



# Survey Department in the Arena of Earth Observation

(A Brief Country Report)

**Nagendra Jha**

Chief Survey Officer

Survey Department

Nepal

2<sup>nd</sup> GEOSS AP Symposium

April 14-16, 2008

Japan

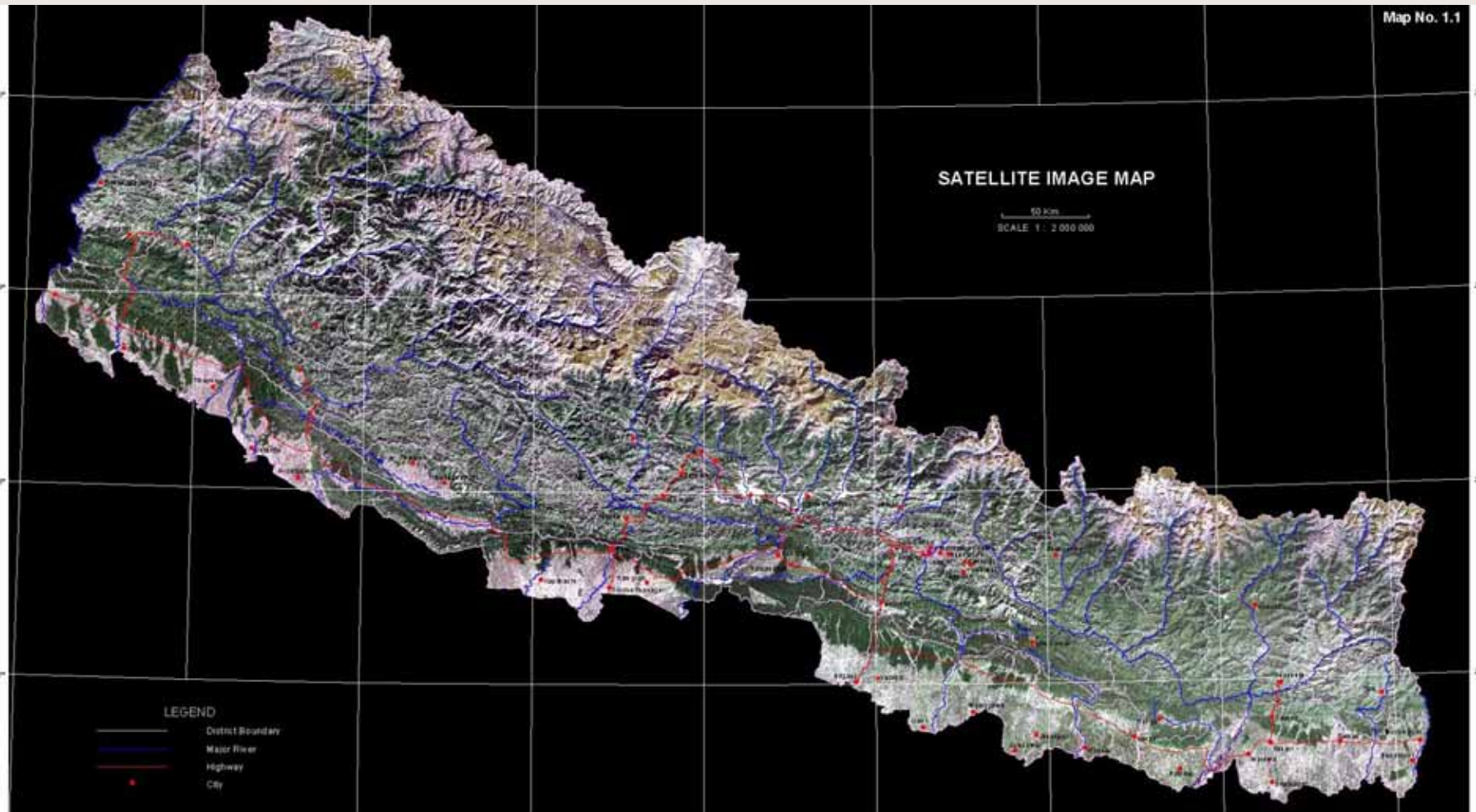
# Introduction: The Country Context

- Nepal is a land locked country bounded by China and India
- Geographically
  - ( $26^{\circ}22'$  -  $30^{\circ}27'$ ) North Latitudes
  - ( $80^{\circ}04'$  -  $88^{\circ}12'$ ) East Longitudes
- Diversities in various aspects
  - Height: 60m to 8848m MSL
  - Various castes, religions, languages etc
  - Living Standard/Style, rural-urban, poor-rich, Himalayan-*Terai*
  - Physiography: (Terai, Churia/Siwalik, Mid hill, Mountainous, Himalayas)
- Only about 67% of land is suitable for human settlement



