

# **Integrated Earth Observation for Sustainable Development in Post-Conflict Nepal**

**Toya Nath Baral**  
**Director General**  
**Survey Department**  
**Nepal**

GEOSS Symposium  
Tokyo, Japan  
11-12 January 2007.

# Contents

- The country context
- Major factors affecting socio-economic development of Nepal
- Expectations of Nepalese People in post-conflict Nepal
- Role of Earth Observation Data in Post-conflict Nepal
- Earth observation data producers in Nepal
- Problems in using Earth Observation Data
- Need of Integrated Earth Observation
- Efforts of Survey Department
- Conclusion

# The Country Context

Area: 147,181 Sq. K.M.

Diverse geographic patterns

Mt. Everest and Mt. Kanchanjanga (the first and third highest peaks in the world) lie in the country

Population: 23 Million

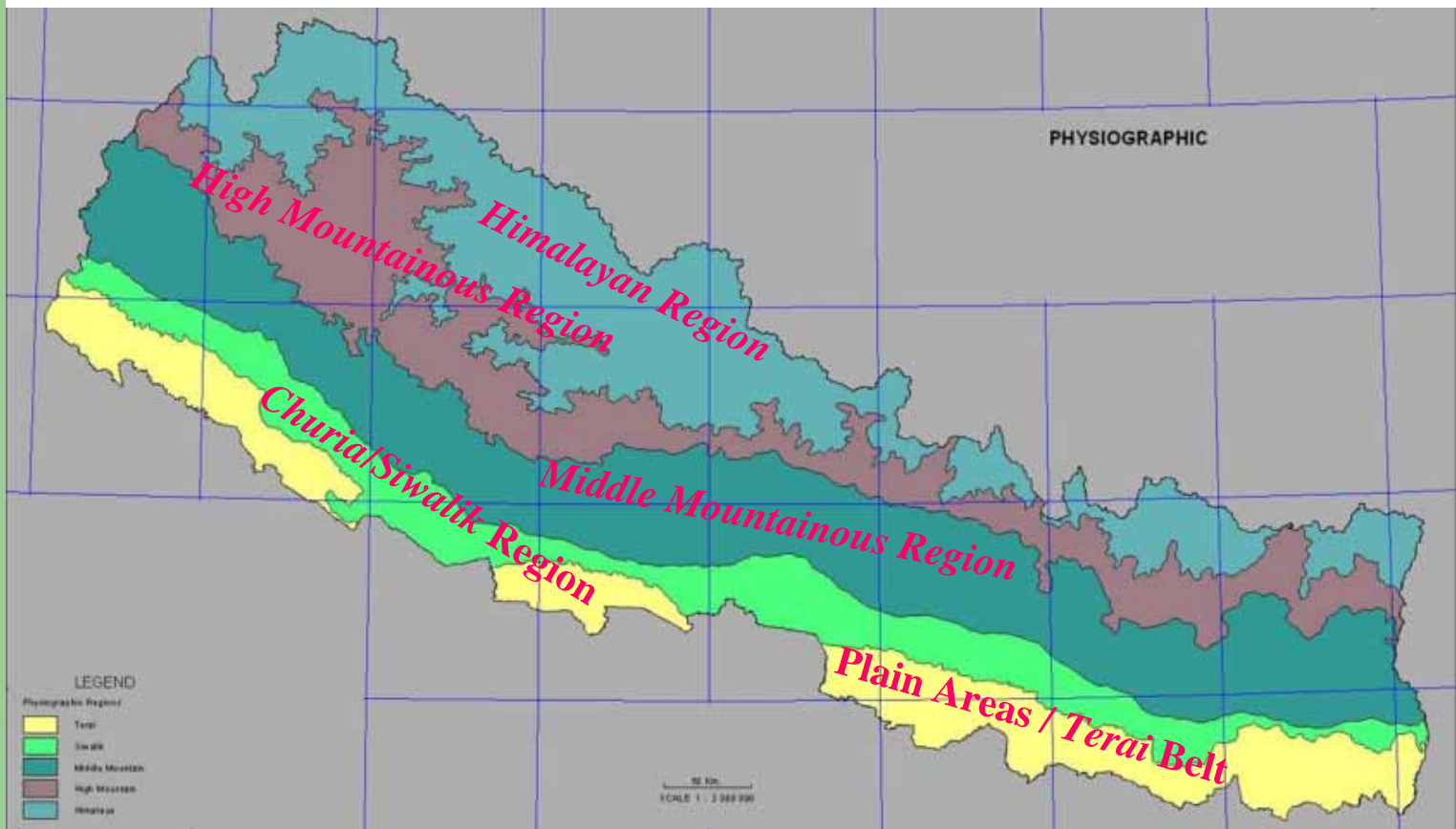
Water is the most important natural resource (83000MW energy can be generated, less than 1 % has been generated)

