
香港斜坡安全
土木工程拓展署 土力工程處
土木工程拓展署 土力工程處
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Geotechnical Engineering Office, CEDD

Background

Education Reform

The Education Commission (EC) submitted to the Government the "Reform Proposal for the Education System in Hong Kong".

The Chief Executive, in his Policy Address, endorsed the recommendations made by the EC for reforming the education system in Hong Kong.

Background

The reform covers the curricula under the new 3-3-4 structure

3 years junior secondary

3 years senior secondary

4 years university

The New Academic Structure for Senior Secondary Education and Higher Education - "334" Web Bulletin

Background

The New Senior Secondary (NSS) Geography curriculum

Topics	Guiding Questions	Explanatory Notes	Concepts	Skills and Suggested Learning Activities
2. Physical landscape of Hong Kong	• What is the general geomorphology and geology of Hong Kong? • What are the major landform features in Hong Kong?	• Geomorphology and geology of Hong Kong - Overall landform distribution - Rock types and their distribution in Hong Kong - Major geological features (folds and faults) in Hong Kong • Modification of Hong Kong landscapes by urban development	Landform Rock type Geological feature Spatial distribution Spatial association Pattern Impact of urbanisation	• Interpret different geological and relief maps to describe the distribution of various rock types, geological features and relief of Hong Kong. • Identify major geological features in Hong Kong from photographs or diagrams and describe their characteristics. • Conduct field trips to some of the geological sites in Hong Kong to identify these geological features. • Overlay the map that shows urban development with the relief map (or use GIS) to show how urban development has modified Hong Kong's landscape.
3. Processes shaping the physical landscape of Hong Kong	• What are the major internal and external processes shaping the present physical landscape of Hong Kong?*	• *Internal processes including: - Folding - Faulting - Volcanism • *External processes including: - Weathering - Erosion - Mass wasting	Internal process External process Spatial association	• Overlay different maps (or use GIS) to show the relationship among geomorphology, rock types and geological features. • Use diagrams to explain how the internal and external processes have shaped Hong Kong's physical landscape.

Topics	Guiding Questions	Explanatory Notes	Concepts	Skills and Suggested Learning Activities
4. Management of geological resources and geological hazards	• How can people manage the geological resources and geological hazards in Hong Kong?	• Geological resources – Reclamation materials - Sources of materials and their distribution - Environmental impact of the extraction of reclamation materials - Local example: Hong Kong [illegible] • Geological hazard – Landslides - Causes of landslides in Hong Kong, including natural and human factors. - Slope management and landslide prevention, e.g. strengthening slopes, restricting development on slopes, maintaining slopes, regular checking of slopes - Local example: Sham Wan Landslide	Geological resource Geological hazard People-environment interrelationship Interaction between physical and human factors	• Gather information to understand the types of reclamation materials and their distribution. • Group discussion: Environmental impact brought about by extraction of reclamation materials. • Interpret the geological [illegible] • Interpret the [illegible] GIS) to find out the sites where landslides may occur. • Conduct a field trip to Sham Wan to identify the measures that have been adopted to prevent landslides from happening again.

*There is no need to go into details of each process. Emphasis should be placed on how these processes shape the overall physical landscape of Hong Kong.

Values and attitudes	• Appreciate the beauty of nature • Appreciate the interdependence of human beings and the natural environment.

See next slide

Personal, Social and Humanities Education Key Learning Area

Geography

Curriculum and Assessment Guide (Secondary 4 - 6)

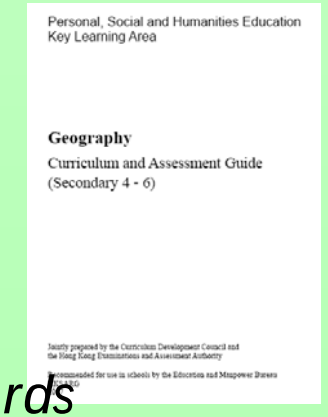
Jointly prepared by the Curriculum Development Council and the Hong Kong Examinations and Assessment Authority

Recommended for use in schools by the Education and Manpower Bureau
HKSARG
2007

土木工程拓展署 土力工程處

Background

The New Senior Secondary (NSS) Geography curriculum



Management of geological resources and geological hazards

⇨ How can people manage the geological resources and geological hazards in Hong Kong?

⇨ Geological hazard – Landslides

- Causes of landslides in Hong Kong, including natural and human factors.
- Slope management and landslide prevention, e.g. strengthening slopes, restricting development on slopes, maintaining slopes, regular checking of slopes
- Local example: Sham Wan Landslide

土木工程拓展署 土力工程處

講題的主要內容

- ✓ 香港與山泥傾瀉有關的特殊環境
- ✓ 比較矚目的山泥傾瀉事件
- ✓ 減低山泥傾瀉風險的主要策略
- ✓ 一些重要數據
- ✓ 天然山坡的山泥傾瀉
- ✓ 針對NSS課程的一些補充資料

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香港與山泥傾瀉有關的特殊環境

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香港地形

香港陸地面積約1100平方公里
(60%是天然山坡)


山多平地少

坡地建城

- 香港
- 里約熱內盧
- 重慶 …

平原建城

- 北京
- 東京
- 星加坡 …

城市發展
受滑坡影響

基本上
不受滑坡影響

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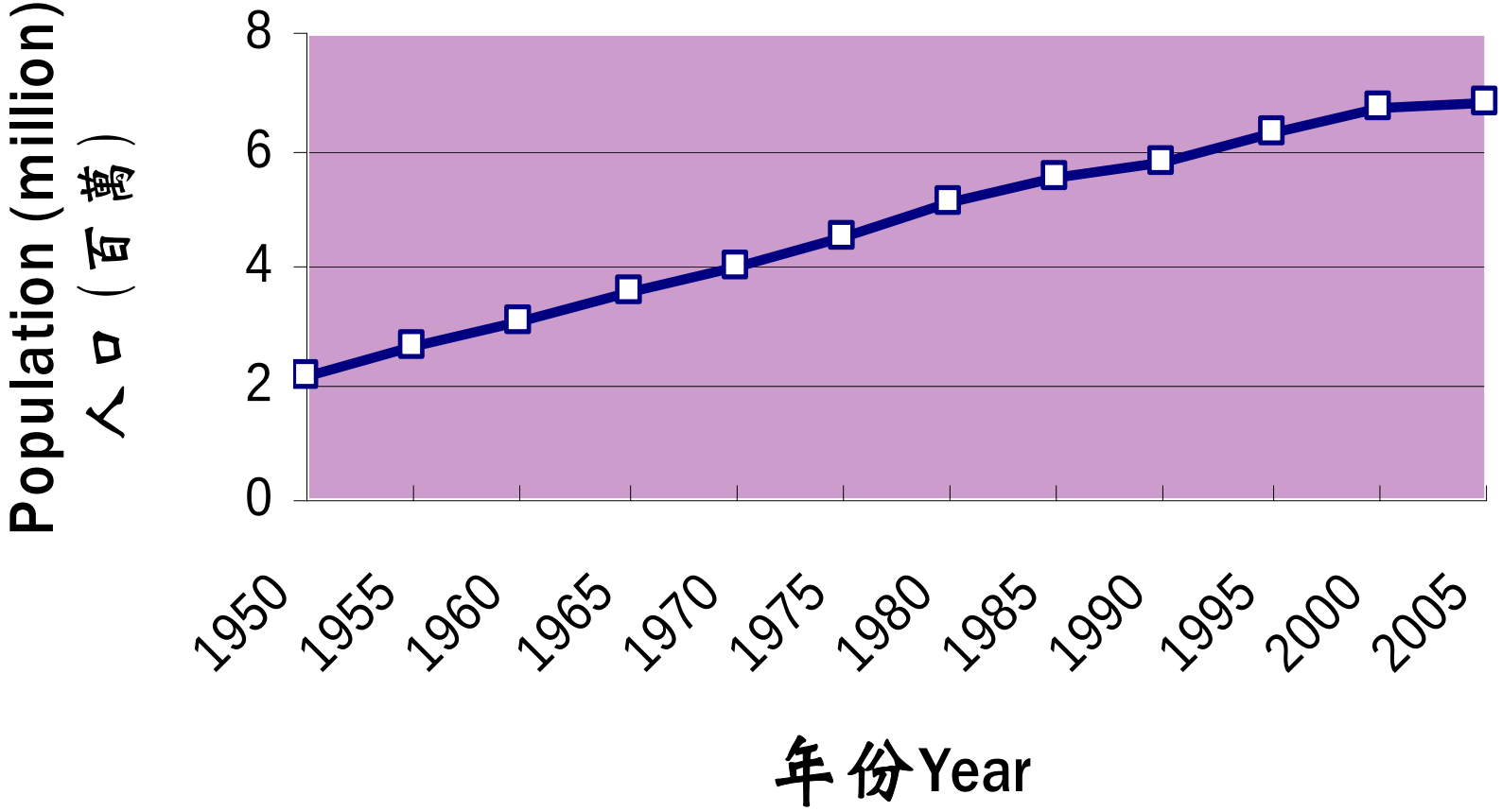
POPULATION OF HONG KONG 香港人口