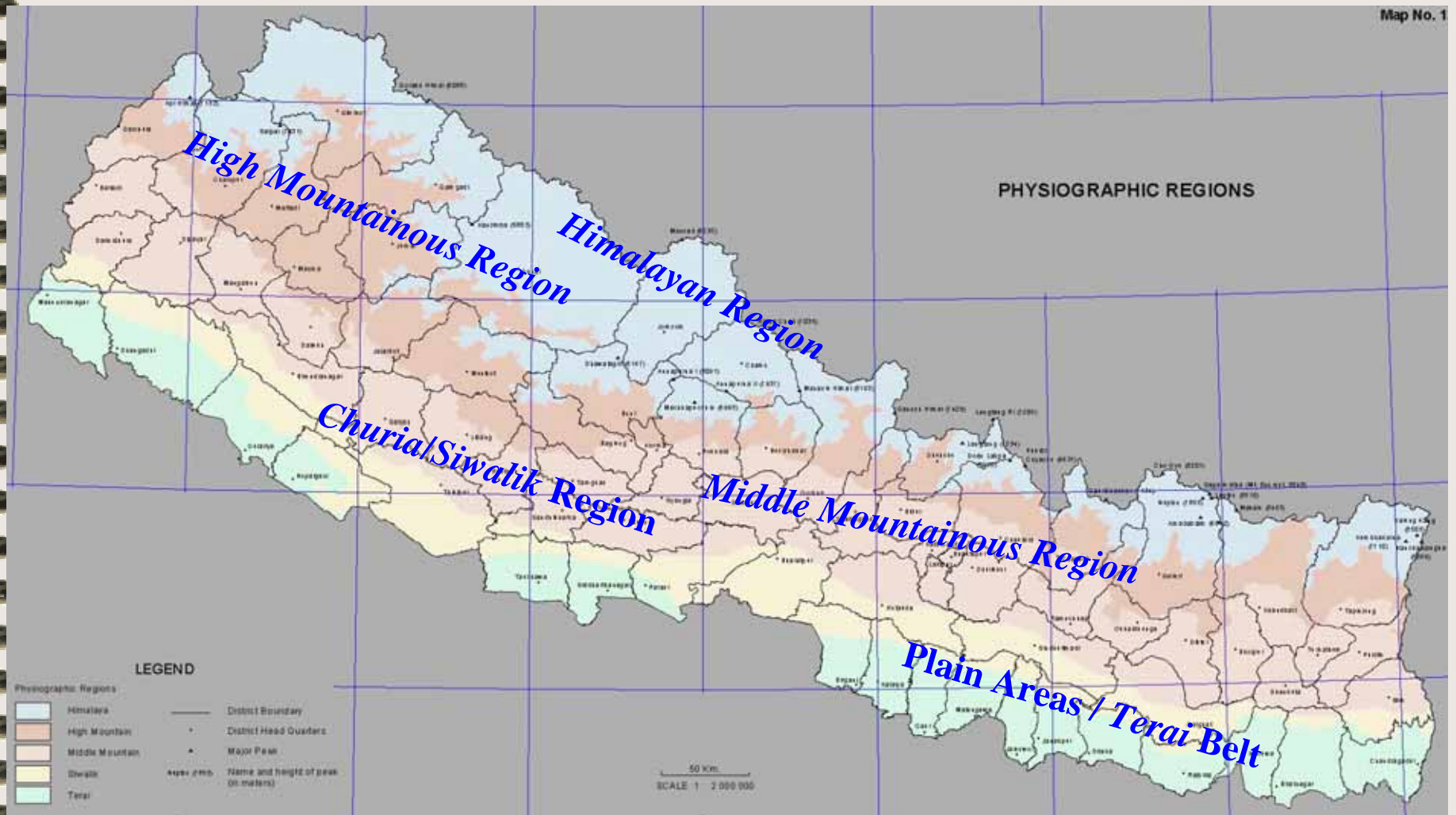
# Introduction...

