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COUNTRY REPORTS

STATUS OF SURVEYING AND MAPPING IN NEPAL

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STATUS OF SURVEYING AND MAPPING IN NEPAL

1. The Survey Department

Survey Department (DOSM), was primarily involved in cadastral surveying at the initial stages of its inception in 1956. But with time, it has grown into a national mapping agency encompassing several sectors of surveying and mapping viz. aerial photography, topographic mapping, geodetic surveys, orthophoto map production, cadastral surveys, land resources mapping etc. The department now has three main branches viz. Cadastral Survey Branch, Geodetic Survey Branch and Topographical Survey Branch, responsible for carrying out respective activities in the country. In addition it has 9 Mobile Survey Offices locally called Survey Goswara responsible for cadastral survey and resurvey as necessary in the districts and 83 district level survey offices to take care of updating cadastral maps and related records in association with the district level land revenue offices in the districts. Some of the districts have more than one district level survey offices. In the year 2002, National Geographic Information Infrastructure Programme (NGIIP) was initiated with one of the pronounced objectives of avoiding duplication in spatial data creation and improvement in usage through the networking of different GI Systems in the country.

2. The present status of surveying and maping

By the mid-1980s, land resources mapping was completed comprising basically of land utilization, land system, land capability and geological maps. A new series of topographic base-maps were produced during 1992-2001. Newer technologies like remote-sensing, GIS and GPS were introduced in the 1990s. This decade also witnessed a growing use of maps and spatial data in decision-making at all levels of government and public governance and the private sector, which can be adjudged by the overwhelming presence of GIS facilities at different organizations and different types of maps in the bookstores (Chhatkuli 2004).

Based on the new series of topographic maps at two basic scales viz. 1:25000 for the plains and the middle mountain region and 1:50000 for the high mountain and Himalayas; DOSM has created digital spatial dataset termed as National Topographic Database (NTDB). In addition four successive levels of lower resolution datasets are under preparation to support data requirement as applied to different scale such as district, regional, national, and global level application by generalizing the basic NTDB datasets (Kayastha 2003a).

Satellite positioning has been introduced in establishing the control network at lower levels apart from activities undertaken to strengthen the existing national geodetic network complemented by precision levelling and gravimetric surveys. A GPS tracking station has been commissioned to continuously track GPS data.

Cadastral surveys of several districts have been undertaken to resurvey the districts that were surveyed in the past without using geodetic control. Cadastral survey offices have been established in all districts to look into the maintenance of cadastral records.

Remote sensing has been introduced to look into the possibility of using the technology in updating basic topographic maps and data.

Survey Department, a national mapping agency (NMA) of the country is gradually changing its role of providing surveying and mapping services in the country to assuming a lead role in regulating the national surveying and mapping activities including development of environment for meaningful sharing of geospatial information at large i.e. from production to regulating and coordinating agency. It has been directing its effort towards fostering cooperation among the partner agencies including private sectors for developing institutional framework, policy directives etc. Efforts have also been made continuously to the development of human resource as required and also to gradually transform present pool of human resources receptive and adaptive to new technology (Kayastha 2003b).

The following sections overviews some of the activities of fundamental importance which were undertaken so far.

3. GII initiatives

The NGII programme was initiated with an overall objective of developing a National Geographic Information Infrastructure in the country to strengthen the planning and resource management. The programme initially aimed to develop a platform to facilitate data sharing among the Central Bureau of Statistics (CBS), Survey Department (DOSM) and four other participating ministries at the centre and 33 CBS Branch Statistical Offices at the districts. It has already published population and housing census 2001 results in hardcopy atlas, CD-ROM and has started disseminating the results through the web. Metadata system has been developed into an operational system. It is conceptualized that in course of time this will accommodate entire data production community in the country encompassing several other types of spatial and spatially related data. (Chhatkuli, Kayastha 2005)

4. Geodetic surveys

Geodetic Survey Branch under the department has launched various activities over the past 30 years; following is the list of some of them:

- A geodetic network of 68 first order geodetic points having 16 Doppler points has been established during 1981-84 including establishments of 7 Laplace points during 1976 as a base point to control the azimuth of the high precision geodetic network of the country.
- Gravity observation was carried out at first order points and gravity transfer was made connecting Colombo and Bangkok to Kathmandu .

- Extension of second order, third order and fourth order geodetic network of the country has been completed on 47 districts out of 75 districts.
- Geodetic levelling net of the country was created by precision levelling along the highways and roads of the country. Altogether 6430 km leveling lines comprising of permanent benchmarks at every 2 km and temporary benchmarks at every 200 metres.
- Absolute gravity observation was carried out during 1990's and 9 absolute gravity station were established at different places of the country. Geoid Nepal 1997 was defined based on gravity measurements at some 1712 stations.
- Geodetic observatory near Kathmandu served as the base stations for triangulation network. Star observation for time and azimuth was carried out regularly at the observatory until 1990s have now been replaced by regular GPS measurements and is being developed into a permanent tracking station.

5. Topographic Surveys

Apart from regular production of administrative maps the branch is currently involved in generalization of basic topographic maps in order to produce maps at smaller scales viz 1:100 000 and 1:250 000. Updating of the basic topographic maps and NTDB using remote sensing imagery has also been taken up as some of the maps are more than ten years old. Besides, the branch carries out topographic surveys as and when required depending on the demand.

6. Cadastral Surveys

Upon completion of the cadastral surveying of the country in 1995 for the first time there were 38 districts out of 75 districts that were surveyed based on local controls. Cadastral resurvey activities were taken up in those districts to prepare new cadastral maps based on national geodetic control network. In addition, the branch has taken up cadastral surveying in areas left out in the past such as village blocks. At present the resurveying works is being undertaken in 13 districts apart from one district where the resurvey work has been completed recently.

