Asian Program for Regional Capacity Enhancement for Landslide Impact Mitigation (RECLAIM II)

National Training Report

22 – 24 December 2008

Department of Geology and Mines, Ministry of Trade and Industry

&

Department of Roads and Agriculture

Thimpu, Bhutan

Background

The Norwegian Ministry of Foreign Affairs (MFA) and the Asian Disaster Preparedness Center (ADPC) have entered into an agreement regarding cooperation for the implementation of the Asian Program for Regional Capacity Enhancement for Landslide Impact Mitigation (RECLAIM) in seven countries namely Bhutan, India, Indonesia, Nepal, the Philippines, Sri Lanka and Thailand. ADPC is executing the program activities under phase II of the program RECLAIM in collaboration with the Norwegian Geotechnical Institute (NGI), the technical partner from Oslo, Norway and partnering institutions from the target seven countries.

The goal of the RECLAIM project is to reduce the landslide disaster vulnerability of human settlements, infrastructure, and critical facilities in the targeted countries of Bhutan, India, Indonesia, Nepal, the Philippines, Sri Lanka, and Thailand. Phase II of the RECLAIM project intended to provide a platform for landslide specialists and decision makers to come together and share the experiences in national as well as regional levels and thereby ensure the exchange of knowledge and technology in landslide mitigation in the region. The expectation is that this approach will help to enrich the capacity as well bring about changes in attitude and practice in promoting the collaborative efforts in landslide risk management through building the partnerships between professionals and decision making community.

More specifically, the project's objectives are:

- To provide target countries with a cadre of specialists and decision makers with up-to-date knowledge of landslide disaster mitigation practices and to integrate this knowledge in routine development work initiated by national and local governments. The project will achieve this by:
    - Providing the scientists and geo-technical engineers involved in landslide studies and services a forum for academic discussion on landslide disaster mitigation,
    - Promoting better practices and models among the target countries,
    - Facilitating the introduction of new concepts into the land use planning process,
    - Promoting a participatory approach of all stakeholders including decision makers in the search for solutions for current problems in landslide disaster mitigation,

- Promoting sustainable development and environmental protection through landside disaster impact reduction and integration of concepts of risk-based mitigation planning at all levels.

- To increase collaboration between Norwegian and Asian institutions in jointly developing cost effective methodologies for landslide risk mitigation and training at national level for enhancement of capacity of national partners, which will result in more joint programs and opportunities for sharing of experience and learning applications in the subject area.

Partner Institute in Bhutan

Department of Geology and Mines under Ministry of Trade and Industry is the nodal agency of the government of the Kingdom of Bhutan. The main roles of the Department are: geological mapping, exploring mineral resources, providing engineering geological services, ensuring environment friendly exploitation of economic mineral resources, and carrying out scientific studies and monitoring of natural hazards like GLOF, earthquakes, landslides and siltation which are the geological processes prevalent in the Himalayan environment.

With the mutual goal of promoting landslide disaster awareness and development of local capabilities to foster and to institutionalize landslide risk management for reduction of the vulnerability of population, infrastructure, critical facilities and shelter, ADPC and DGM organized a national training course on landslide mitigation activities in Bhutan.