## Satellite Image Map of Nepal



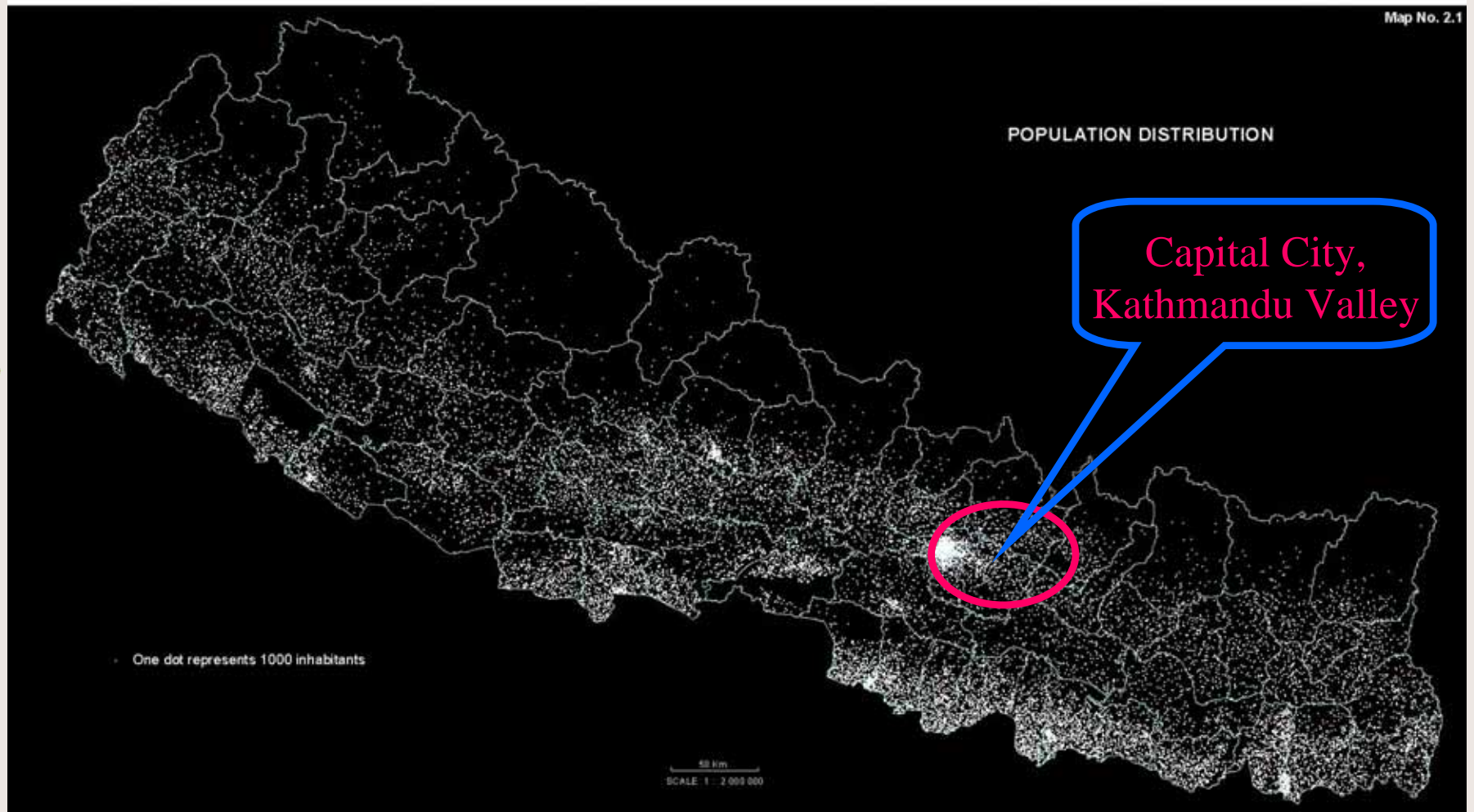
# Introduction...

## Physiography of Nepal



# Introduction...

## Population Distribution of Nepal



# Survey Department

- Mandate from the government for surveying and mapping
- Focal Point for **APRSAF**
- Member of other international organizations

GEO

SNAC

GSDIA

FIG

ISCGM

AARS

PCGIAP

Asia Pacific Regional Space Agency Forum, Group of Earth Observation, SAARC Networking Arrangement on Cartography, Global Spatial Data Infrastructure Association, Federation Internationale des Geometres, International Steering Committee for Global Mapping, Asian Association on Remote Sensing, Permanent Committee on GIS Infrastructure for Asia and the Pacific

