

A Proposed National Surveying And Mapping Policy In Nepal

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Abstract

The political objective of Nepal is poverty reduction and sustainable development. The sustainable land administration and management is a tool to achieve the political objectives. From an institutional perspective, land administration and management includes the formulation of land policy, the legal framework, resource management, land administration arrangements, and land information management. In Nepal, The draft of National Land Policy document has been formulated and it is under discussion at ministerial level. One of the recommendations on that National Land Policy document is the formulation of National Surveying and Mapping Policy. It is realized that the time has come to formulate the "National Surveying and Mapping Policy" based on the proposed National Land Policy document in keeping abreast of development and changes in the global technological environment. In this paper, an attempt has made to prepare National Surveying and Mapping Policy in Nepal. The main issues and challenges are also raised on this paper to formulate the National Surveying and Mapping Policy in Nepal.

This paper starts with Background and describes the background for developing this policy document. It then describes about Survey Department activities. It then elaborates the policy on Surveying and Mapping in Nepal with policy on Geodetic Surveys and Space Science, Topographic Survey and Geographical Information Infrastructure, Cadastral Survey and Land Information, Research & Development, Resource, Administration. Finally, it concludes with some concluding remarks.

1. BACKGROUND

Land is one of the main resources in Nepal for economic growth as well as overall development of the

country. The land administration and management is the main concern for Government of Nepal to achieve the national objective of poverty reduction. From an institutional perspective, land administration and management includes the formulation of land policy, the legal framework, resource management, land administration arrangements, and land information management.

National Land Policy is of fundamental importance to sustainable growth, good governance, and the well-being of and the economic opportunities for people. It consists of a whole complex of socio-economic and legal prescriptions that dictate how the land and the benefits from the land are to be allocated. In Nepal, comprehensive National Land Policy is yet to be formulated in the new changing contest and the draft policy document is under discussion. There is a need of political commitment to formulate the National Land Policy. National Surveying and Mapping Policy should be based on the National Land Policy. There are various instruments for land administration and management. The surveying and mapping is one of the world wide recognized tool for the land administration and management.

The Ministry of Land Reform and Management (MLRM) is mandated to formulate and implement policies for land administration and management. There are three departments and one corporation (an autonomous body) responsible in the field of mapping, land management and geo information. The land reform and management department mainly deals with the records of land holding, land taxation, land valuation, land ceiling and land tenancy. The Department of Land Information and Archiving is mandated to develop and maintain a nationwide land information system (LIS) and national land records archive. Similarly, Guthi Corporation is responsible for managing trust land and to maintain the management of the worship in temples and other cultural and religious heritage of Nepal.

Survey Department is responsible for the national surveying and mapping activities in Nepal. There is also Mapping Committee constituted by land survey act 1963 (revised 1999) for the co-ordination, monitoring and evaluation of surveying and mapping activities.

In order to formulate the plan and policies to guide the survey department, it needs detail formulation of the different activities related to geoinformation production and its distribution. Survey department attempted in the past to formulate its plan and policies and published a book on national mapping (issues and strategies) 1998. The National Land Policy document has been formulated and it is under discussion. It is realized that time has come to formulate the "National Policy on Surveying and Mapping" based on the National Land Policy document in keeping abreast of development and changes in the global technological environment.

2. Survey department activities

Geodetic Surveying, Topographical Surveying with geo-information services, and Cadastral Surveying with land information services are main activities of Survey Department. The department also assists and coordinates the surveying and mapping, geographic information and land information system activities conducted by different agencies in Nepal.

Geodetic Surveying activities of Survey Department are:

- to establish and maintain National Geodetic Control Network including horizontal control, vertical control with bench marks and gravity anomaly of the country
- to establish and archive national geodetic data base of the country with proper computation and adjustment.
- to make available the geodetic horizontal and vertical ground control data for the users of development activities.

Topographical surveying and geo-information activities of Survey Department are:

- to provide aerial photography and prepare orthophoto maps as required,
- to prepare, publish, update and make available national topographic base maps and national

- topographic data base with related information,
- to prepare, update and publish small-scale topographic maps, administrative maps and land resource maps of the country.
- to prepare map specification reports and co-ordinate the activities of aerial photography, surveying and mapping, geographic information system and small scale maps publication and their distribution.

