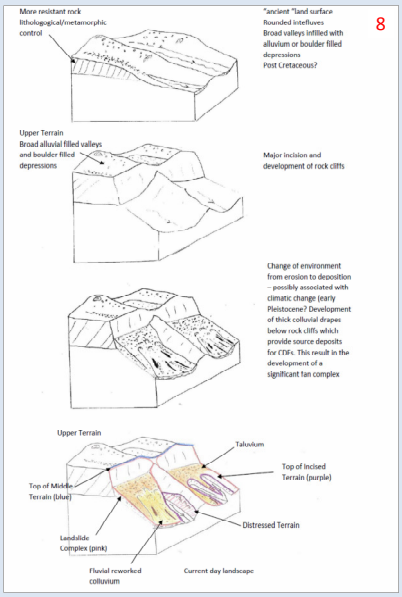
The Importance of Reading the Landscape
The use of Engineering Geomorphology in Regional Landslide Hazard Assessments

The Problem

A severe rainstorm occurred in Hong Kong on 7 June 2008. The storm was centred over western Lantau Island (1) and had a peak hourly rainfall of 145 mm, a peak 4-hour rainfall of 350 mm and a 24-hour rainfall of 622 mm. The rolling 4-hour rainfall equated to a return period of 500 -1000 years. The storm triggered over 2,400 landslides on Lantau Island (2). In particular, large (up to 10,000 m^3) long run out (up to 1 km) channelised debris flows were generated (3). The landslides resulted in numerous road links being severed and many homes being temporarily evacuated (4).

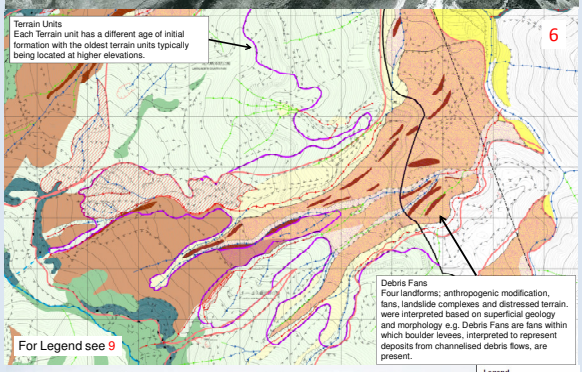
The Methodology

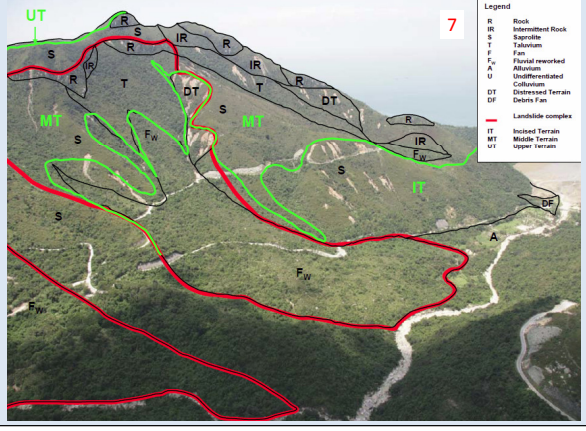


The Arup Fugro Joint Venture (AFJV) was commissioned by the Hong Kong Government to undertake a natural terrain hazard study of the area most affected by the storm (approximately 18.5km^2). The AFJV was supported by GeoRisk Solutions. The Study involved developing a methodology for prioritisation and selection of the thirty natural hillside catchments for detailed assessment. Given the size area and the tight deadline (6 months), the approach adopted was engineering geomorphological mapping based on Aerial Photograph Interpretation (API) at a scale of 1:2,500 (5).

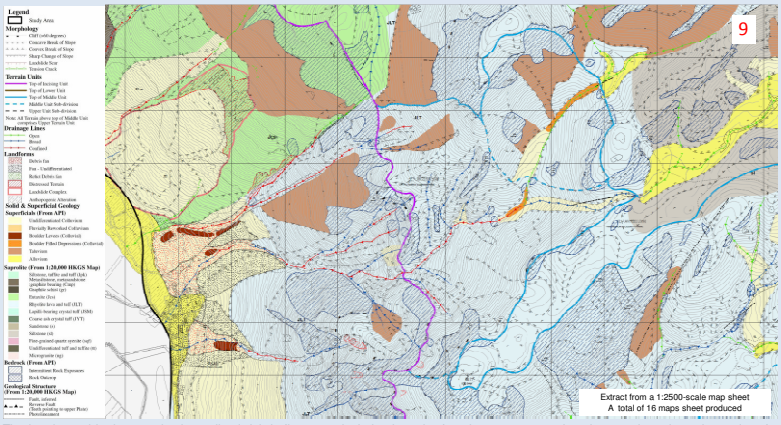
The individual components of the map, which formed a key output of the study, were developed sequentially. These comprise morphological mapping, superficial geological mapping, and drainage line map. These maps were then used to interpret landforms and finally terrain units. Emphasis was placed on the identification of fans and areas of high landslide activity (distressed terrain) (6 & 7). Based on the mapping, conceptual models were developed (8) to assist with hazard identification.

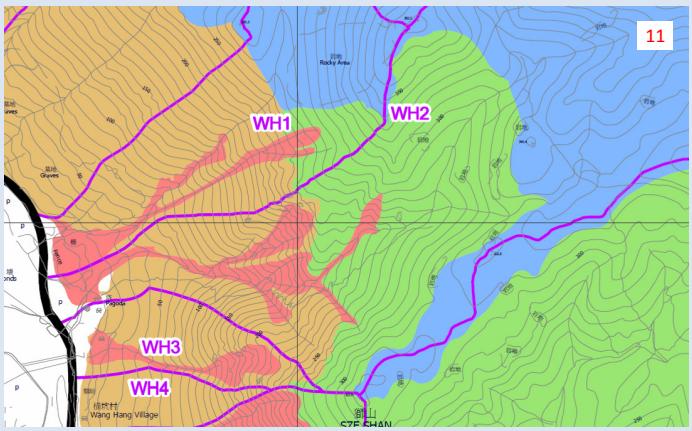
These various components were then combined to generate the final engineering geomorphological map (9).





The Product





The key hazard in the area is channelised debris flows, particularly given the fact that many coastal settlements have been located on fans and debris fans (9). Consequently, the methodology utilized mapped fans as surrogates for areas potentially affected by relatively high magnitude, low frequency channelised debris flows. Such hazards are considered under-represented in the existing landslide datasets in Hong Kong.

A combination of landslide susceptibility based on existing landslide database and terrain units, combined with fan activity was used as a basis for the derivation of a hazard matrix (10) and a hazard map (11). This was subsequently combined with facilities to allow catchment risk ranking for detailed assessment, and where appropriate, mitigation measures.

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	VERY HIGH	HIGH	MODERATE	LOW
Primary Classifier	Debris Fan is present	Within the Incised Terrain Unit	Within the Middle or Lower Terrain Units	Within the Upper Terrain Unit
Secondary Classifier	Undifferentiated Fan and Distressed Terrain are present	Within Upper, Middle or Lower Terrain Units and contains Distressed Terrain	Confined Drainage Line within the Upper Terrain Unit	N/A
Tertiary Classifier	N/A	Undifferentiated Fan present but no upslope areas of Distressed Terrain	N/A	N/A

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