# Institutional Setup

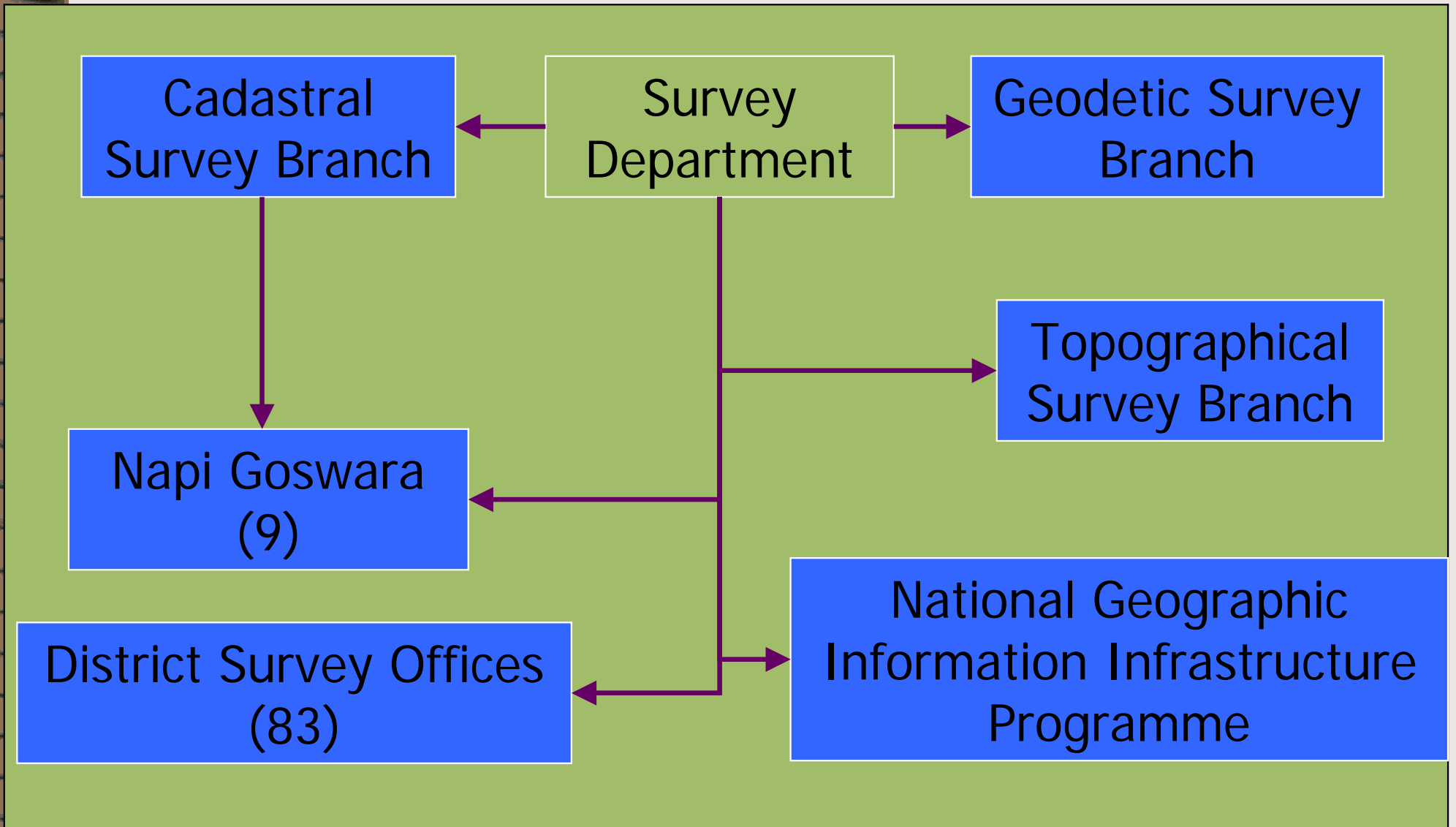
- Three main branches viz. **Cadastral Survey Branch**, **Geodetic Survey Branch** and **Topographical Survey Branch**.
- Nine Mobile Survey Offices locally called **Survey Goswara** responsible for cadastral survey in the districts.
- 83 district level **Survey Offices** taking care of updating cadastral 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.

## Institutional Setup...

- 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.



# Organization



# The present status of surveying and mapping

- By mid 1980s, **land resources mapping** was completed comprising basically of land utilization, land system, land capability and geological maps.
- 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.

# The present status of surveying and mapping ...

- Based on the new series of topographic maps 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 at different scale such as district level, regional, national, and global level applications by generalizing the basic NTDB datasets

# The present status of surveying and mapping ...

- Satellite positioning has been introduced
  - in establishing the control network at lower levels.
  - 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.

# The present status of surveying and mapping ...

- 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 in **updating basic topographic maps** and data.

# Roles and Efforts

- Gradually changing its role of providing services to assuming a lead role in regulating the national surveying and mapping activities.
- Its efforts are directed toward:
  - Development of environment for meaningful sharing of geo-spatial information at large
  - Fostering cooperation among the partner agencies including private sectors for developing institutional framework, policy directives etc.
  - Development of human resource as required
  - Gradually transforming present pool of human resources receptive and adaptive to new technology.