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衣

食

住

行

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建造樓宇時要切削大量山坡

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建設道路網時亦需切削山坡

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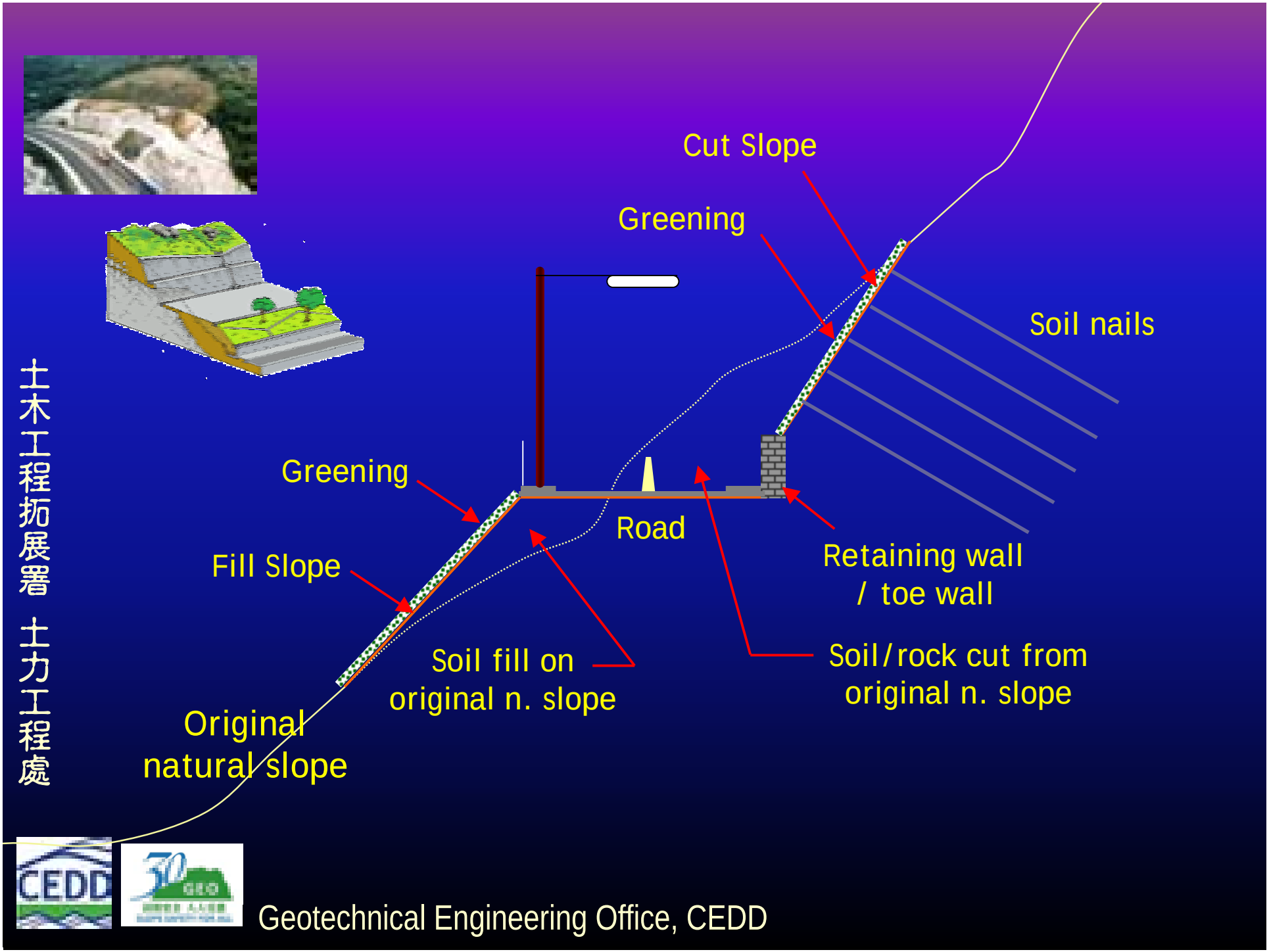

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樓宇及道路設施建造在或非常接近斜坡

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樓宇及道路設施建造在或非常接近斜坡

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香港的特殊環境

- 陡峭地形 (60%是天然山坡，70%土地的傾斜度>15°)
- 降雨量 (平均每年 2300 mm)
- 深層風化土 (可至100公尺厚)
- 人口稠密 (7,000 人/km^2)
- 57,000 人造斜坡
- 樓宇及道路設施建造在或非常接近斜坡
- 1977年前不注重土力工程技術，建造了大量不合現時安全標準的人造斜坡，構成香港山泥傾瀉一個主要問題

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比較矚目的山泥傾瀉事件

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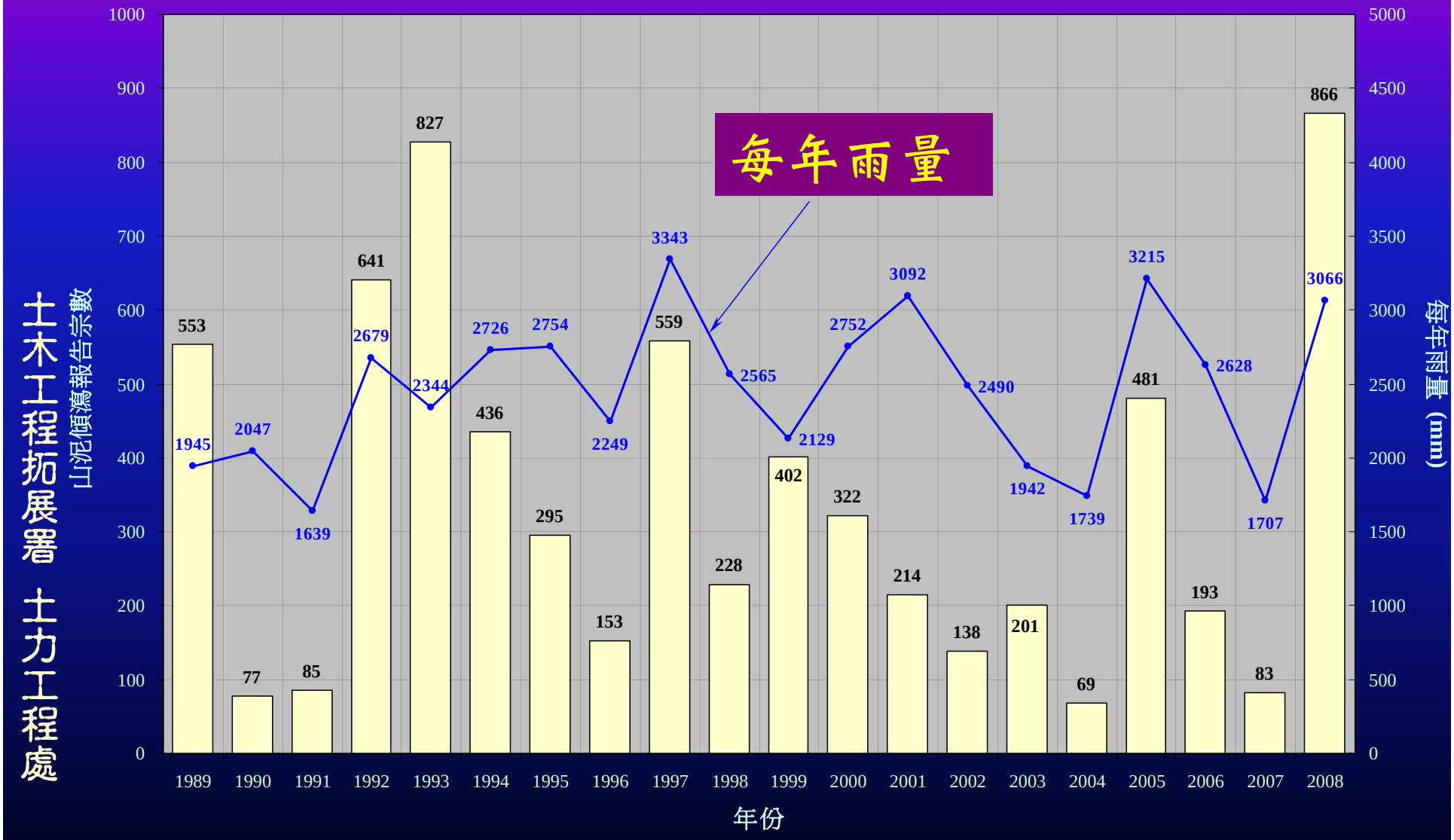
山泥傾瀉 – 每年平均約300宗

山泥傾瀉數字及雨量



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收到300宗山泥傾瀉報告，是25年來最高。（每年平均值約為300宗

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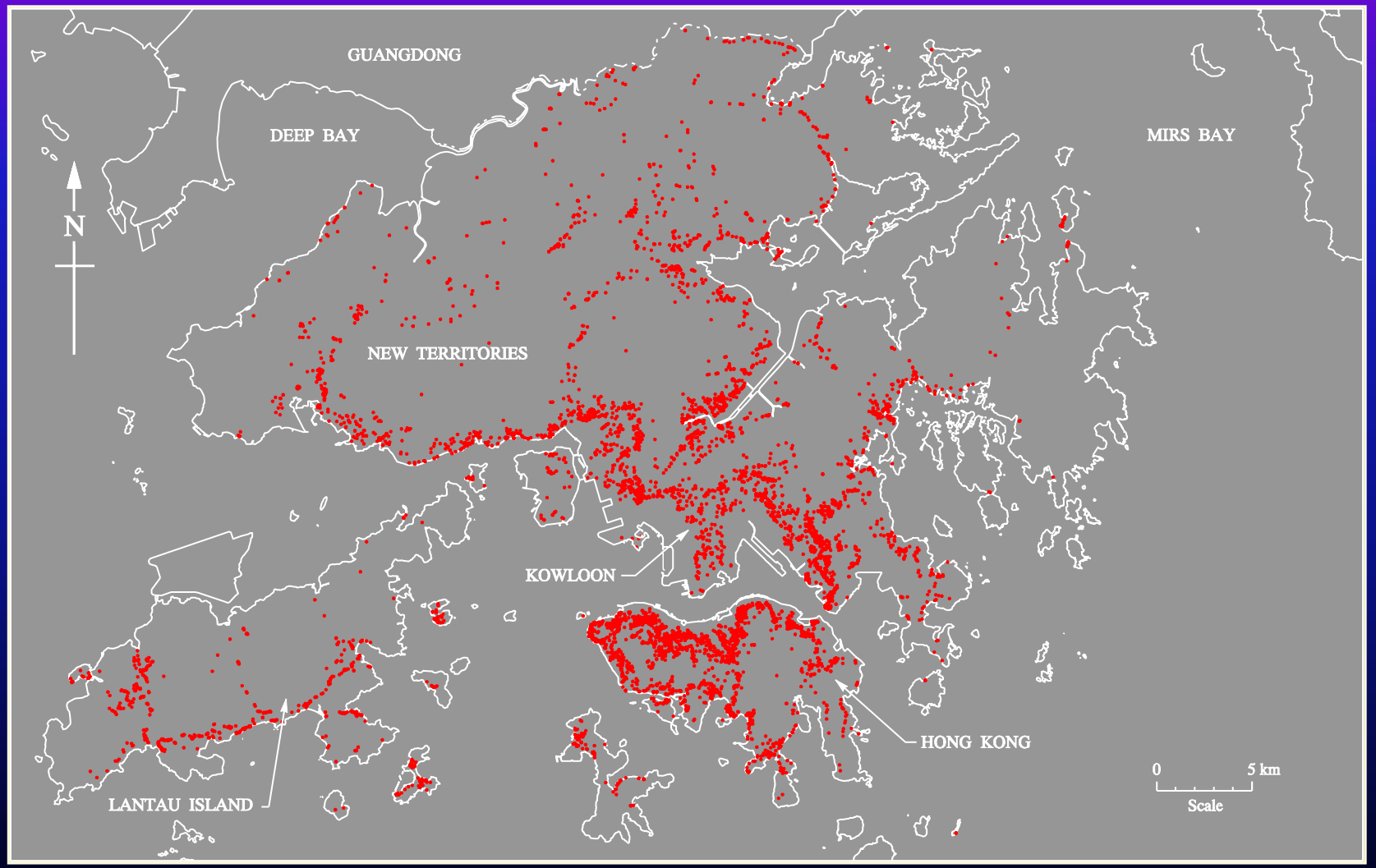
土力工程處收到的山泥傾瀉報告發生地點(1982-2004)