In order to improve upon the accuracy and maintenance, the branch has initiated a pilot study on numerical cadastral surveying. Based on the pilot work, the methodology may be replicated in several other areas demanding precision and land value. This will have a great impact on the development of LIS in the country.

7. Education

Land Management Training Centre under the Ministry of Land Reform and Management (formerly Survey Training Centre) has been imparting trainings related to surveying and mapping including land management. At present 3 courses are run in the centre namely Basic Surveyor, Junior Surveyor and Senior Surveyor. Following the decision of the government to engage private sector in survey education few years back there are currently five private institutions imparting basic surveyor course. Further more the

Tribhuvan University is exploring the possibility of opening graduate level course in surveying.

8. Licensing

The department is currently working on the modalities of issuing license to private surveyors in order for them to participate in various land survey activities in the country. This has been possible with the inclusion of such provision in the land survey and measurement act in the recent past.

9. Publications

The department has published some of its products and results of seminars/workshops in the form of books and magazines apart from the hard copy maps for public consumption. A journal is being published annually since 2002. The following is the list of publications

- Nepalese Journal on Geo-informatics Number 1 to 5
- List of Geographical Names Volume I to V, New versions of this publication has been planned; and three volumes viz. Volume II, IV and V have been published recently.
- Working manual of Cadastral Survey 2060BS (In Devnagari)
- Proceeding of the Colloquium on the Role and Functions of Survey Department in the context of Broader Technological Development (2005).
- Proceeding of A Seminar on Space Technology Applications and Recent Developments in Geo-spatial Products" (August 17, 2005).
- Socio-economic Atlas (2005)
- School Atlas (2001)
- Brochure (Survey Department at a glance) (2059BS, 2062BS)

10. Mapping Committee

In order to facilitate publishing of different mapping products and also to maintain minimum level of standards, Mapping committee is constituted headed by the Secretary at the Ministry of Land Reform and Management of Government of Nepal. Director General, Survey Department is the Member Secretary and the representatives of the Ministry of Home, Ministry of Defense, Ministry of Foreign Affairs, Ministry of Law, Justice and Parliamentary Affairs, Ministry of Finance, Department of Geography of Tribhuwan University, are the member. Its main responsibilities are as follows:

- To assist various ministries, departments and organizations in the preparation of maps and give consent to them for publishing such maps.
- Store all published maps in a central repository in the Department for security purpose.
- Bring about uniformity in the mapping procedures in Nepal.
- Advise the government in the preparation of policy in Mapping and related works.
- Avoid duplication of mapping work; improve quality of finished product and coordinate between different governmental organizations.

11. Data, Products and Services

A. Available Maps and Data

- Geodetic Control Data
- Aerial Photographs
- Topographical Base Maps
    - Terai and Middle Mountain at the scale of 1:25000
    - High hills and Himalayas at the scale of 1:50000
- Land Resources Maps
- Administrative and Physiological Maps
- Maps of VDC/Municipalities, District, Zone & Development region.
- Digital Topographic Data
- Cadastral Plans
- Ortho photo Maps
- Soil Data

B. Available Services

- Establishment of Control Points for various purpose
- Cadastral Surveying
- Photo Laboratory Services
- Surveying and Mapping for Development Activities
- Topographic and Large scale Mapping
- Digital Geo-spatial Data base
- GIS Development

12. Participation in international forums

Survey Department has participated in different international activities organized by related international forums. It is also affiliated with Asia Pacific Regional Space Agency Forum (APRSAF), Japanese Aerospace Exploration Agency (JAXA), Asian Institute of Technology (AIT), Asian Association on Remote Sensing (AARS), Group of Earth Observation (GEO), International Federation of Surveyor (FIG), International Society for Photogrammetry and Remote Sensing (ISPRS) and International Steering Committee for Global Mapping (ISCGM) in different capacities. The department is regularly in communication with these organisations for the promotion of space technology application in Nepal either by participating in their events or by presenting its state of art of the technology.

It has successfully convened 23rd ACRS in 2002 in Kathmandu.

13. Steps ahead- Plans and Programmes envisioned for the future

Apart from its regular programs, the Department has initiated several programs in the present context of technological advancement. Brief descriptions of these are given below, but the future plans are by no means limited to these as change with the trend is inevitable:

Re-engineering of Cadastre System

Although the present cadastral database is adequate for the day to day functioning of administration of land, it is found to be deficient in the scientific administration, management and manipulation of land data. To resolve this, the Department has targeted to give priority to the following issues.

1. Preparation and updating of cadastral plans and land data, for districts, which have not been surveyed within the National Geodetic Framework.
2. Numerical cadastre method to be used for mapping for greater accuracy.
3. Preparation of Parcel based Cadastral Information System with a priority to regions of high population density for Land Information System.
4. Preparation of Parcel Plan of land, and provide the data to the respective landowners, with a precedence to municipal areas.

National Geographic Information Infrastructure

In order to facilitate data sharing and integration of as much data of various user agencies as possible, and to disseminate the data to the users; the department is striving towards development of multi-resolution topographic database, and to integrate the NTDB with database of the population Census.

Land Resource Information System

Among the different Land resource maps prepared by the Department with the help of the Canadian government, it is found that the Land utilization maps are in urgent need of updating. These maps have to be prepared at a larger scale and should also be update. For this, the existing data will be upgraded with the help of aerial photographs and satellite imagery and by using computerized technology digital database will be prepared.

National Atlas Information Service

For planning world-class mapping policies and other educational needs, a national atlas is essential. The Department has planned to prepare a National Atlas Information Service to cater to the need.