Landslides in Bhutan

One of the components of our project is to study the GLOF induced landslide prone areas in the downstream of Mangde Chu in Trongsa. The Mangde Chu, which flows into the Brahmaputra river is around 240 Km long. 160 Km of its total length flows in Bhutan with its head water in the North at around 7,300 m elevation and descends to around 100 m elevation in the South.

What is a landslide?
A landslide is the natural phenomenon of mountain slope deformation. Landslides are classified into rockfalls and slide-type landslides (see Figure 1). In Bhutan, rockfalls claim many lives and cause damage to vehicles and other property every year. Further, slide-type landslides too cause damage. For example, breaches in roads caused by slide-type landslides not only result in traffic problems but also lead to a shortage of supplies owing to the disruption of transport.

Landslide mapping
In this project, we made a distribution map of slide-type landslides that occurred along the Mangde Chu using satellite images obtained from the Japan Aerospace Agency (JAXA). The existing landslide topography caused by slide-type landslides may re-slide because the slide material (hereafter, “landslide body”) has become unstable by the sliding activity. If the landslide body is eroded by a strong stream or GLOF or shaken by a large-scale earthquake, the landslide body may move again or a new secondary slide may occur in the landslide body. Figure 2 shows a sample of the landslide map of the region in the vicinity of Bjizam, Trongsa. The map shows that the mountain slopes comprise slide-type landslide bodies that extend for several hundred metres. Another landslide mapping was carried out around Samcholing in Trongsa. Around 13 large scale landslide bodies (A-M) were recognised by studying the satellite map and actual field work as shown in Figure 3. Secondary landslide was observed in the landslide body A, which is marked with a black star in Figure 3. Photo 1 shows the actual location of the secondary landslide. The retaining wall of the road was moved slightly from its original position due to this secondary landslide movement, which is caused mainly by gully erosion. Therefore, regular monitoring of the indicated landslide area is necessary. For example, ascertaining the presence of cracks in the road is important to obtain predictive information of landslide activities.

Landslides and our lives
The word “landslide” conjures a negative image. However, landslides play an important role in our lives. Most of Bhutan consists of steep mountainous regions. Hence, people settled in relatively gentle slope and engaged in cultivation on terraced fields. Most of these gentle slopes were formed by landslides. This means that landslides have provided us a place to live. For example, the Samcholing region comprises a large-scale landslide body extending for more than 2 km; this landslide body has been dissected by small landslides (See Photo 1). Residents are benefited by this landslide topography that is suitable for terraced paddy cultivation.

The landslide map provides basic information for disaster management. In particular, the map is necessary for planning and constructing new roads and setting up components of hydropower facilities, such as power plants, pipelines, and electric wires and cables. Hence, the landslide mapping plays an important role in planning and constructing any infrastructure on the ground.

We expect the progress of survey and countermeasures for landslides in Bhutan in future, since people cannot escape from it. The countermeasure should be comprehensive and include landslide mapping, field survey, infrastructure planning, disaster reduction planning in the government and awareness program. The government, relevant organizations and departments, dzonkhags and aid agencies need to work together to reduce disaster