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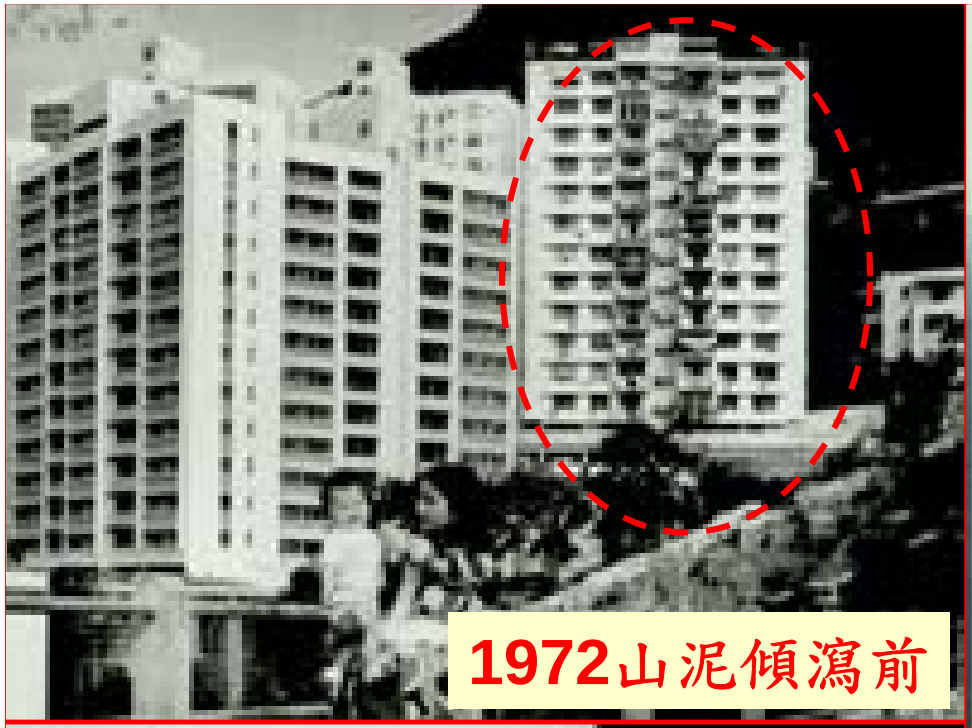
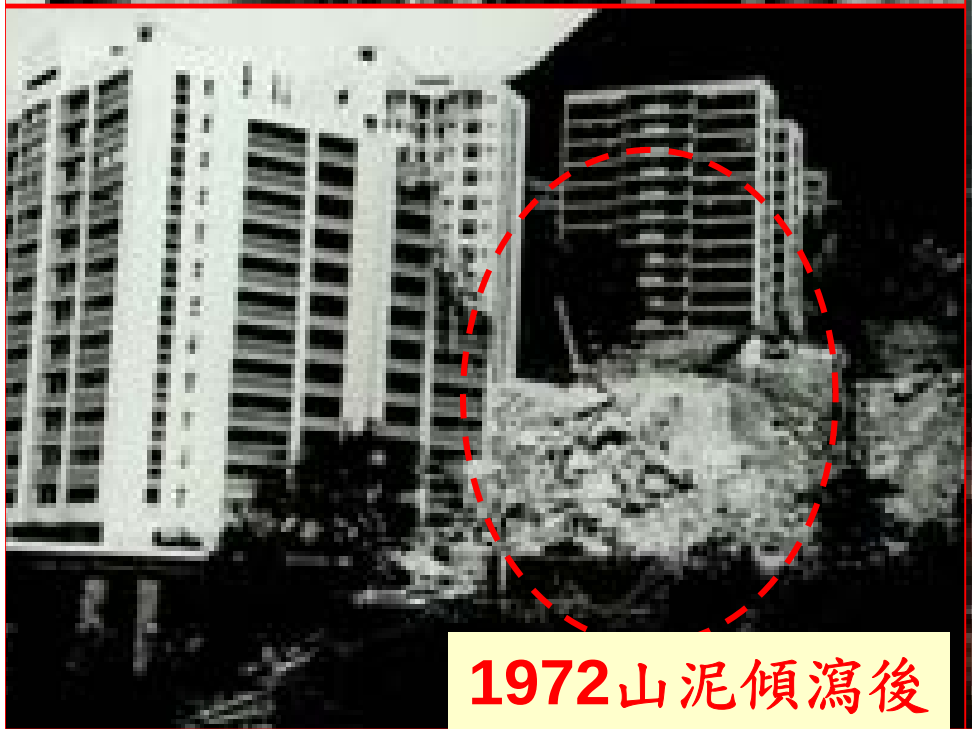
1972 6月18日 寶珊道山泥傾瀉

(塌下泥石約20,000 m^3) (67人死亡)



1972山泥傾瀉前



1972山泥傾瀉後

1972寶珊道山泥傾瀉三維3D動畫

引起傳媒及公眾廣泛關注

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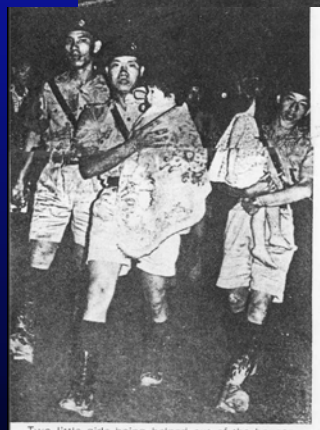
Death strikes Mid-Levels . . .

What was left of Kotewall Mansion. Only a slender tree near the compound is left standing.

Trapped people, with feeble cries for help, tons of concrete rubble, building debris, mud and slush were the scene in Po Shan Road – Conduit Road – Kotewall Road area, after three buildings were involved in a chain-collapse.

A two-storey garage had first hit a Conduit Road, and the two had fallen on a 12-storey apartment block in Kotewall Road. The debris of the three buildings had ended in Babington Path.

Up to late last



Two little girls being helped out of the houses by policemen.

"I'm all right. I'm all right" insists a woman resident of Kotewall Mansion as an ambulanceman attends to her.

本港新聞 ①

水挾山泥爲禍連環衝塌半山區數幢房屋

摧倒旭和大廈

十二層樓廿四單位住客衆多星夜竭力搶救

賽珊道對下大學閣地盤先塌，廿一號六層大廈首遭牽連，干德道兩層車房隨之塌下，繼以雷霆萬鈞之勢將十二層高之旭和大廈撞倒，旭和大廈又將毗鄰十四層新厦撞塌最頂四層，全部倒下巴丙頓道，另一大廈亦遭影响，該區多間大廈居民緊急疏散。

巨禍發生之範圍

彼此牽連數幢倒塌

連夜動員

戴稿時散

旭和大廈一帶災場

避遷時紛紛

民居厦近附厦大帶一和旭

搶救人員整日發掘救出多人

鷄寮死亡失踪人數超過一百

救出多人擡出六屍

寶珊道 李福樹 全家及

一片呼救聲呻吟聲

陳坤冒險衝前救人

旭和大廈住客逾百

災圖片特輯

1972 6月18日秀茂坪山泥傾瀉

(塌下泥石約6,000 m^3)
(71人死亡)

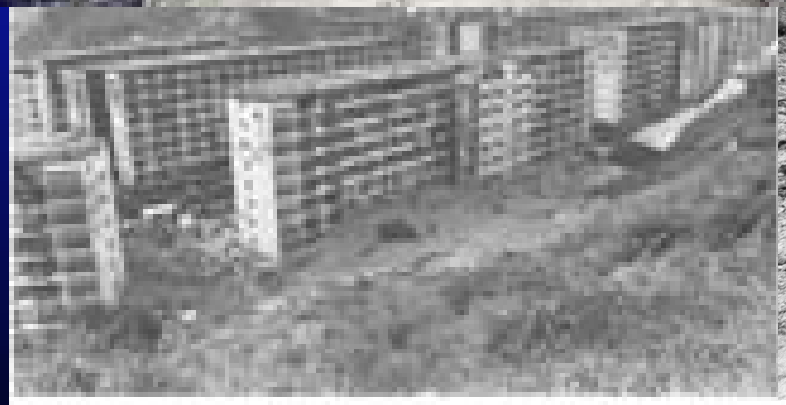
山泥傾瀉前

塌下的填土坡

山泥傾瀉後

1976年秀茂坪山泥傾瀉

(塌下泥石約5,000 m^3) (18人死亡)



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90年代較為觸目的山泥傾瀉事件

1994年7月 觀龍樓

1995年8月 深灣道

1995年8月 翡翠道

90年代較為觸目的山泥傾瀉事件

1999年8月 深井新村

1999年8月 石硤尾

Geotechnical Engineering

引起傳媒及公眾廣泛關注

THREE DIE IN LANDSL

A MAN and his nine-year-old daughter were among three people killed last night when a retaining wall below one of Hong Kong's biggest housing estates collapsed on to a busy footpath.