# Important activities

---

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

# GII initiatives

- The NGII Programme was initiated with an overall objective of developing a National GII in the country.
- The programme 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.
- Published socio-economic atlas in hardcopy and CD-ROM format and has started disseminating the results through the web as well.
- Metadata system has been developed into an operational system.

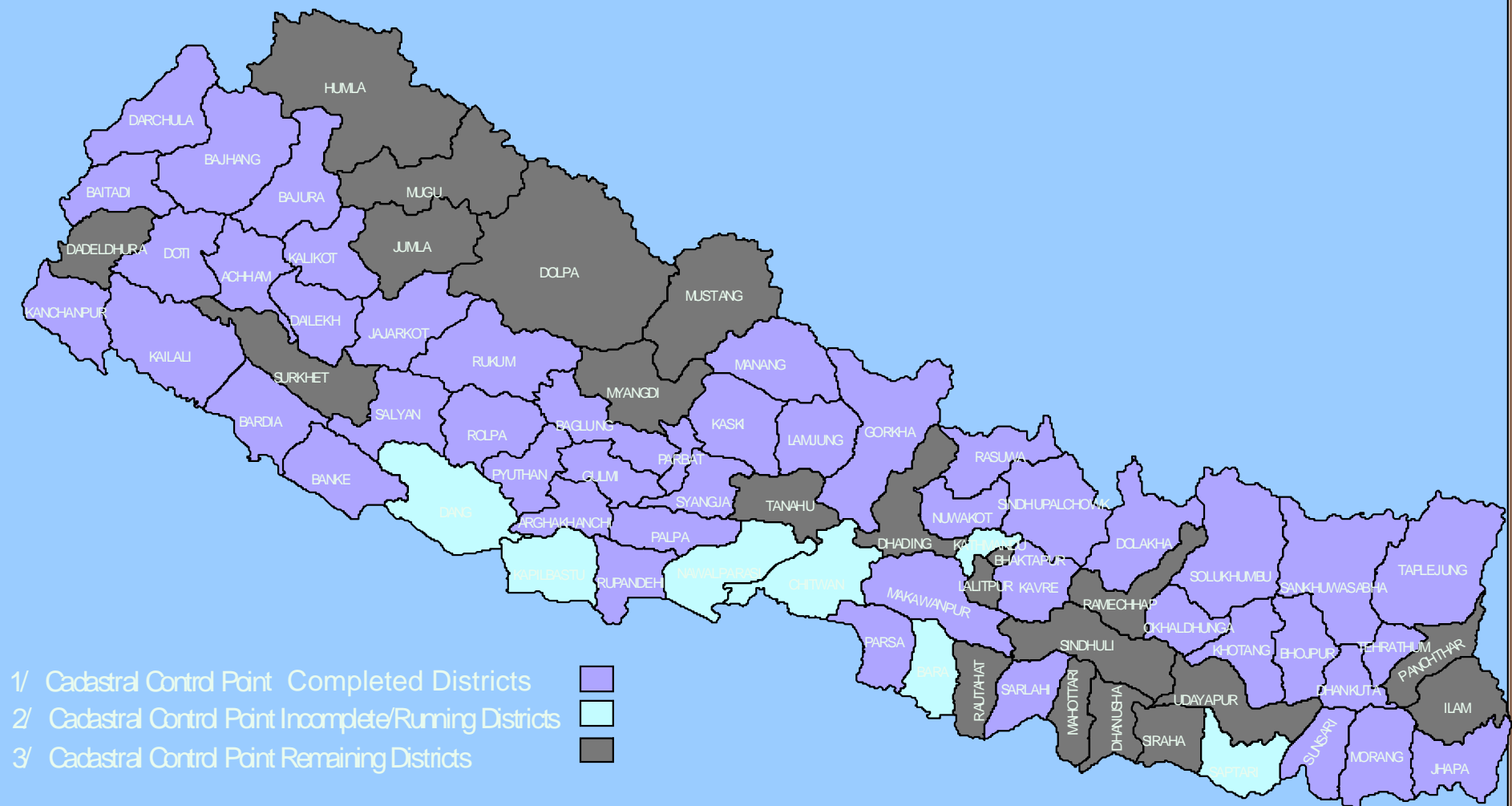


# Geodetic Surveys

- A geodetic network of 68 first order geodetic points having 16 Doppler points has been established during 1981-84.
- Absolute gravity measurement at first order points and gravity transfer connecting Colombo and Bangkok.
- Extension of lower order geodetic network of the country has been completed in 47 districts out of 75 districts.
- Geodetic levelling net (6430 km) along the highways and roads of the country.
- Nine absolute gravity stations established.
- Geoid Nepal 1997 defined based on gravity measurements at some 1712 stations.
- Geodetic observatory near Kathmandu served as the base stations for triangulation. Star observations until 1990s. Now regular GPS measurements and is being developed into a permanent tracking station.