Cadastral surveying and land information services of Survey Department are:

- To prepare large scale cadastral plan and records of governmental, private and public land of all the districts of Nepal and distribute land certificate to the landowners.
- To co-ordinate land information system activities.
- To update and maintain the large scale cadastral plan and records of all the district
- To delineate the parcel boundary if required.
- To co-ordinate the integrated land development programs land pooling and land acquisition for development works of different agencies.
- To provide services on land information for the land owners

3. Policy on surveying and mapping

All socio-economic developmental activities, conservation of natural resources, planning for disaster mitigation and infrastructure development require high quality spatial data. The proposed Surveying and Mapping Policy has been formulated based on the draft National Land Policy document. Survey Department is responsible for producing, maintaining and disseminating geoinformation throughout the country. The policy has been formulated based on the legislative and institutional framework for the surveying and mapping activities in Nepal.

3.1 Vision

“To produce and make available high quality geo information products and services for sustainable land administration and management as well as planning and various lands related development activities to achieve the

national objective of poverty reduction and sustainable development”

3.2 Objectives

The surveying and mapping policy shall be formulated to achieve the following objectives of the survey department

- To establish and maintain the national horizontal and vertical control network of the country.
- To publish, maintain, update and make available national topographic base maps, including small-scale maps and other different types of maps and related information and their subsequent updating.
- To maintain cadastral system and develop parcel based national land information system based on large scale cadastral plan and land records.
- To study technical development activities in the field of surveying and mapping and formulate the necessary activities as required in this field.
- To provide the geo information services and co-ordination of the different agencies involved in the field of surveying and mapping.
- To formulate and recommend the concerned authority of the government about the plan and policies of surveying and mapping activities of the country.
- To promote the use of geospatial knowledge and intelligence through partnerships and other mechanisms by all sections of the society and work towards knowledge-based society.

3.3 Issues and challenges

There are some issues which are not addressed properly and need to be address on the surveying and mapping policies such as efficient & effective updating national topographic data base, pricing policy of geo information products like national digital topographical database and ortho photo, cadastral survey & its updating, cadastral survey of the un surveyed village block areas and uncultivated government lands, high accuracy cadastral maps on dense areas, the 3D cadastre with condominium ownership of housing, access & use of land information, growing demands for the use of RTK GPS data, review of the spheroid , projection system & national geodetic control network of the country, the focal institution to promote

space technology in Nepal, formulation of space law, human resources development and use of modern technology etc.

The following are the main challenges on surveying and mapping sector in Nepal:

- Review on national surveying and mapping policy : Implementation of norms and standard of surveying and mapping on all the mapping agencies, research and development, wider sharing of geographic information and maps, coordination of different agencies involved, collection & maintenance of geographic/land information/geographic names and human resources for the surveying and mapping.
- Maintenance of cadastral maps and documents: Strengthening of district cadastral survey offices. Require physical facilities. Monitoring system through regional office. The existing cadastral maps are very old and the parcel boundary on the maps are unclear
- Updating national topographic data base and topographic base map series and preparation of small scale map: The topographical maps should be updated regularly in certain interval of time period.
- Maintenance of geodetic network, Geodetic survey activities and research: The extension and densification of higher order geodetic control points are required. Re-observation and subsequent computation & adjustment of the extended geodetic control network are required to define the positional accuracy of the geodetic control point.
- Unavailability of sufficient gravity points distributed all over the country: Gravity anomaly map and magnetic charting of whole country needs to be prepared.
- Coordination between the national /international survey agencies: Global control network and mapping, boundary survey, sharing of geographic information, congress – seminar,etc.
- Collaboration with the national /international educational institution/university: Human resource development on strengthening geodetic survey capacity, development of land information services and development of digital mapping system
- Development of digital mapping system: Cadastral Information System , Land Resource Information System and National topographic data base (System development, data acquisition, updating, data

generalization ,digital production system and information dissemination etc)

3.4 National policy on Surveying and mapping

On the basis of the goal, objectives and issues, the national policy on surveying and mapping is identified on the following fields:

- Geodetic Surveys and Space Science
- Topographic Survey and Geographical Information Infrastructure
- Cadastral Survey and Land Information
- Research & Development
- Resource
- Administration

3.4.1 Geodetic Survey and Space Science

Geodetic data includes horizontal and vertical ground control points distributed all over the country in their own network system. The development and maintenance of horizontal and vertical ground control networks comes in the responsibility of the national government. These data are the main bases for national and regional mapping activities. Homogeneous, accurate and well-maintained geodetic control networks are also the prerequisites for geographic information systems/ Land information system. Geodetic, astronomic, gravimetric data are required to define the shape and size of the earth corresponding to the country. This information is also useful to study the outer space events and also to detect deformation of earth structure.