Emergency services immediately evacuated 2,000 families from the 20-year-old, 21-storey Kwun Lung Lau Estate building in Smithfield Road, Kennedy Town, fearing that it might collapse.

Also killed was another man, 26-year-old Ng Yuk-wing. Early this morning emergency services were still searching the mud and rocks for more trapped pedestrians.

Among the injured were two other members of the dead man and girl's family – the 33-year-old mother and her 15-year-old son. Both were in fair condition at Queen Mary Hospital.

Witnesses said the collapse, at about 8.30 pm, was heralded by a noise like a bomb exploding. It was followed by screams for help.

It left an eight-metre-high pile of rubble and mud sprawling over the footpath and an adjacent sitting area.

Emergency services rushed

By STAFF REPORTERS

sign of life according to the heat detectors.

"We have no idea how many people may be under the rubble. The police and survivors cannot give us an exact number of casualties.

"It is possible that more walls or even the whole building may collapse. Four of the seven towers have been evacuated."

Dozens of blue-clad firemen worked in solemn silence, carefully levering away rock after rock, while other rescuers stood behind the glare of hastily-erected lighting straining to catch the faintest moan from beneath the debris.

A chain of Fire Rescue Service workers trundled to and from the mountainous heap

sure there was no danger of further collapse.

Hundreds of the evacuated people were housed overnight in schools and halls in nearby Pokfield Road. Others were taken in by friends or relatives.

It is unclear when they will be able to return to their homes.

Police divisional commander for Western District, Chow Pak-chu, said: "We evacuated the residents in C and D blocks first and then at 9.30 pm they started to evacuate A, B and E blocks."

At 1 am they were checking on the condition of F and G blocks before making a further decision on whether to evacuate the residents.

Among the government officials who visited the scene were Secretary for Security Alistair Asprey and Secretary for Works James Blake.

The disaster came after almost 48 hours of torrential rain had brought Hong Kong to a near standstill, causing at least one other death, floods and landslides as the territory was lashed by the heaviest storms in 20 years.

On Friday, 297 millimetres of rain fell in a 24-hour period while yesterday Hong Kong and the New Territories were drenched by another 195.1 mm.

The black rainstorm

石硤尾邨斜坡崩塌

千人大逃亡

瀉傾大泥山崩滑土護下樓龍

傷三死三有知已救搶掘挖行

八千住客大疏散

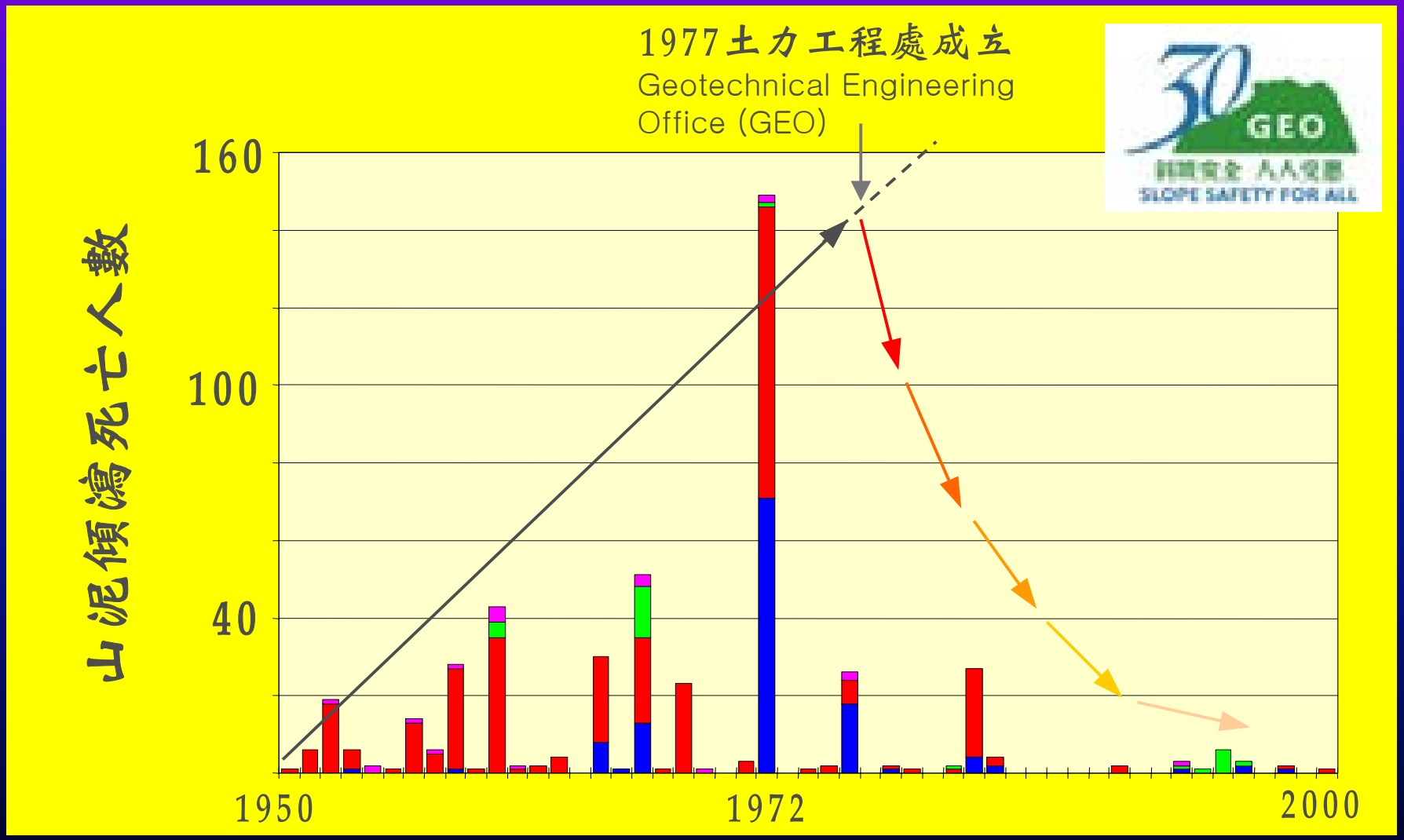
翡翠道塌大幅山泥掩馬路

父子通渠子遭泥活埋

父遭山泥冲走幸獲救

百米山坡崩瀉推倒兩船廠三人失踪

山泥傾瀉導致的死亡人數



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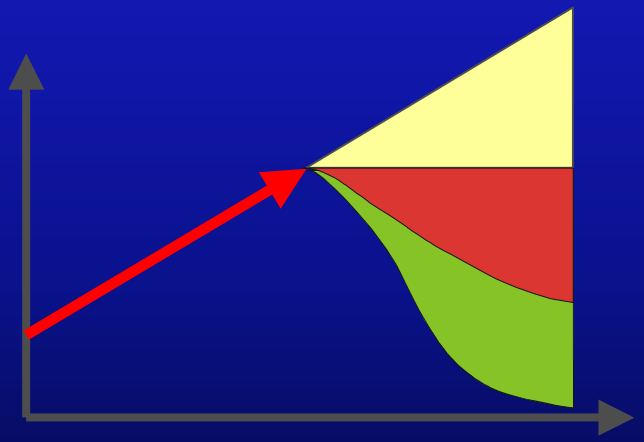
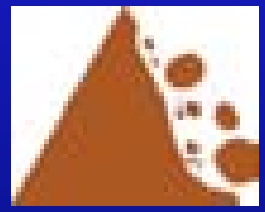
減低山泥傾瀉風險的主要策略





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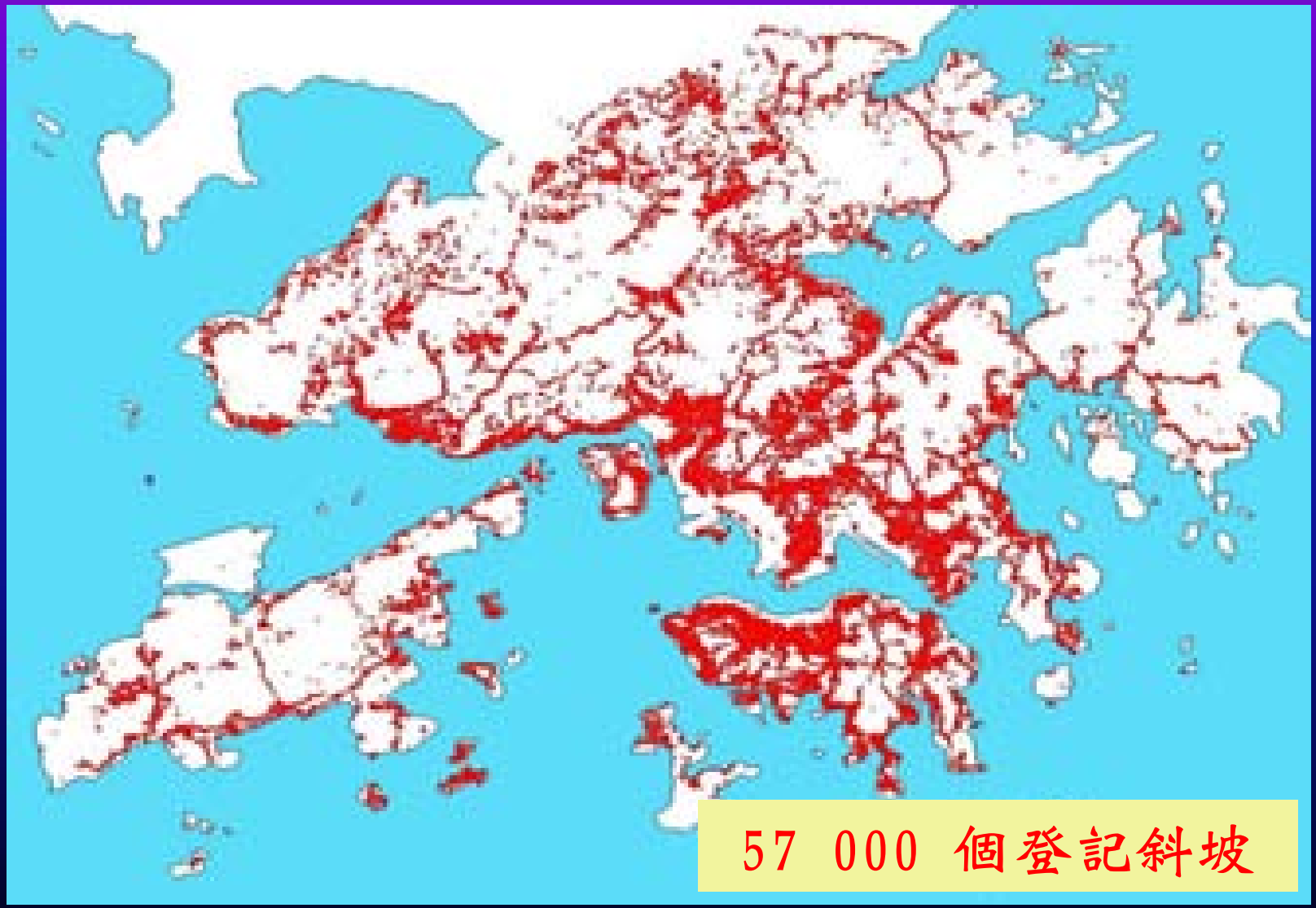
人造斜坡數目



