The Natural Terrain Landslide Study - Phases I and II (Special Project Report SPR 5/97)

Evans, N.C., Huang, S.W. & King, J.P.

Abstract

Most landslides on natural terrain in Hong Kong are shallow debris slides and flows with short runout distances. Such landslides are quite common, and occasionally develop into hazardous events with a long runout which can constitute a risk to developments downslope. Less common types of natural terrain slope instability in Hong Kong include deep-seated, slow movements.

The demand for land in Hong Kong means that there will be a continuing trend to develop areas close to steep natural slopes. In view of the hazard from natural terrain landslides there is a clear need to identify areas which may be particularly susceptible to these phenomena.

All natural terrain in Hong Kong has been surveyed using aerial photographs taken between 1945 and 1994, and data on over 25,000 visible natural terrain landslides have been collected. These data, together with information on geology, slope angle, geomorphology and vegetation have been entered into a Geographic Information System (GIS) in order to examine the spatial distribution of landslides with respect to these factors.

It appears that the underlying geology and the angle of slope are the most important parameters for determining natural terrain landslide susceptibility at the regional scale. Geological strata which appear to be particularly susceptible include rhyolitic and dacitic lavas, jointed tuffs, layered sequences of volcaniclastic rocks and lavas, and layered sedimentary sequences. The most susceptible slopes are generally those with angles of approximately 35° to 40°. The shape and aspect of a particular slope may also be useful in assessing susceptibility.

The approximate runout distance has been determined for nearly 9,000 landslides (the more recent events). Of these, 2.3% (204) have plan runout distances of more than 150m and 0.3% (34) have plan runout distances of more than 300m.

Data on natural terrain landslides for the period 1985 to 1994 have been compared with rainstorm intensity on a yearly basis. This has allowed the assessment of rainfall intensity thresholds for the onset of natural terrain landsliding. It appears that a rainfall event affecting perhaps 20% to 50% of Hong Kong and with the potential to trigger a high density (more than ten per square kilometre) of natural terrain landsliding in susceptible areas, can be expected, on average, every two years.

Occasional large landslides might have occurred in Hong Kong in the geological past, and investigations of some possible large landslide deposits are in progress.

A review of natural terrain landslide mitigation measures has been completed. There are a range of methods which could be applied in Hong Kong, ranging from the purely technical
(the prevention or control of landslides) to the purely administrative (planning and development controls).

The analyses carried out to date have shown that susceptibility mapping is possible. This work is being progressed. Studies are also in hand to allow regional estimates of hazard to be made.