware, software, networking, training facilities provided by NGII will be useful for all GIS applications in Nepal. For each of the applications listed hereunder, most of the data will be available from NGII and very little data will need to be collected from primary sources. This will make such applications more efficient in terms of time and resources.

NGII can support all study and planning activities, which use spatial and/ or spatially related data for their applications. A comprehensive list will be too large. To name a few, some of the areas where NGII will support GIS activities for national development in Nepal are:

- Study of socioeconomic parameters and socio-economic modeling/ planning,
- Analysis of spatial dimension of gender issues ,
- Study and identification of distribution/ cluster of economically and socially vulnerable class and people,
- Urban planning and urban infrastructure development,
- Route planning and traffic control,
- Land development and landuse planning/ zoning,
- Feasibility study of engineering projects and identification of alternate projects,
- Environment study.

The following are examples of some of the NGII data users and their applications in the first six months of the programme:

Users	Applications
Bagmati Integrated Watershed Management Project	Land-use planning/ mapping
Melamchi Drinking Water Project	Study and design of diversion tunnel scheme
Local Infrastructure and Agriculture Roads Department (DOLIDAR)	Hazard study and rural infrastructure planning
Care Nepal	Watershed studies
National Landuse Project	District and village level landuse study
Ministry of Agriculture and Cooperatives	Agriculture pocket area identification
Ph. D. Student	Ph. D. research study
King Mahendra Trust for Nature Conservation	GIS applications and training for nature conservation
Department of Irrigation	Study and design of irrigation project
Dip Consultancy	Preparation of Technical Proposal
Department of Mines and Geology	Landslide inventory and hazard mapping
Doti District Development Committee	District Periodic Plan
Department of Hydrology and Meteorology	Study of water balance in river basin
Department of Forest	Study of Sub-watershed
Kathmandu Metropolitan City	Urban Geographic Information System
Topographical Survey Branch	Map updating and derived mapping
Surkhet District Development Committee	District Periodic Plan
Nepal Forest Resources and Research Programme	Environmental change study
Integrated Research Application and Development	Hydropower and Approach Road study

Organizational Setup for NGII

A national geographic information system in Nepal when operational will not only change the information handling scenario but will make impact on the decision making system in all organizations in the country. The experiences of other countries show that Survey Department does take a key role in the NGII initiative, but success will be very much dependent on the leadership and vision at the highest level. Therefore a long-term vision for the sustainability of NGII and a suitable organizational and institutional framework becomes absolutely necessary. There are so many activities still to be planned and formulated. A multi-tier organizational set-up is suggested. The following organizational setup is outlined here to initiate discussions in this regard.

NGII Council (at the apex level)

VC National Planning Commission: Chairperson
Secretaries of different Ministries: Members
Secretary, MOLRM: Member Secretary

NGII Steering Committee

The present Mapping Committee under the chairpersonship of MOLRM Secretary may be reorganized with additional responsibility of coordinating GIS related activities within ministries. Chief of NGII should be included as a member.

NGII Executive Committee

Director General, Survey Department: Chairperson
Director Generals of chief executives of related organizations: Members
Chief, NGIIP: Member Secretary

Nodal Committees

Conclusion

The NGII in Nepal is being developed on bottom-up approach. It is users driven and built-up step by step based on available results and future requirements. The major benefit of this approach is that the system will be on constant development and in the mean time it is delivering results during development period as well.

Survey Department of Nepal has adopted an open data dissemination policy. This provides for a better opportunity for a NGII initiative in Nepal. All individual projects can benefit with cost-effective and efficient implementation of their GIS and RS applications. This will form a basis for the development of National Geographic Information System (NGIS) in Nepal.

The programme is now being developed as a project through Denmark, Finland, EC and HMG/N financing. Necessary long-term vision for organizational and institutional framework for the sustainability of NGII is necessary. A national geographic information system in Nepal when operational will not only change the information handling scenario but will make impact on the decision making system in the country. The experience of other countries shows that Survey Department does take a key role in the NGII initiative. But success will be based on the leadership and vision at the highest level.

References

- Chhatkuli, R.R. (1996); Geoinformatics: A New Challenge to Surveying and Mapping Professionals in Nepal, Nepal Surveyor Vol 1996.
- Chhatkuli, R.R. (2001); NGII Initiative in Nepal to Support Framework Data Requirement for Eco-system Study and Management using GIS and RS; Paper circulated at the 1st Regional Seminar on Geo-Informatics for Asian Eco-System Management, Kathmandu, 2-6 December 2001.
- Chhatkuli, R.R. (2002); Concepts and challenges of National Geographic Information Infrastructure Programme in Nepal, Valedictory Lecture, 5th ESRI India Users Conference, New Delhi, 23 January 2002.
- Harvey, Francis (2001); US National Spatial Data Infrastructure (NSDI), GIM Volume 3, March 2001.
- Maser, Ian (2001); The Indian National Geospatial Data Infrastructure, GIM Volume 15, August 2001.
- Roger, Gilles and Lopez, Salvador (2001), Nepal Population and Housing Census 2001: Mapping Component, EC Nepal, July 2001 (Unpublished Revised Draft Report).