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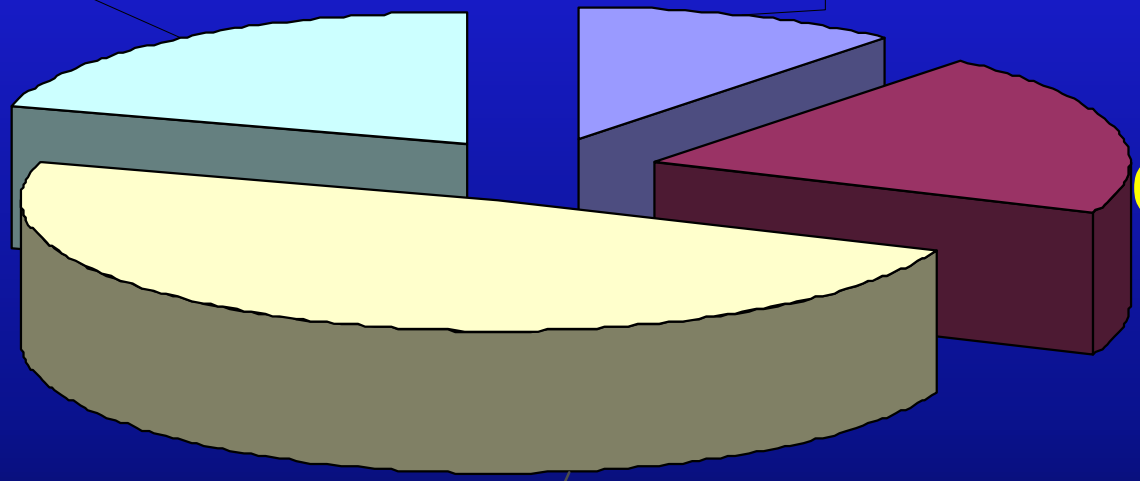
維修責任

政府新斜坡
(11500 Nos.)

私人新斜坡
(6500 Nos.)



私人舊斜坡
(11500 Nos.)

政府舊斜坡
(27500 Nos.)

39,000 政府斜坡
government slopes

18,000 私人斜坡
private slopes

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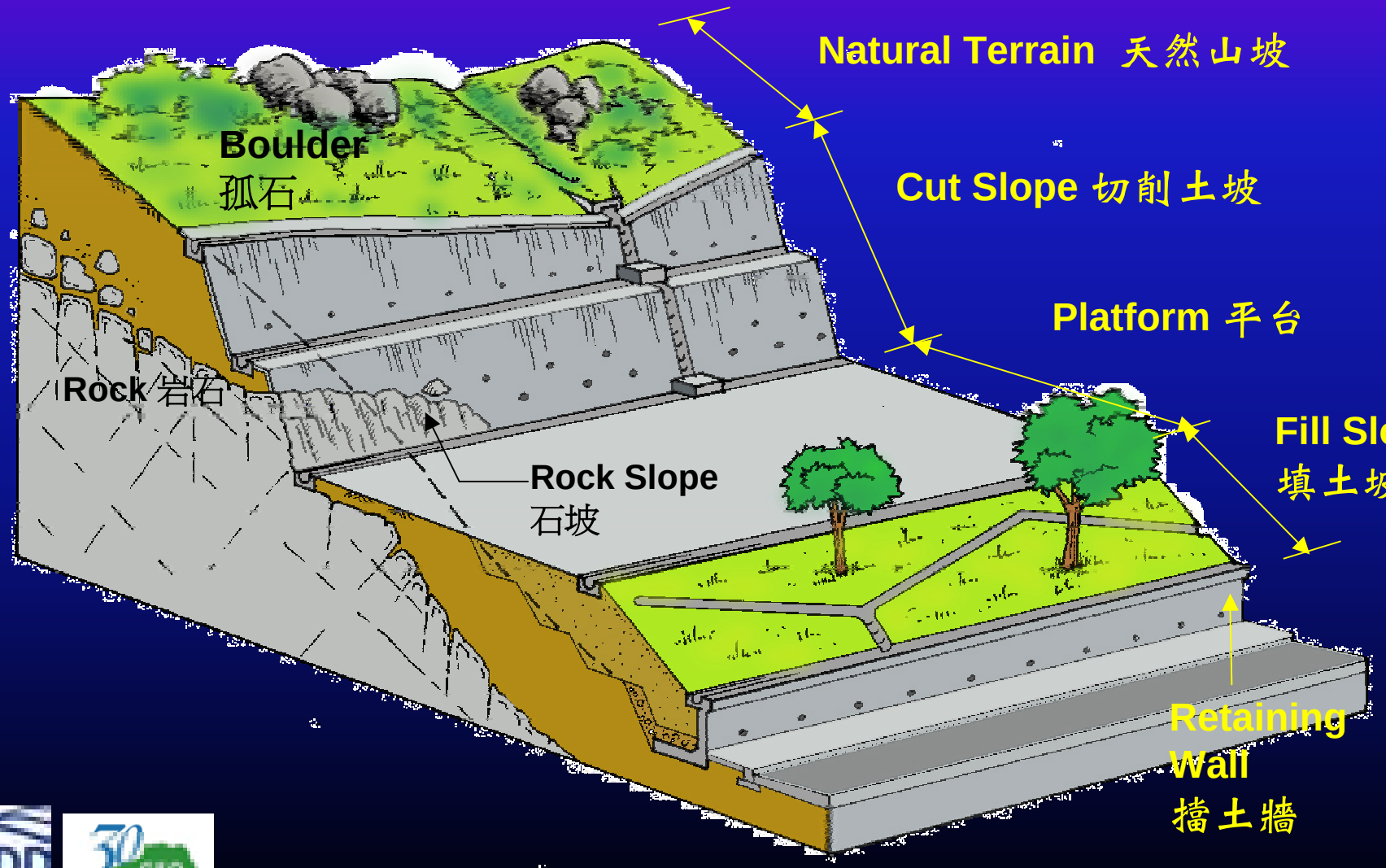
斜坡的類別



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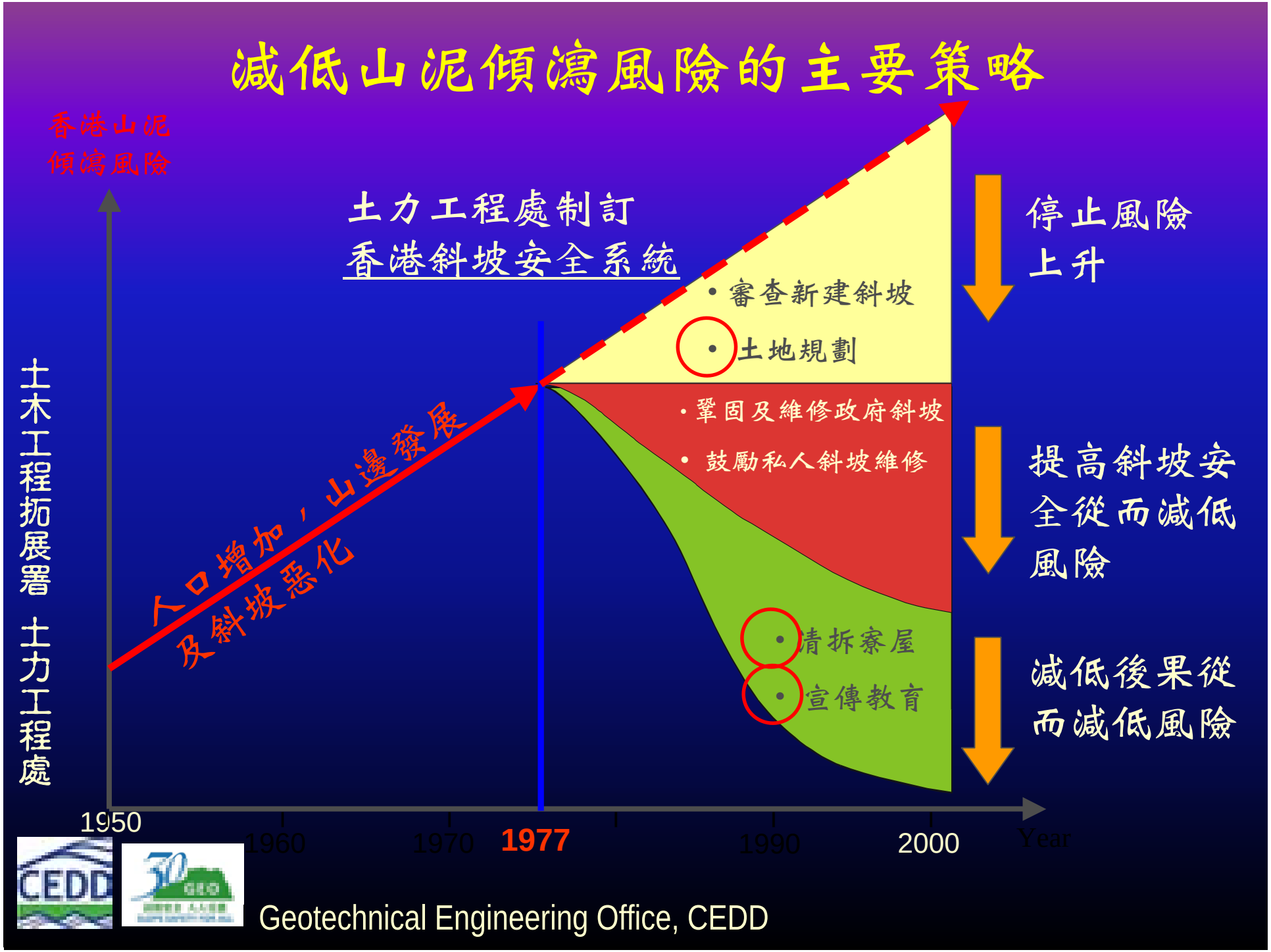
減低山泥傾瀉風險的主要策略