Workshop

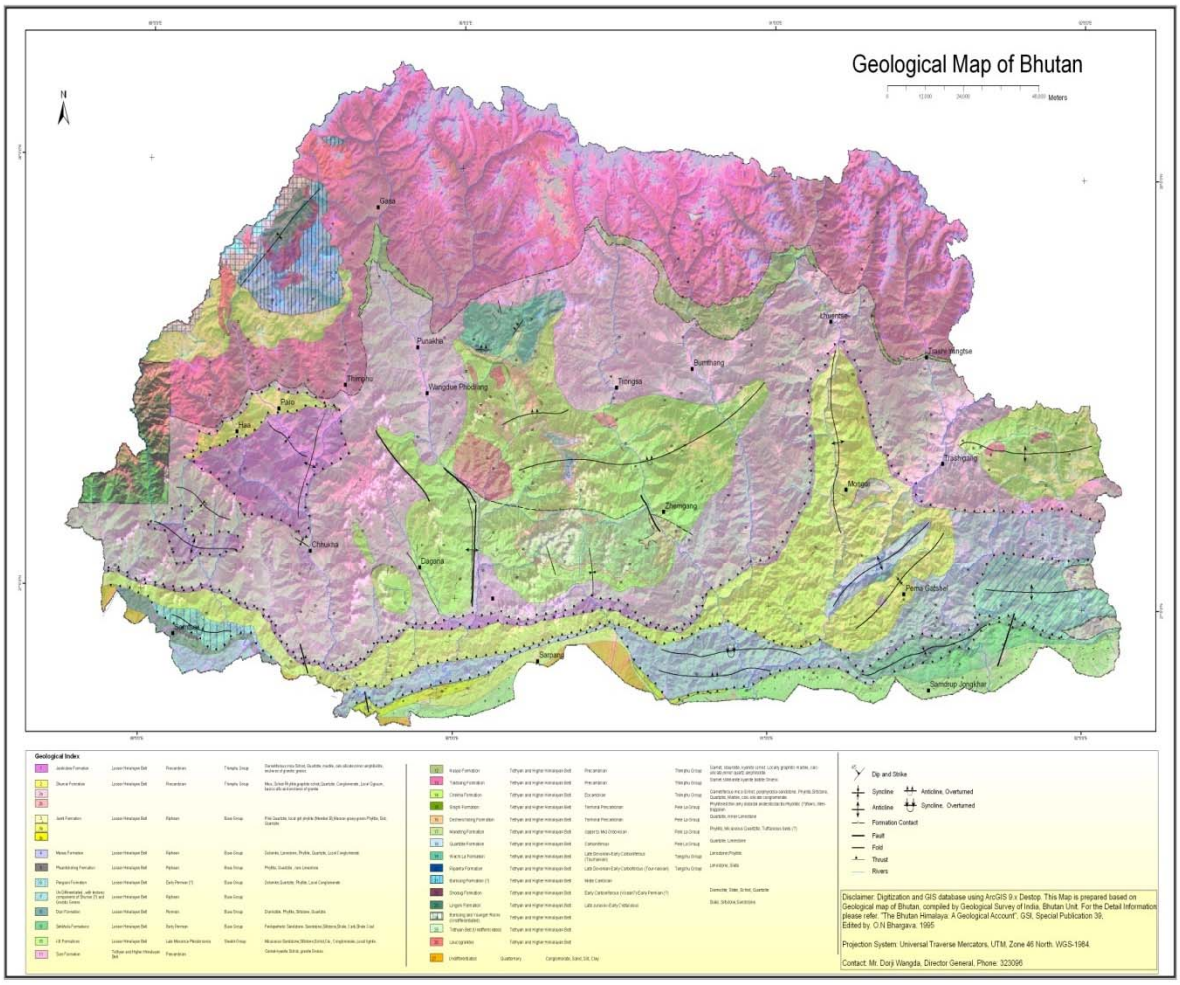
The national training on landslide mitigation measures was organized under RECLAIM phase II in order to discuss the landslide hazards in Bhutan and exchange experience and lessons learnt from the mitigation measure adopted by nodal agencies in Bhutan. The objective of organizing national trainings is to strengthen the capacity of local agencies in landslide risk management, create awareness and promote policy initiatives at local level.

The workshop was organized for 2 days on 22nd and 23rd December 2008 in Thimpu with 30 participants from relevant authorities of Bhutan and Asian Disaster Preparedness Center, Bankgok. 22nd December 2008 the workshop started with a technical session on Bhutan geological situation and its relations to landslide risks and to share experiences of landslide risk management measures undertaken in Bhutan. 23rd December the participants visited Punakha where landslide mitigation measures have been carried out successfully. (Refer Annex I for detailed Agenda of the workshop)

Geology and landslide risks of Bhutan

Situated in the higher Himalayan region, Bhutan has a unique geological character. Himalaya is the youngest and growing mountain in the world and has the youngest rocks at the bottom of the mountain. This formation of geological character is named as “Siwalik” and consists of sandstone, siltstone, claystone and unconsolidated and semi consolidated conglomerate dip at low angle.

Geological Map of Bhutan



Souce: Presentation on Geology and Structure of Bhutan by Ugyen Wangda Chief Geologist/Head of Division, Department of Geology and Mines, Bhutan (Annex II)

Source: Presentation *Landslides* by Yeshi Dorji, Specialist (Geology), Department of Geology & Mines

With this unique geological character as well as climate change induced heavy rainfalls and glacier melting and road cutting in steep slopes of the mountain are triggering increased number of landslides in Bhutan. The main source is the glacier melting due to climate change and global warming which results in flooding of glacier lakes which causes landslides as a side effect. Other main causes of landslides include tectonic activities in the Himalayan Region, heavy rainfall during monsoon periods, steepness of the slopes and the undercutting of the river banks by deeply incised rivers.

During day 1 of the national training, a lengthy explanation and discussion on landslides in Bhutan was carried out. The landslides were defined with different types, causes and triggering factors. The discussion included investigation measures used in Bhutan such as analytical measures based on lab and field analytical properties; observational methods based on monitoring of instruments like extensometers, inclinometers and piezometers or repeat ground observations; empirical methods based on rapid hazard assessment techniques involving identification of causative factors and their influence in inducing instabilities. Mitigation measures practiced in Bhutan include hydrological methods where an attempt is made to lower the groundwater level or to reduce the water content of the material; Chemical and mechanical methods, in which attempts are made to increase the shear strength of the unstable mass or to introduce active external forces (e.g. anchors, rock or ground nailing) or passive (e.g. structural wells, piles or reinforced ground) to contrast the de-stabilizing forces.

Although the incidents of earthquakes are rare in Bhutan, it lies in a seismically active zone. Therefore, Bhutan should be prepared for earthquakes and earthquake induced landslides. A comprehensive presentation and discussion was carried out on different types, causes, characteristics and behaviors and reported cases of earthquakes in Bhutan.

