Chapter 6

Field Visit to the Site on the Kathmandu-Trishuli Road

Later in the day, the participants visited the DPTC landslide monitoring site on the Kathmandu to Trishuli road. Mr. E. Pelinck, the Director General of ICIMOD also visited the site with the participants. The visit was coordinated by Mr. B. Tiwari and Mr. I. Kitahara of DPTC.

Box 2: Background Information to the Landslide Site 19 km along Kathmandu-Trisuli Road

The landslide is located at 19.5 km along the Kathmandu-Trisuli road at Okharpauwa, about one hours drive from Kathmandu. The landslide was activated after the excessive rainfall of 1962 and stabilised afterwards. The landslide was re-activated after the rainfall of 1979 and was further aggravated by the earthquake of 1989.

The landslide has damaged more than 100m of the 70km long Kathmandu-Trisuli Road. The length and extent of the damage is increasing each year. Many cracks can be seen on the surface, the number and extent of which are increasing continuously after every monsoon period. Plenty of water throughout the area, inclined trees and electrical poles, many scars at the crown and sides are the typical landslide features of the area. The scale of the landslide is about 300m x 100m.

The quarrying of stones at the bottom of the site (upper side of the road), an unlined irrigation canal and roadside drain on the landslide surface, leakage of water from supply pipes, and seepage of water from the upper catchment of the landslide are the major causes of the increase in land movement. Fortunately, the landslide is situated on barren land and there is no other infrastructure except the road below the landslide area. But the collapse of the landslide may block the Kathmandu-Trisuli Road and important tourist spots e.g., Kakani and Dhunche, can also be cut off.

At the request of the Department of Roads, the Water-induced Disaster Prevention Technical Centre (DPTC) has been monitoring the landslide as one of its model monitoring sites and it started to install monitoring equipment in July 1992. Monitoring equipment was installed to observe land movement on the following dates:

Equipment	Numbers	Period
Rain gauge	1 unit	July 1992
Tiltmeter	1 unit	July 1992
Extensometer I	1 unit	July 1992
Extensometer II	1 unit	Sept 1993
Moving pegs	2 rows	July 1992

Following the installation of the equipment, data have been collected and analysed regularly. A topographical map on a scale of 1:500 was prepared in 1992. One 30m deep vertical core boring was carried out on the roadside to reveal the geological strata. After monitoring the moving pegs for one year and observing the cracks, the whole landslide was divided into five major blocks.

Data from the installed equipment have been collected regularly. Collected data from June 1993 to August 1994 have been analysed to establish the relationship between displacement and rainfall. The potential ground fluctuation by inclinometer and displacement by extensometer have been correlated to rainfall data. Total maximum displacements of the land mass within a fourteen month period in horizontal and vertical directions were 3.577m and 1.107 m respectively. As revealed by the bore log, the deepest slip surface of the lowest block of the landslide is situated at a depth of 17 to 18m from the roadside.

Ground and surface water are found to be the major causes of landslides. So the most effective protective measure has been determined as efficient drainage of such water. Perfect surface and subsurface drainage works in conjunction with a designed toe wall may be sufficient to stabilise the slide mass. Soil fill and plantation at the lower limb of the slide mass will probably have a beneficial effect as well.

Discussions at the Field Site

After reaching the model site the participants observed the damage to the road caused by the landslide. Some participants asked for a demonstration of how the extensometer recorded land movement. It was felt by some that as an extensometer only gives the surface movement, it might be necessary to have some equipment for subsurface movement monitoring. For surface movement, the suitability of moving pegs was agreed to the adequate. It was suggested to either embed the tiltmeter glass in concrete or to screw in the concrete to control the separation of glass after vibration.

Some participants suggested that monitoring the upper catchment of the landslide area might be necessary to determine the seepage pattern. As the equipment installed in the area is insufficient for detailed monitoring of the landslide, it was suggested that more extensometers at various locations of the landslide blocks might be necessary.

Some of participants thought that more involvement of the local people in monitoring would ensure protection of the equipment. It was unanimously decided that mitigation measures should also include the local people.

Participants at the Workshop

Landslide along the Tribhuvan Rajpath