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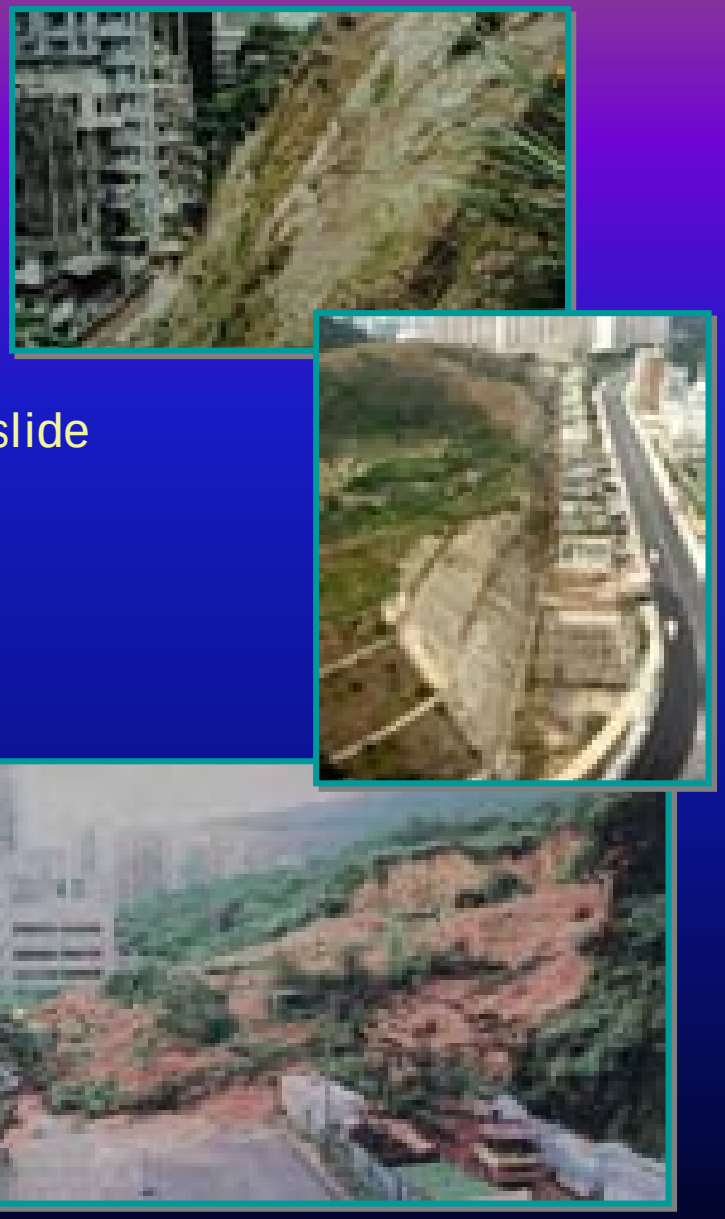
LANDSLIDE RISK

= Chance x Consequence

High Chance of Landslide

High Consequence of Landslide



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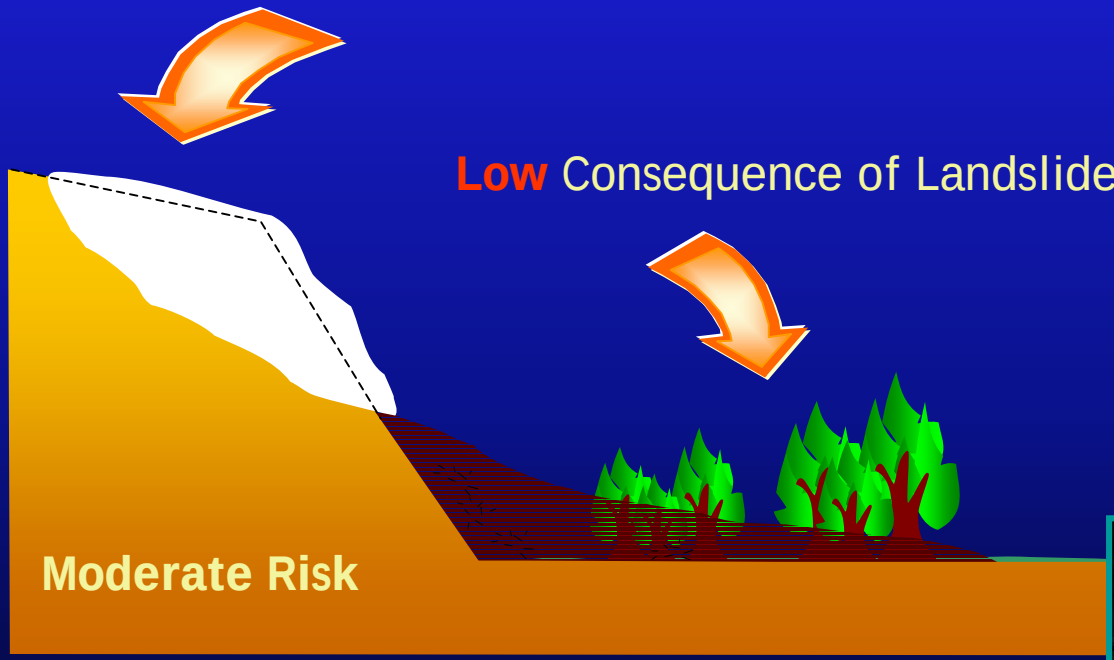
High Chance of Landslide



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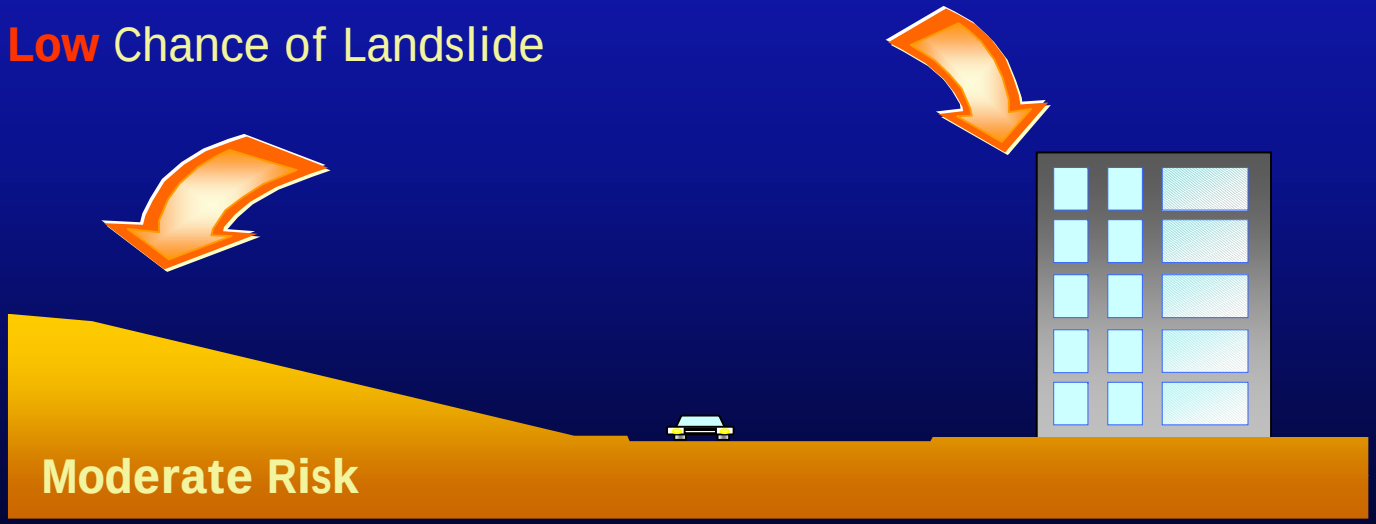
High Consequence of Landslide