Government Systems are in transition after a decade long violent conflict

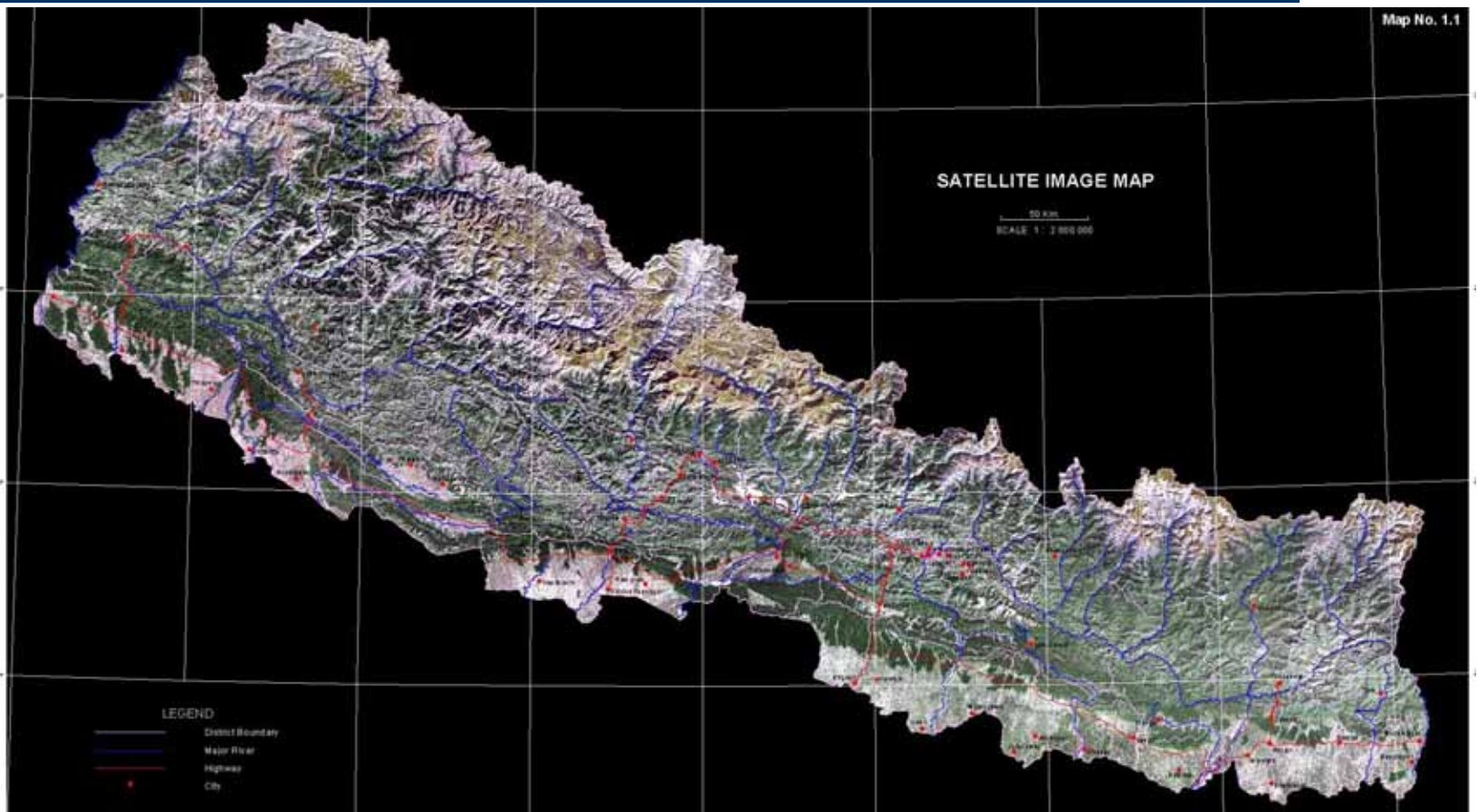
Post-conflict Agenda is “Reconstruction, Restructuring and Rehabilitation” for ‘New Nepal’



