

# Reflections on the Slope Safety System of Hong Kong from 2008

GEOTECHNICAL ENGINEERING TECHNICAL DIVISION

reported by



Ir. Mak Wai Kin

The Geotechnical Engineering Technical Division invited Ir. Chan Yun Cheung, former Head of Geotechnical Engineering Office (GEO), Civil Engineering and Development Department of Hong Kong, to give a talk on 10 January 2017. The talk at Tan Sri Prof. Chin Fung Kee Auditorium, Wisma IEM, was chaired by Ir. Mak Wai Kin and attracted 61 participants.

First, Ir. Chan talked about the severe rainstorm in Hong Kong on 7 June 2008. Hong Kong Observatory recorded the highest hourly rainfall of 145.5mm since 1884. The return period was 1 in 742 years.

In western Lantau, the 24-hour rainfall of over 600mm was recorded with a return period of 1 in 1,100 years. A total of 274 minor and 100 major landslide incidents were reported.

The rainstorm highlighted some aspects of the slope safety system such as areas it was found lacking and where improvements were required to manage the risk of landslides.

Ir. Chan said the GEO experience showed that annual rainfall was not a good measure of the severity of individual rainstorms in terms of their potential to trigger landslides. In 2005, GEO introduced Landslide Potential Index (LPI) to describe the severity of a rainstorm with respect to its potential to cause a landslide, by using rainfall and landslide records to obtain the statistical relationship between rainfall intensity and landslide frequency. Figure 1 shows the recorded LPI in Hong Kong since 1984, with the rainstorm on 7 June 2008 recording the highest LPI of 12.

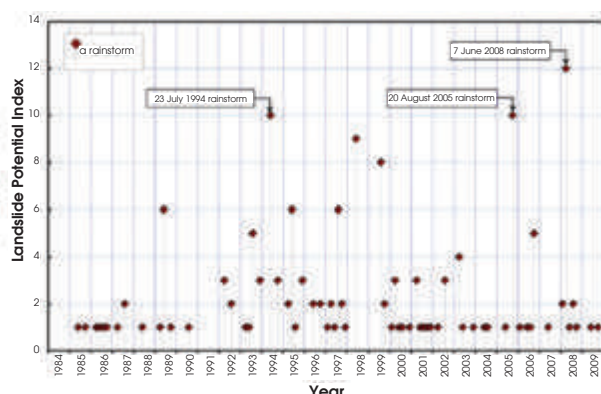


Figure 1: Landslide Potential Index Against Rainstorm Occurrence (1984 to 2009) in Hong Kong

Ir. Chan said some 8,800 man-made slopes were constructed from late 1970s to late 1980s, using “old technology” and based on the geotechnical knowledge and skills of that time. These were not sufficiently robust for long-term performance and posed the risk of landslides. During the rainstorm of June 2008, slope failures were recorded on a number of these slopes.

It was important, he said, to manage natural terrain landslide hazards. For instance, during a rainstorm on North Lantau Highway, landslides in the upper catchment sent debris downstream, blocking the drainage system at the hillside toe along the road. It caused severe flooding of the highway, resulting in traffic disruption.

Next, Ir. Chan talked about how to manage natural terrain landslide risks which were basically similar to that for man-made slopes. He emphasised on expanding the scope of works as a tool to control landslide risks. After the Landslip Preventive Measures Programme ended in 2010, GEO launched the Landslip Prevention and Mitigation Programme (LPMitP).

The differences between the two programmes and their features are summarised in Figure 2.

	Landslip Preventive Measures Programme	Landslip Prevention and Mitigation Programme
Time Frame	2000 - 2010	2010 and beyond
Government man-made slopes	Upgrade 250 per year (pre-1977 slopes)	Upgrade 150 per year (Any slope)
Private Man-made slopes	Safety-screening 200 per year	Safety-screening 100 per year
Natural hillside catchments	Ad hoc, a few per year on average	30 per year
Budget	HK\$900M	HK\$600M
Target	Dealt with all high consequence pre-1977 man-made slopes Residual risk 25% of that at 1977	To contain landslide risk to the As Low As Reasonably Practicable level

He concluded by highlighting two important aspects: Conceptual framework and the human resources to operate the system.

Technical Division chairman Ir. Yee Thien Seng then presented Ir. Chan with a memento and certificate of appreciation. ■