Low Chance of Landslide



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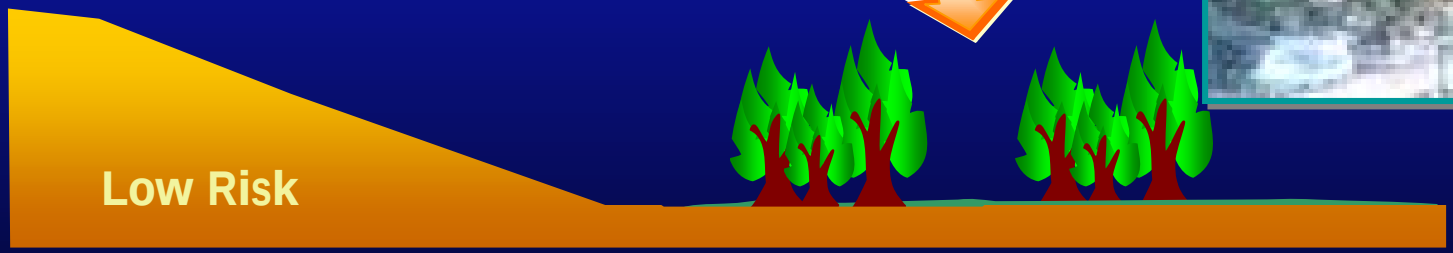
Low Chance of Landslide

Low Consequence of Landslide



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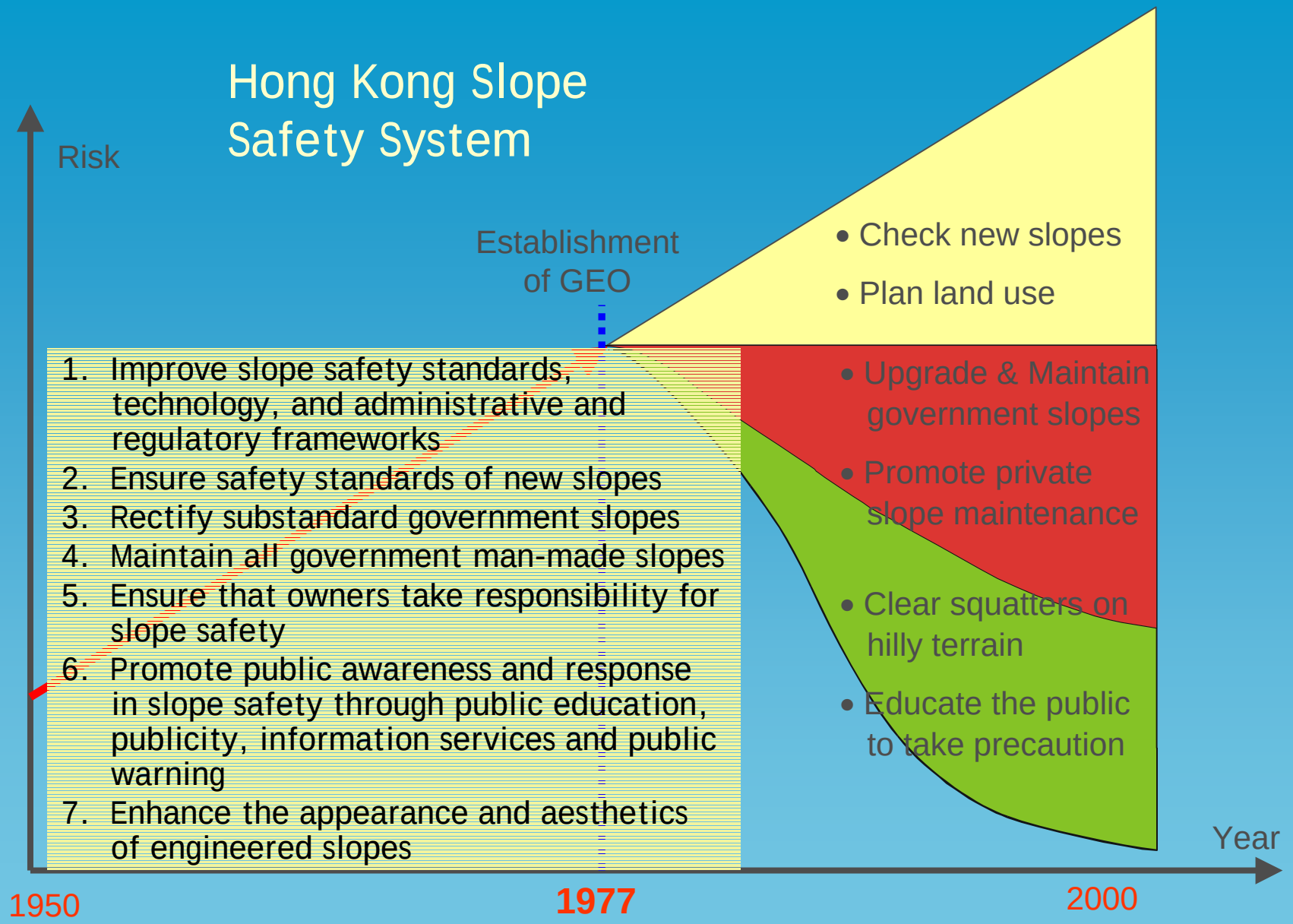
Hong Kong Slope Safety System



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30th Anniversary (1977 – 2007)