# Network extension for cadastral survey:

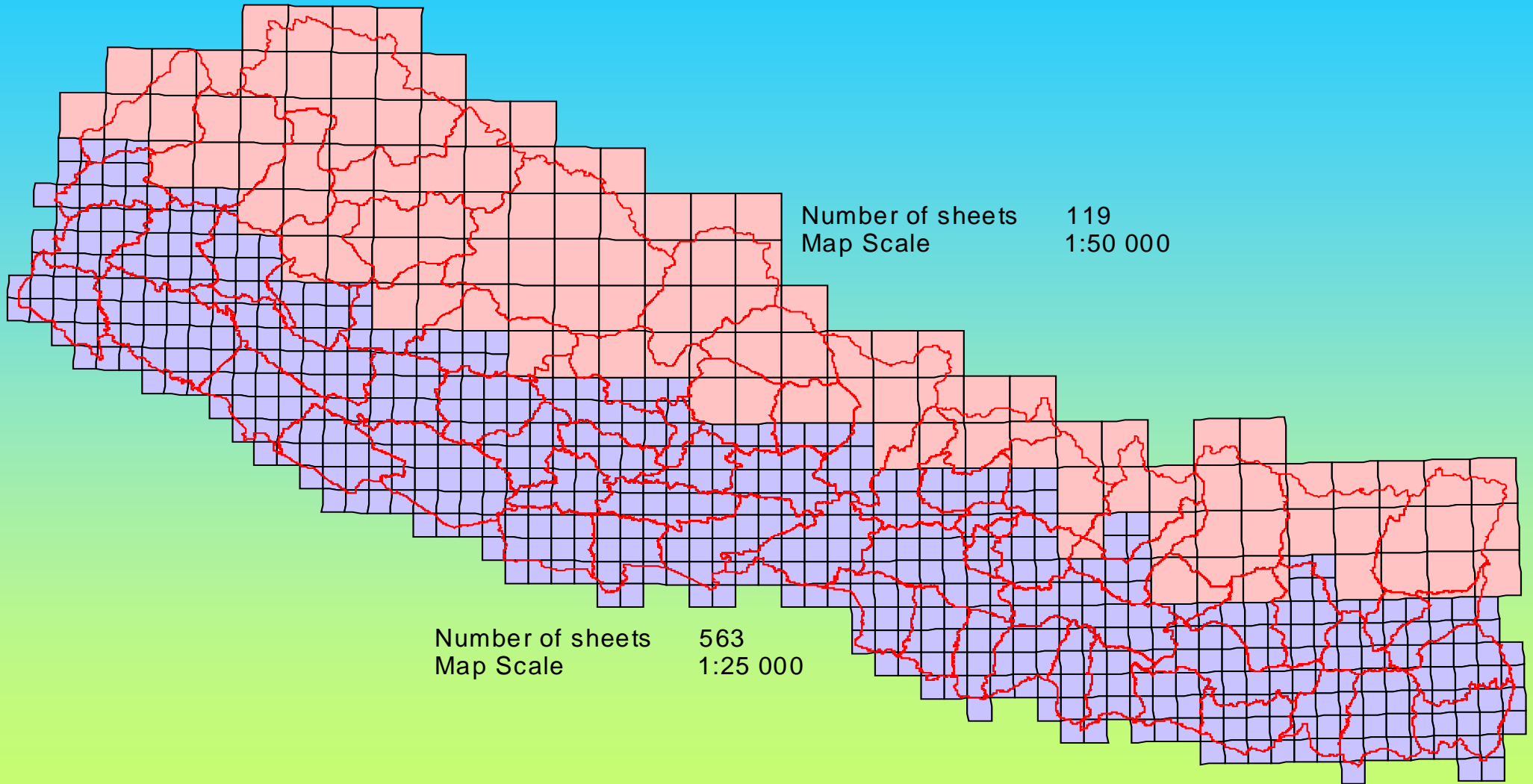


# Topographic Surveys

Apart from regular production of administrative maps the department is currently involved in:

- Generalization of basic topographic maps 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.
- Topographic surveys as and when required depending on the demand.