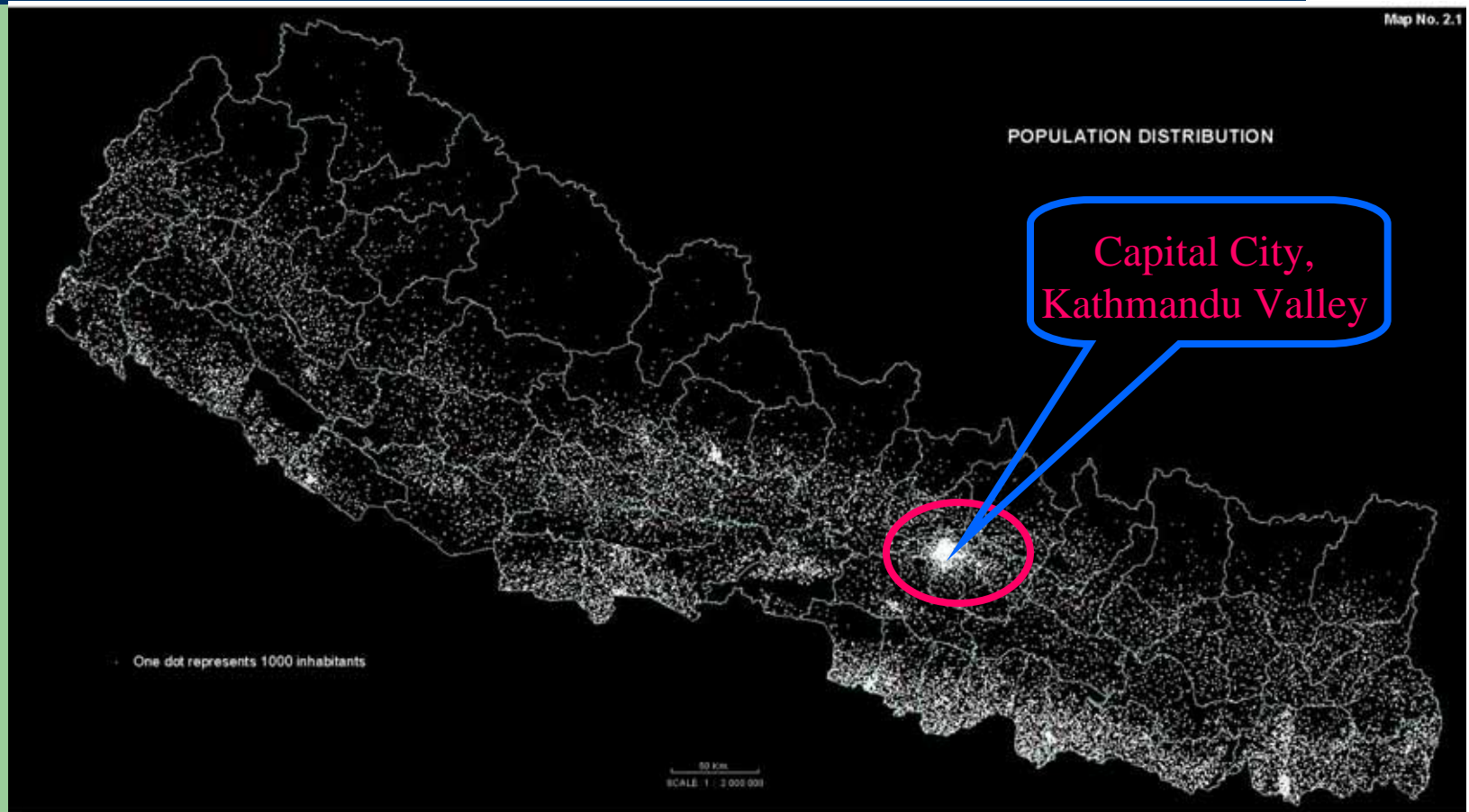
# Physiography of Nepal



# Satellite Image Map of Nepal



# Population Distribution of Nepal





# Major Factors affecting Socio-economic Development of Nepal

- **Cultural and Social Discrimination**
  - Caste System
  - People from so called upper caste has domination over every aspects of Nepalese society
  - Majority of National population from rural/remote area is disadvantaged from national benefits
- **Inequitable distribution of Land**
  - More than 80% engaged with agriculture, covers 40% GDP
  - Majority of population has limited access to land
  - Some groups (Kamaiyas, Sukumbasi's, etc.) have no access to land
  - Women's access is negligibly low