Geodetic Surveys policies of Survey Department are

- Precise higher order geodetic control network (horizontal and leveling network) shall be carried out by Survey Department and maintain the records in an archive.
- The lower order control network (i. e. horizontal and vertical) for large scale map preparation shall be carried out by Survey Department and maintain the records in an archive. Permission of lower order control survey may be granted to other agencies with the condition that the control survey shall be carried out within the stipulated specification and the control survey data shall be provided to Survey Department for quality control and archiving.
- Gravity points shall be established on all over the

country so that gravity anomaly map shall be available to know the gravitation field of the country.

- Magnetic observations shall be carried out at different places of Nepal for the preparation of magnetic charting of the country.
- Maintenance of geodetic ground control points (i.e. first, second and third order) and precise bench marks shall be carried out to ensure that the position of points are not disturbed in the field.
- GPS tracking stations shall be established for the real time GPS data capturing
- Survey Department shall promote the users to use geodetic data for development activities and collect the revenue by selling control points coordinates and bench marks data.

Space Science policies of the Survey Department are

- Survey Department will be the focal point for users to contact for using high resolution satellite imagery data and aerial photographs in the country
- Survey Department shall coordinate and provide technical supports for the aerial photography and space technology
- Survey Department with Ministry of Science and Technology shall coordinate for the promotion of satellite technology
- Space law shall be formulated based on the existing laws
- Satellite technology shall be introduced for large scale mapping

3.4.2 Topographical Survey and Geographic Information

Topographic survey includes the preparations of topographic base maps, derived scale topographic maps, thematic mapping, the development and maintenance of horizontal and vertical ground control networks comes in the responsibility of the national government. Land resources mapping and large scale topographic mapping. Topographic base maps are an important general source of information for any land related inventory, planning and implementation of the development projects. Derived/ administrative maps, Thematic maps/land resource maps, and large scale maps are required for nation-wide development, administration and statistical purposes.

Topographical Survey policies of Survey Department are

- Topographic base maps and digital database of terai and middle mountain region of Nepal shall be prepared at the scale of 1:25000 with 20m contours.
- Topographic base maps and digital data base of higher mountains region of Nepal shall be repaired at the scale of 1:50000 with 40m contours.
- Geographic information system (GIS) and Remote sensing (RS) tools shall be used and provide services for the study, monitoring and management of socio-economic, environmental and other development projects.
- Total updating of base maps shall be carried out on a 10 to 20 year cycle through the use of new airborne or space borne imagery.
- Small-scale maps (i. e. derived administrative maps) shall be prepared to assist general planning and decision making process of various governmental and non-governmental organizations.
- Land resource maps/land use maps and corresponding reports shall be prepared in co-ordination with other agencies concerned.
- Atlas, tourist maps and wall maps shall be prepared with the co-operation with the other agencies concerned.
- Large scale maps for development projects and urban area digital topographic data base shall be prepared upon the request of various development projects and municipalities.
- Large scale aerial photography of selected region shall be carried out and orthophoto maps shall be prepared upon request of other agencies.

Geographic Information policies of the Survey Department are

- The institutional and technical framework for NGI centre shall be defined
- The custodianship of framework data shall be with Survey Department
- Clearing house shall be developed for the access and use of actual data sets through metadata
- The standard of metadata shall be defined and make available for all the stakeholder

3.4.3 Cadastral Survey and Land Information

Cadastral survey includes the recording of location, extent, land ownership rights, area, land use and the physical characteristics of a parcel. Special care should be taken in the preparation of cadastral maps and records as this concern with the individual land property right, the social order and the public confidence.