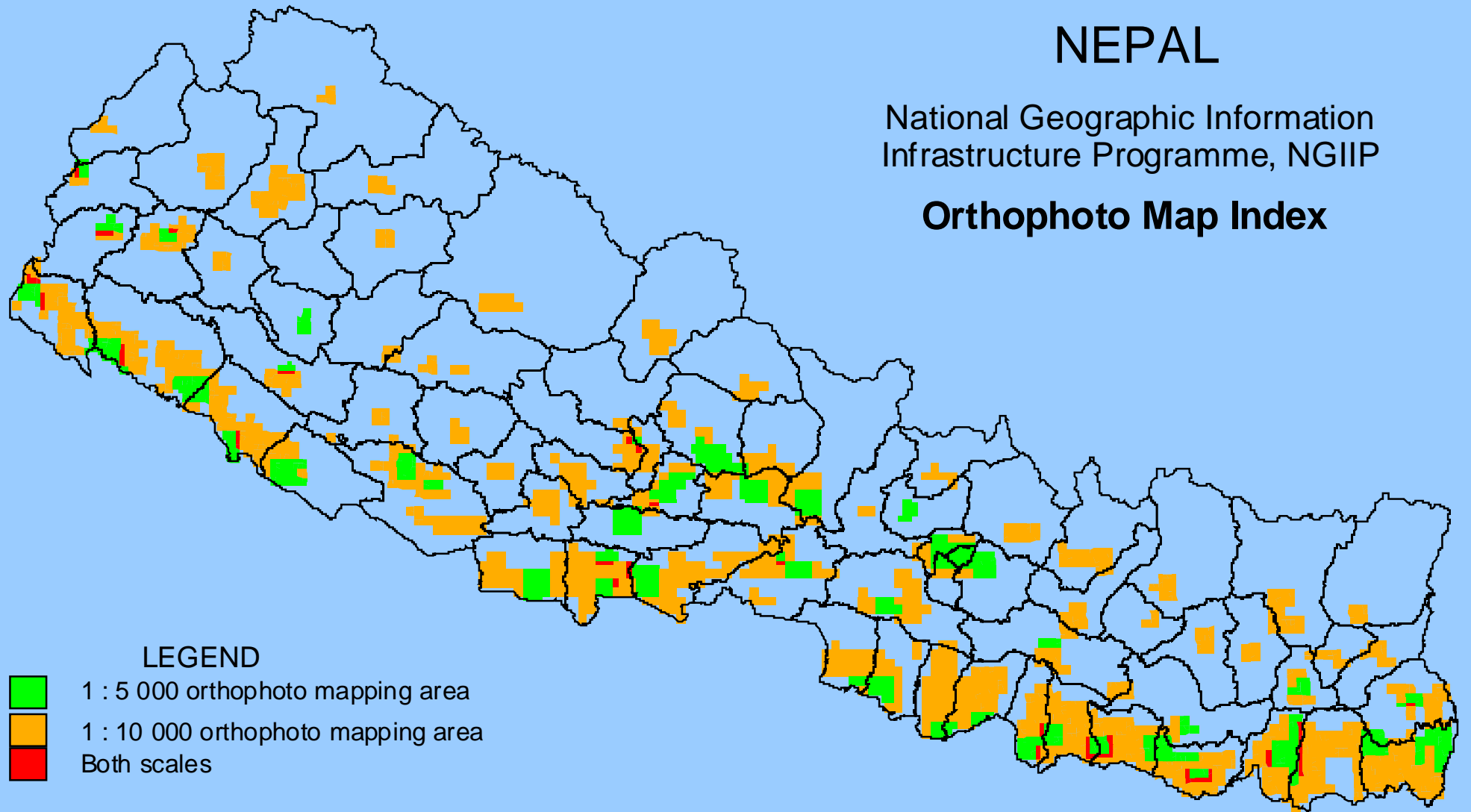
# FUNDAMENTAL DIGITAL TOPOGRAPHICAL DATABASE AVAILABLE AT SURVEY DEPARTMENT



# NEPAL

National Geographic Information  
Infrastructure Programme, NGIIP

## Orthophoto Map Index



# Cadastral Surveys

- Complete cadastral surveying of the country in 1995 for the first time - 38 districts out of 75 districts were surveyed based on local controls. Cadastral resurvey activities taken up in those districts to prepare new cadastral maps based on national geodetic control network.
- 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 accuracy and maintenance, the department 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 higher land value. This will have a great impact on the development of LIS in the country.

# Digital Cadastre

---

- 3 wards of Banepa Municipality as Pilot Work
- Satisfactory Result
- New Work started in Tikathali and Imadol VDCs of Kathmandu District



# Licensing

- The department has started issuing Licenses to the Surveyors
- 27 Licensees has been issued for the first time
- Code of Conducts for the Surveyors has been defined
- The Department is currently working on the modalities of issuing license for different category to private surveyors in order for them to participate in various land survey activities in the country.