# Major Factors affecting Socio-economic Development of Nepal...

- Difficult geographic terrain
  - Elevation ranges from 60m to 8848 m
  - Only 17% is plain land
  - Only a few part is connected to national highway
  - Difficult to construct physical infrastructures like roads, hydroelectric projects, drinking water projects, irrigation projects, etc.
  - Lots of investment and resources required



# Major Factors affecting Socio-economic Development of Nepal...

- Natural Disasters

- Flood, landslides, out bursting of glacial lakes, earthquakes, epidemics
- Major occurrences of Earth quakes have been experienced
- About 75 % of annual downpour of Nepal occurs over a period of three to four month,
- There are about 12, 000 landslides each year
- At least 44 glacial lakes in the Himalayas are at risk of outburst
- various types of epidemics, each year.
- Soil erosion damages development infrastructure

# Some Examples of Natural Disaster



Damage caused by earthquake



Damage caused by landslide



# Some Examples of Natural Disaster...



Effect of Flood



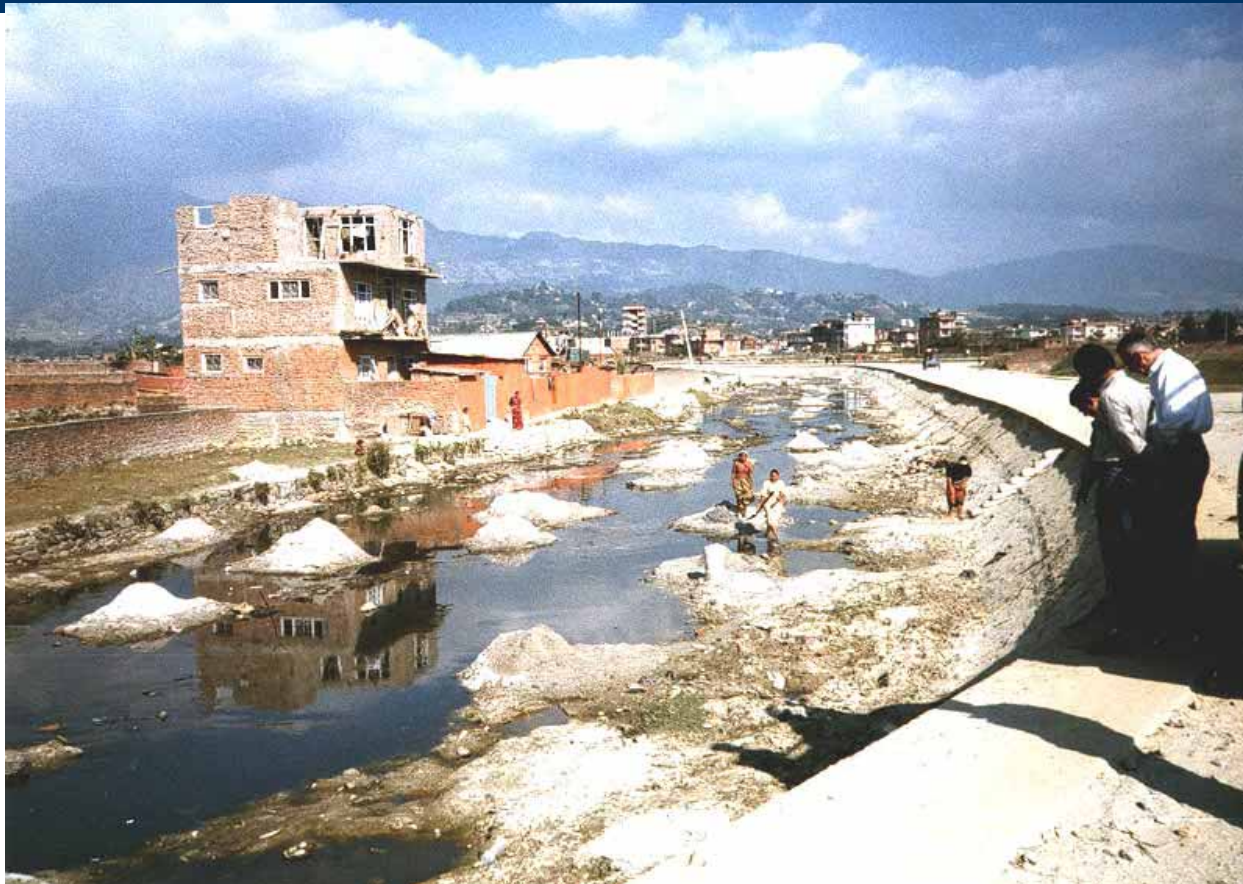
# Some Examples of Natural Disaster...



