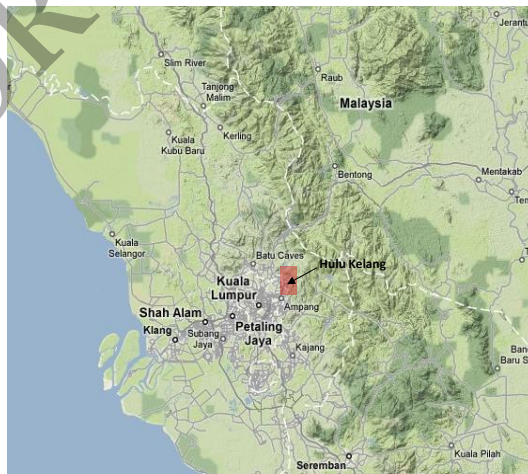


Bukit Antarabangsa Landslide



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Location



Catastrophic Landslides in Hulu Kelang Area



Catastrophic Landslides in Hulu Kelang Area

Date	Location	Casualties	Loss of Properties
11-Dec-1993	Highland Towers	48 killed	Collapse of one block of 12-storey high apartment
15-May-1999	Bukit Antarabangsa	-	Closure of the main and only access road to the residential areas in Bukit Antarabangsa
20-Nov-2002	Hillview	8 killed	Damage of 1 unit of bungalow
31-May-2006	Kampung Pasir	4 killed	Damage of 3 blocks of longhouses
6-Dec-2008	Bukit Antarabangsa	5 killed, 17 injured	Damage of 14 units of bungalows



Bukit Antarabangsa Landslide



Bukit Antarabangsa Landslide



Bukit Antarabangsa Landslide



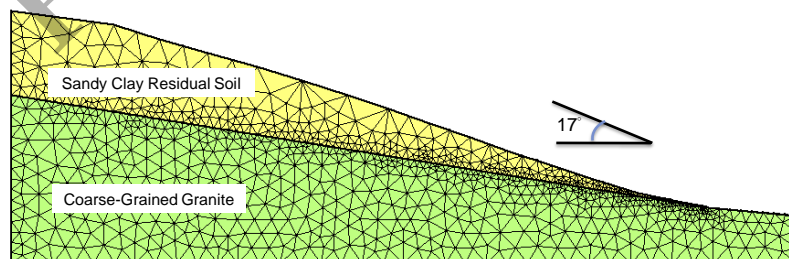
Bukit Antarabangsa Landslide



Bukit Antarabangsa Landslide

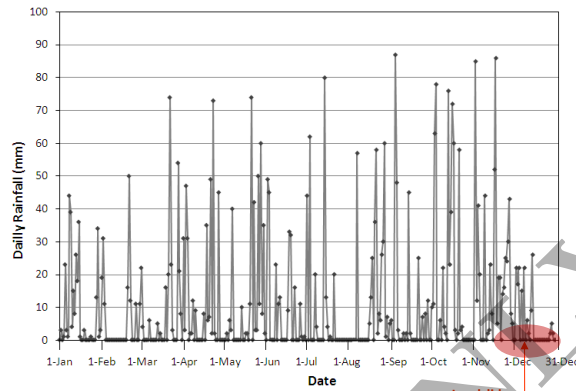


Bukit Antarabangsa Landslide



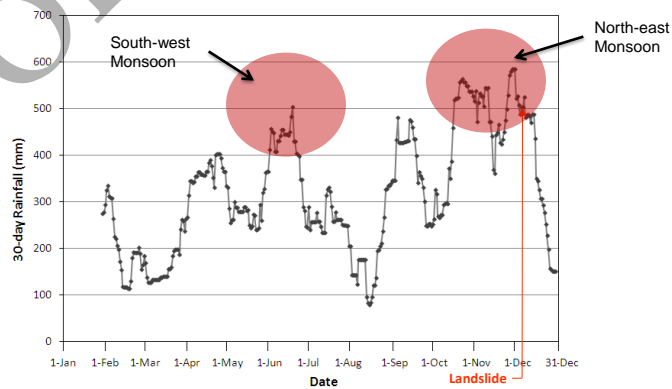
Bukit Antarabangsa Landslide

Daily rainfall – Not significant to trigger landslide. In fact, there was no rainfall occurred on the day of landslide occurrence.



Bukit Antarabangsa Landslide

Cumulative 30 days rainfall – 30 days antecedent rainfall could be used to explain the occurrence of landslide.



Bukit Antarabangsa Landslide

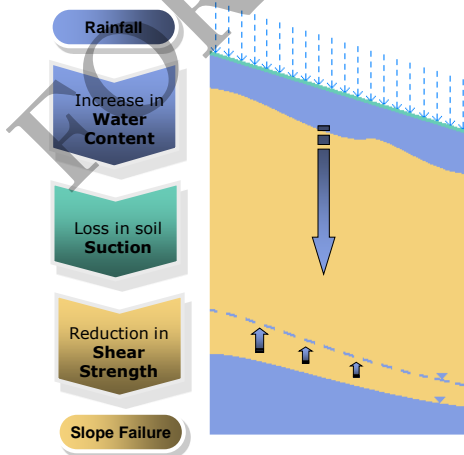
A landslide is not only triggered by one major rainfall event, but up to 30 days antecedent rainfall preceding the landslide event (subjected to the type of soil slope).

May-June and November-December appear to be the high risk months for landslide occurrences due to the high 30 days cumulative rainfall during the monsoon season. It is supported by the fact that most of the historical catastrophic landslides occurred in these months.

500 mm of 30 days cumulative rainfall can be used as an indicator for the potential landslide occurrence.



Mechanism of Rainfall-Induced Landslide



Characteristic of fine-grained residual soil:

- High suction during dry condition.
- Low permeability, thus require prolonged rainfall infiltration.
- High water retention ability.
- Significant suction loss during wet condition.

Slope failure after prolonged rainfall.



-- The End --

THANK YOU!!!



FOR ITW ONLY