Ad hoc land use practices and urbanization have increased the landslide threat and vulnerability. There have been many landslide incidences around Asia due to improper planning of urban cities, bad practices in building and construction. Unplanned road construction in the mountainous terrains of Bhutan have increased the slope instability

and thereby the number of landslides. Planning of land allocation is necessary for different activities/services in order to sustain the health, diversity and productivity of lands for the use & enjoyment of present & future generations. Disaster risk management should be a core factor in such planning. During this presentation of “Problems associated with Landuse Planning and landslide risk management”, a comprehensive explanation of what is land-use planning, when, where and why landuse planning is required and how it mitigates landslide risks were discussed with focus on legal and policy regulations which mandate for landuse planning.

The “Presentation on the Slope Stability, Hazard Assessment and Mitigation Measures of Dhamdara, Phuentsholing Bhutan” focused on the assessing the slope stability and hazards of Dhamdara city and recommend possible mitigation measures. In assessing the slope stability, collection of samples to determine the Grain Sizes, moisture content and densities, Portable Penetrometer Test (PPT), geomorphological studies and Geo-physical resistivity survey were carried out to understand the subsurface conditions as well as the bearing capacity of the earth. During this study it was revealed that the main reasons for the slope instability are

- High slope angles
- Weak geological Formation
- Presence of faults (MBT and local faults)
- Excessive rainfall
- Excessive grazing by cattle.
- Uncontrolled water management where the water freely flows along the slopes forming gullies and in due course of time these gullies develop mini slides and to major slides.
- Human interference

The mitigation measures suggested were to clearly demarcate the hazard prone area and restrict it for any development activity. Such areas are recommended to cover by plants, drainages should be constructed, building of a stepped retaining wall for the stability of the base and build proper culverts and bridges to divert rain water and minimize flooding.

The discussions of the day focused on Bhutan’s vulnerability for landslides, different types of landslides and their causes and what are the mitigation measures Bhutan can undertake to minimize the landslide risks.

Field visit to Punakha

After a thorough discussion of the landslide situation in Bhutan on Day 1, the Day 2 of the training focused on a visit to Punakha which is prone to Landslide risks and some mitigation works had been carried out. Along the way to Punakha, the group visited several other sites where landslide risk mitigation measures are being carried out. The

organizers of the national training explained how the Bhutanese authorities are implementing landslide risk mitigation activities in these sites.

Concluding Remarks

The participants were grateful to the National Training organizers for their efforts in organizing a thorough training on landslides which is one of the main disaster threats Bhutan is facing every day. They also thanked the ADPC and NGI for their technical inputs and experience and knowledge sharing on regional and international landslide mitigation practices and success. The organizers and the participants were grateful to Ministry of Foreign Affairs of the Government of Norway for their timely intervention in creating awareness and promoting landslide risk mitigation measures in Asian region.

Annex 1: Agenda

National Training Course under Asian Program for Regional Capacity Enhancement for Landslide Impact Mitigation (RECLAIM - 11),
Thimphu Bhutan

Period - 22.12.2008 - 23.12.2008 Venue: Tala Conference Hall Tentative AGENDA

22/12/2008		
9.00 - 9.30	Registration of Participants	Phuntso NorbulWangchu Wangmo
9.30 - 9.35	Welcome Address	Ugyen Wangda, Chief GeologisUHead, Geological Survey of Bhutan
9.35 - 9.45	Opening address	Director General (DGM)
9.45 - 9.55	Opening address	NMSI Arambepola-Director, Disaster
9.55 -10.05	Opening address	Yeshi Dorji, Specialist, DGM
10.05 - 10.25	Introduction of Participants	
10.25 -	Vote of Thanks	Ugyen Wangda, Chief Geologist,HoD, DGM
10.30 -	Group Photo	
10.45- 11.15	Tea Break	
Technical Session		
11.15 -	Geology of Bhutan	Ugyen Wangda Chief Geologist, HoD, DGM
11.35 - 12.05	Landslides - Bhutan	Yeshi Dorji, Specialist, DGM
12.05 -	Lunch Break	
13.30 -	Earthquakes in Bhutan	Dowchu Dukpa, Sr. Geologist
14.00 -14.30	Land use Planning	Arambepola, Director, AD PC
14.30 - 15.00	Slope Stability in Phuentsholing Town	I.K Chettri, Sr Geologist, DGM
15.00 - 15.30	Discussion	
15.30 - 4.00	Tea Break	

7.00 pm	Welcome Dinner	Galingkha
23/12/08 **- Field Trip to Punakha**		
9.00 am	Depart from Thimphu	
10.00 -10.30	Coffee at Dochula Pass	Galingkha
11.30 am	Proceed to Punakha & stop over at the sites where the landslide mitigation works have been carried out.	
12.30 -13.30 hrs	Lunch at Meri Phuensum, Khuruthang	
13.30 - 14.30 hrs	Visit Punakha Dzong	
14.30 - 16.30 hrs	Depart from Punakha	
16.00 hrs	Tea and snacks at Dochula	Galingkha
24/12/2008		
	Site Seeing for Mr. Arambepola in Thimphu	
25/12/2008 **Departure from Paro to Bangkok**		