Effect of Soil erosion



# Human Induced Disaster



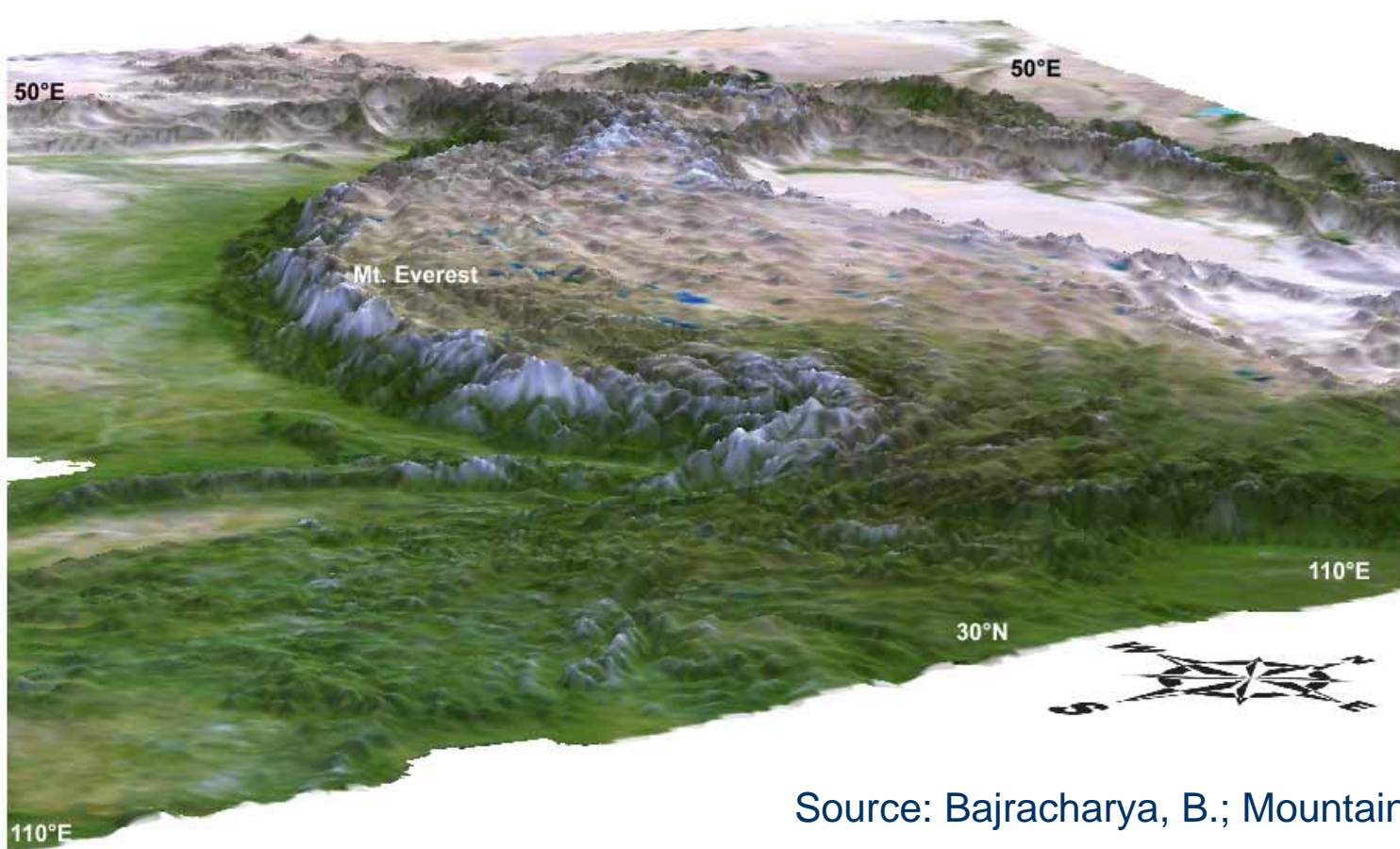
Source: Remote Sensing Section, Department of Mines and Geology