Cadastral Survey policies of Survey Department are

- Large scale cadastral plans and land records shall be prepared for all the districts of Nepal on the basis of national geodetic control system to cover all the government, private and public land of the country and distribute the land ownership certificate.
- Each and every parcel in urban areas shall be adjudicated and individual parcel plan with dimension shall be prepared as per the boundary demarcation by survey monuments
- Cadastral plan and relevant records shall be updated and maintain on all the districts as requested by the district land revenue offices.
- Delineation of parcel boundary shall be carried out upon the request of landowners.
- Technical assistance on cadastral survey shall be provided to the various governmental organizations including municipalities.
- Complete records of government as well as public land shall be prepared
- Public-public and public-private co-operation shall be introduced for cadastral surveying
- Partnership with local authority for the creation and sharing of digital cadastral database
- Total Quality Management principal shall be developed to verify the works carried out by private sectors/licensed surveyors

Land Information policies of the Survey Department are

- The maintenance of spatial parts of land information shall be with Survey Department
- The rights and restriction for the use and access of land information will be defined
- E-conveyance method with digital signature will be introduced for the electronic transaction of land ownership to promote e-governance
- The computer technology shall be introduced for

- cadastral surveying and cadastral map printing
- Partnership shall be done with local authority, private sector and academia for the development of national wide land information system

3.4.4 Research and Development

Research and development (R&D) on surveying and mapping is necessary to look into technical developments taken place, to formulate the necessary adjustments to the working procedure of various phases and to introduce new functions in surveying mapping activities.

Research and development policy of Survey Department

- Geodetic observation and analysis of the computed results shall be carried out to determine the shape and size of earth and corresponding most suitable geoid for the country.
- Research and development in the field of geodesy and astronomy shall be carried out for analyzing and monitoring precise geodetic information in collaboration with national and international agencies.
- Quality assessment of the topographic base maps and geographic information shall be carried out to make the recommendation for the improvements.
- Quality assessment of the land information product and the cadastral survey system shall be carried out for a reliable land administration.
- Research and development in the land administration sector shall be carried out to solve the various technical and socio-political issues on land management

3.4.5 Resource Policy

Resource policy includes the human resources, equipment for the production process and technology required for surveying mapping activities.

The Resource policies of survey Department are:

- Seek the co-operation with the other national and international institutions/universities to train the lower, middle and higher level of technicians in the field of Geoinformatics and land management.
- Promote the survey professional to attend national

/ international workshop seminar and conference.

- A system shall be developed to provide the survey license to the qualified surveyors
- Out source the laborious and tedious jobs to the private sectors
- Establish a lab for calibration of Survey equipment and publish specifications and manuals.
- Drive towards the cost recovery policy

3.4.6 Administration Policy

Different agencies use maps and geo-information data produced by Survey Department for land related applications. Some of them have their own special map production units. At present map and geo-information data producer have no obligation to take into account the consistency and compatibility of the system. Duplication of work is another problem in geographic information system and services.

In recent years changes have occurred in surveying and mapping technology with the introduction of computer techniques and space science. Therefore an integrated approach to system co-ordination and management should be developed to ensure efficient and effective application.

Administrative policies of Survey Department are

- Map specification and standard shall be set by Survey Department to follow in all surveying and mapping works.
- Private survey companies and licensed surveyors shall involve in surveying and mappings activities for reliable and quality of the geoinformation products.
- Mapping committee constituted by land survey act 1963 (revised 1999) shall be activated for the co-ordination and management of different agencies involved in the geoinformation system and services as well as monitoring and evaluation of surveying and mapping activities.
- An effective marketing and customer information program shall be lunched to promote the use of maps and geo-information data for development activities.
- Customers satisfaction shall be assessed and user council shall be formed
- Organization restructuring shall be done to cope with the technological development.

4. Concluding remarks

The proposed National Surveying and Mapping policy is formulated based on the draft National Land Policy document. The vision of policy is defined as “To produce and make available high quality geo information products and services for sustainable land administration and management as well as planning and various lands related development activities to achieve the national objective of poverty reduction and sustainable development”. Based on this vision the policy on Surveying and Mapping in Nepal are formulated and policy on Geodetic Surveys and Space Science, Topographic Survey and Geographical Information Infrastructure, Cadastral Survey and Land Information, Research & Development, Resource and Administration are discussed on this paper. The main issues and challenges are also raised in this paper for the formulation of Surveying and Mapping Policy.

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