# Publications

Some of the publications apart from regular surveying and mapping products are;

- Nepalese Journal on Geo-informatics - annually.
- List of Geographical Names Volume I to V, New versions planned; Volume II, IV and V published recently.
- Working manual of Cadastral Survey 2060 BS
- Proceedings:
  - Colloquium on the Role and Functions of Survey Department in the context of Broader Technological Development (2005 AD).
  - Seminar on Space Technology Applications and Recent Developments in Geo-spatial Products (August 17, 2005).
- Socio-economic Atlas (2005 AD)
- School Atlas (2001)

# Mapping Committee

Mapping committee has been constituted to facilitate publishing of different mapping products and also to maintain minimum level of standards. Its main responsibilities are as follows:


- To assist various ministries, departments and organizations in the preparation of maps and provide authorizations for publication of maps.
- Store all published maps in a central repository in the Department for security purpose.
- Bring about uniformity in the mapping procedures.
- 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.

# Participation in international forums

- Survey Department has participated in different international activities. It is also affiliated with several agencies.
- The department is regularly in communication with these organizations 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.
- **Published global map ver. 1 through ISCGM and in the process of publishing ver. 2.**
- It also has successfully convened 23rd ACRS in 2002 in Kathmandu.

# FengYunCast Geo-System

- China Meteorological Administration CMA has granted FengYunCast Geo-System User Station to Nepal
- This User Station is installed in Nagarkot Observatory in Kathmandu
- Data is yet to be received since the installation is not finalized
- The system will deliver data from meteorological satellites FY-2C and FY-2D



## Steps ahead – Plans and Programmes envisioned

---

Apart from its regular programmes, the Department has initiated/planned several programmes, some are:

- Re-engineering of Cadastre System
- National Geographic Information Infrastructure
- Land Resource Information System
- National Atlas Information Service

# Role of Earth Observation Data in Post Conflict Nepal

- To make evidence-based policy decisions,
- To facilitate in formulating need based plans,
- To take precautionary initiatives to save lives and destruction of infrastructures from natural disasters
- Ultimately, In the context of reconstruction of post-conflict Nepal, it is expected that the earth observation data could be optimally used as fundamental tool for the development activity to make it sustainable.

# Earth Observation Data producers in Nepal

---

- Survey Department, the National Mapping Organisation of Nepal
- Land Use Project, Ministry of Land Reform and Mgmt
- Department of Mines and Geology
- Department of Forest
- Department of Water Induced Disaster Prevention
- Ministry of Agriculture and Cooperatives
- Department of Hydrology and Meteorology
  - Metropolitan Cities / Municipalities for land resource maps
- International Center for Integrated Mountaineering Development (ICIMOD)
- Many more other organisations, NGOs / INGOs



# Efforts of Survey Department in Earth Observation Sector

- Participation in the activities of international professional organisations to introduce newer concept and technologies
  - Associated with **FIG, GSDIA, AARS, ISCGM, PCGIAP, APRSAF, GEO and SNAC** (SAARC Networking Arrangement on Cartography, Presently chaired by the Director General of Survey Department Nepal)
  - Convened successfully **23<sup>rd</sup> ACRS** in 2002 in Kathmandu
  - Published **Global Map Data of Nepal** ver. 1 through ISCGM and in the process of publishing ver. 2

# Efforts of Survey Department in Earth Observation Sector...

---

- Worked with some mini-projects supported by **JAXA** in Disaster Management sector.
- The department is making its best effort to support the implementation of **GEOSS-10 Year implementation plan**

# Constraints of Space Application in Nepal

- Lack of sufficient allocation of budget and resources for the investment in space technology application sector
- Lack of proper education, research and awareness in the field of space technology
- Lack of proper human resources and the expertise
- Lack of data sharing and co-ordination policies among the organizations involving with space technology application
- Lack of recognized platform to develop the overall space technology to improve access, sharing, integrated and use of space data

# Regional Cooperation Expected

---

## ➤ Human Resource Development

- Looking for opportunities of Advanced Trainings and Academic Degrees in Space Technology Sector
- Participation at Regional Seminars Workshops etc

## ➤ Resource/Data Sharing

- Establishment of Regional Spatial Data Infrastructure is recommended
- Survey Department expects its role as nodal point for one of the region within Asia Pacific

## ➤ Disaster Monitoring

- Capacity Building for data interpretation and Use

A graphic of a spiral-bound notebook with a brown cover and a white page. The spiral binding is on the left side. A thin horizontal line is drawn across the page, just above the text. The text "Thank You for your Kind Attention" is centered on the page in a white, outlined font.

Thank You for your Kind Attention