# Glacier lakes of Nepal



# Satellite image of Hindu Kush Region (Perspective View)



Source: Bajracharya, B.; Mountain GIS Portal



# Expectation of Nepalese People in Post-conflict Nepal

- Everlasting peace and security
- Restructuring, reconstruction and rehabilitation
- Rapid growth in the socio-economic condition, equitable access to national benefits, minimal losses from disasters, and good governance
- Sustainable development and prosperous Nepal

# 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**
  - Geodetic data
  - Topographic maps and database
  - Thematic maps / Land Resources Maps
  - Cadastral Information (Maps and attribute data)
  - National Spatial Data Infrastructure initiatives
- **Land Use Project, Ministry of Land Reform and Management**
  - Land use plans for each Village Development Committees / Municipalities throughout the country
  - Airborne and satellite data are used
- **Department of Mines and Geology**
  - Geological maps are produced
  - Airborne and satellite data are used, In situ observations are also performed

# Earth Observation Data producers in Nepal...

- **Department of Forest**
  - Airborne and satellite data are used
  - Maps for forest type classification, land use / land cover classifications, change detection and forest cadastral boundary demarcation are produced.
- **Department of Water Induced Disaster Prevention**
  - River database is produced and hazard maps are prepared for flood affected areas and area affected by glacier lakes outburst
  - Airborne and Satellite data are used
- **Ministry of Agriculture and Cooperatives**
  - mainly involved in agriculture resource management using remote sensing technologies and Geographical Information System (GIS) applications

# Earth Observation Data producers in Nepal...

- **Department of Hydrology and Meteorology**
  - Responsible for weather forecast and prediction in the country
  - Satellite data downloaded through the internet are used
- **Metropolitan Cities / Municipalities for land resource maps**
  - Some of the Metropolitan cities and Municipalities have prepared land resources maps of their territory using remote sensing images and topographic database prepared by Survey Department.
- **International Center for Integrated Mountaineering Development (ICIMOD)**
  - Maps and database of the Hindu Kush –Himalayan Region has been produced
  - Image data is used in larger scale
- **Many more other organisations, NGOs / INGOs**

# Problems in using Earth Observation Data

- Lacking efficient system of providing timely data and products for policy makers.
- Imperfect mechanism for data and information sharing
- Lacking proper data management approaches
- Lacking interoperability and compatibility of geospatial data produced by various organisations
- Lacking professional education, training, and research activities in the country
- Lack of awareness among the users, decision makers, policy makers, planners about the role of earth observation data for societal benefit
- Lack of sufficient funding to establish necessary infrastructure for the production of data as per requirement.

# Need of Integrated Earth Observation in post-conflict Nepal

- Various organisations are involving in producing earth observation data in the country.
- Due to various problems those data are not optimally used for the development activities.
- A strong mechanism of integrated observation through efficient data and information sharing system with effective NSDI could be expected for optimal use of earth observation data produced from various organisation for the sustainable development in Post-conflict Nepal.



# Efforts of Survey Department in Earth Observation Sector

- Being the National Mapping Organisation the department has realized its leading responsibility in the field of earth observation.
- Production and dissemination of various kinds of earth data
- NSDI initiatives have been taken
- Consultative meetings and seminars are organized time to time to enhance awareness about the role and application geoinformation or earth observation data within the professional community.
- A radio program "*Hamro Jamin, Hamro Napi*" is broadcasted fortnightly in Radio Nepal to enhance awareness among general public

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

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

- **Some limitations with Survey Department**
  - Lack of sufficient infrastructure
  - Lack of sufficient and adequately educated human resources
  - Lack of awareness among the potential stakeholders
- **Support is expected**
  - Survey Department expects support from external agencies in its endeavors.
  - International professional organisations can support in capacity building of the department by providing opportunities to participate in their activities,
  - International academic institution can support by providing opportunities of higher studies, and
  - Donor agencies can support in establishing necessary infrastructure

# Conclusion

- To conduct the activities of reconstruction of post-conflict Nepal in a sustainable way earth data are required
- Survey Department is in the position to take leading responsibility to establish a platform for integrated earth observation and provide earth observation data needed for the reconstruction of the country
- Capacity building and infrastructure development at Survey Department is also of primary importance

Thank You very much  
your Kind for very much  
Attention !!!