Hong Kong Slope Safety System

Geotechnical Engineering Office

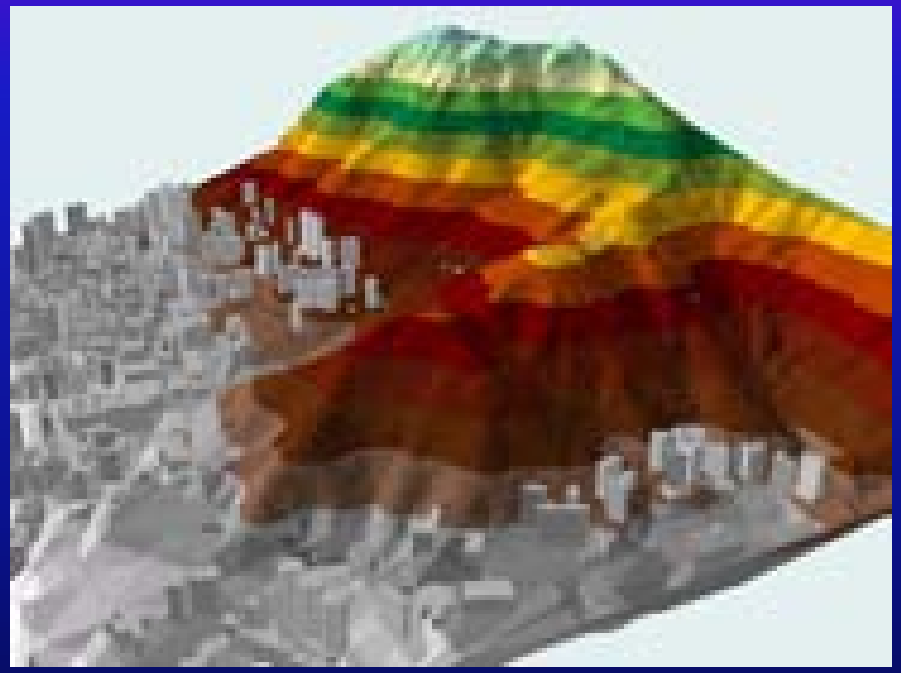
30 GEO

創建安全 人人受惠

SLOPE SAFETY FOR ALL

完善土地規劃

- ✓ 消除潛在天然災害的一個極具成本效益的方法
- ✓ 土力工程處在土地發展的早期規劃階段提供岩土方面的專業意見



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完善土地規劃－實例

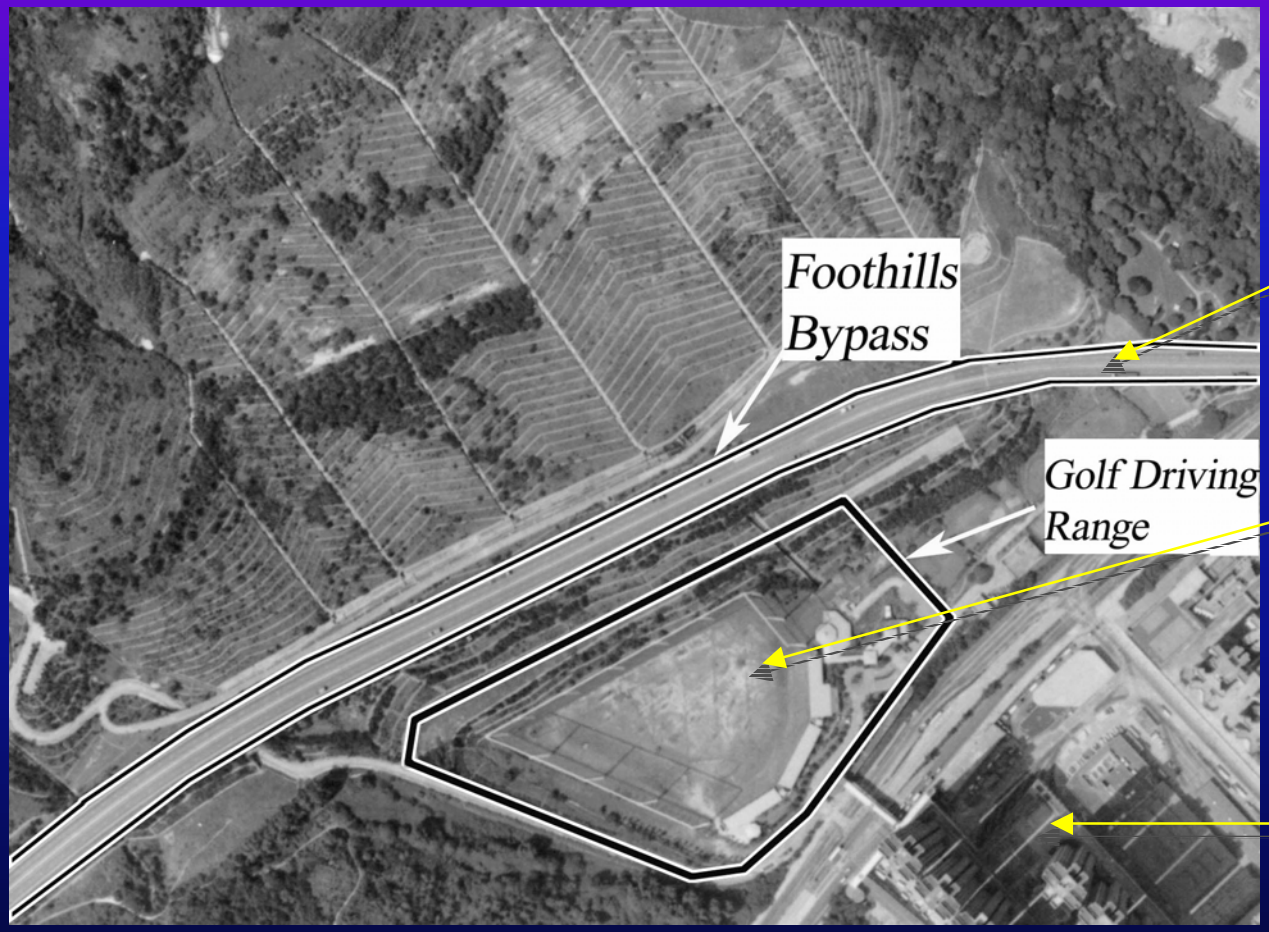
1990年發生大規模山泥傾瀉

屯門19區原本用作住宅發展

土木工程拓展署 土力工程處

Geotechnical Engineering Office, CEDD

完善土地規劃－實例



龍富路

屯門康樂體育中心高爾夫球場

新屯門中心

後改作繞道及高爾夫球練習場

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清拆寮屋

向陽村

土木工程拓展署 土力工程處

清拆寮屋

- ✓山邊寮屋特別受山泥傾瀉影響
- ✓曾造成嚴重死傷（例如在1982年的一場豪雨中便奪去23條寮屋居民性命）

清拆寮屋

用「工程」方法不能處理寮屋斜坡問題

土木工程拓展署 土力工程處

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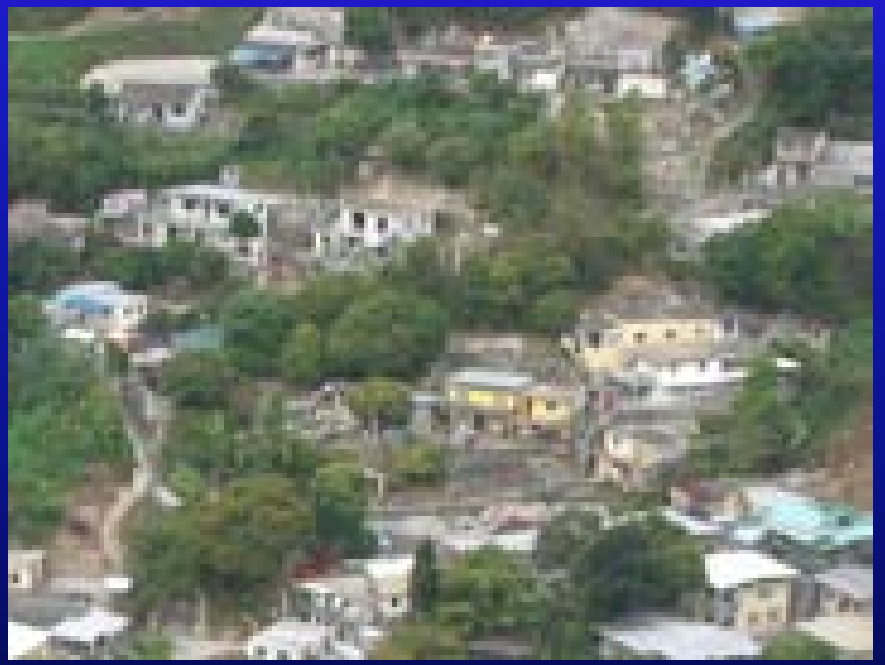
清拆寮屋

- ✓需要先消拆寮屋來提供工程所需的通道
- ✓工程期間的安全問題
- ✓以後維修的困難



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清拆寮屋

政府政策 ：

- 儘量不採用鞏固斜坡的方法
- 清拆寮屋及提供「上樓」安排

非發展清拆 NDC

鑒於斜坡安全理由而清拆寮屋

清拆前

清拆後

土木工程拓展署 土力工程處

清拆寮屋

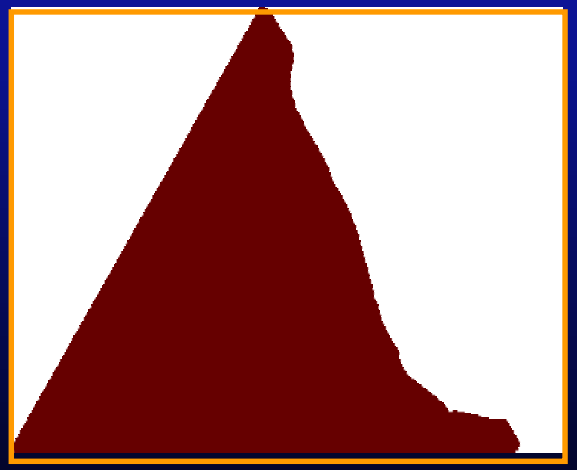
直至2007年

- ✓ 超過75,000間寮屋已被清拆
- ✓ 但香港仍有約10,000名寮屋居民
- ✓ 政府仍會努力進行勸籲工作

宣傳教育

主要訊息：

- ✓ 山泥傾瀉警句生效時注意採取個人防禦措施
- ✓ 定期維修私人斜坡



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宣傳教育

避免使用山邊道路

寮屋居民儘快前往安全地方暫避

土木工程拓展署 土力工程處

宣傳教育

展覽

土木工程拓展署 土力工程處

Geotechnical Engineering Office, CEDD

宣傳教育

公開講座

土木工程拓展署 土力工程處

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宣傳教育

宣傳刊物

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宣傳教育

宣傳刊物

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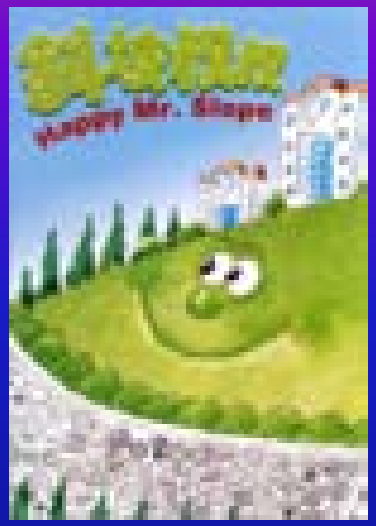
宣傳教育

Target for children



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宣傳教育

Target for students –
educational kit

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宣傳教育

學校講座

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宣傳教育

Guidance documents

香港斜坡安全網頁

Pamphlets & brochures

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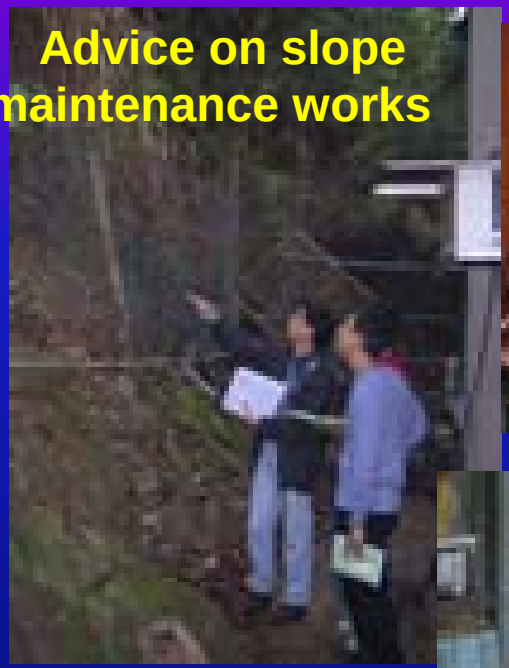
社區咨詢服務

- Advice on slope maintenance works



- Slope safety/maintenance seminar

- Meet the owners corporations

- Advice to owners who receive a DH Order

Meet-the-public service

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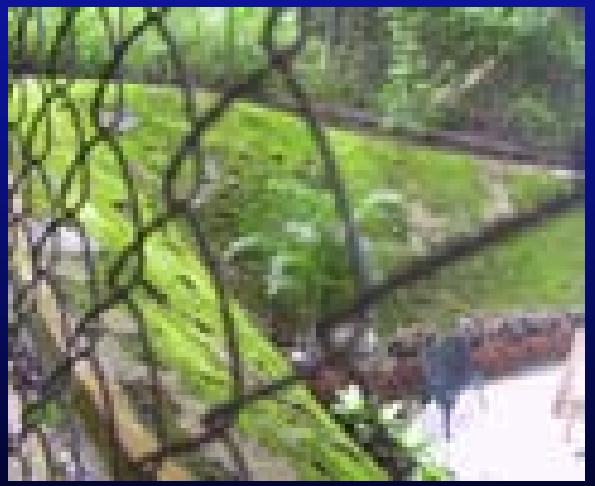
與非政府團體合作



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與傳媒合作

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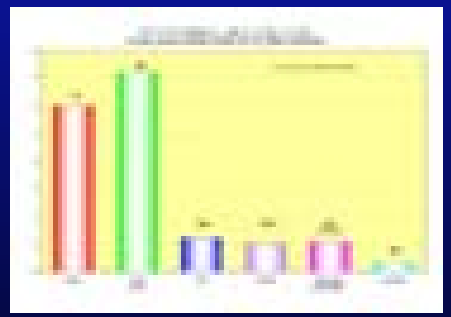
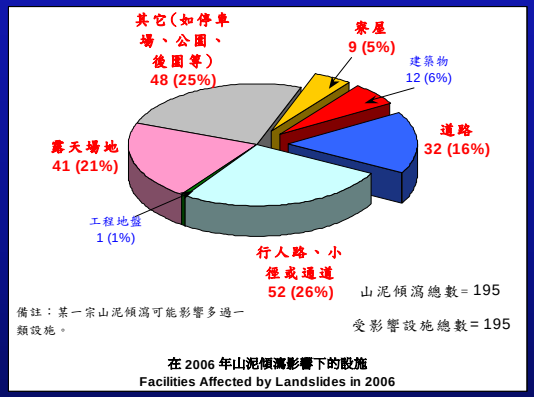
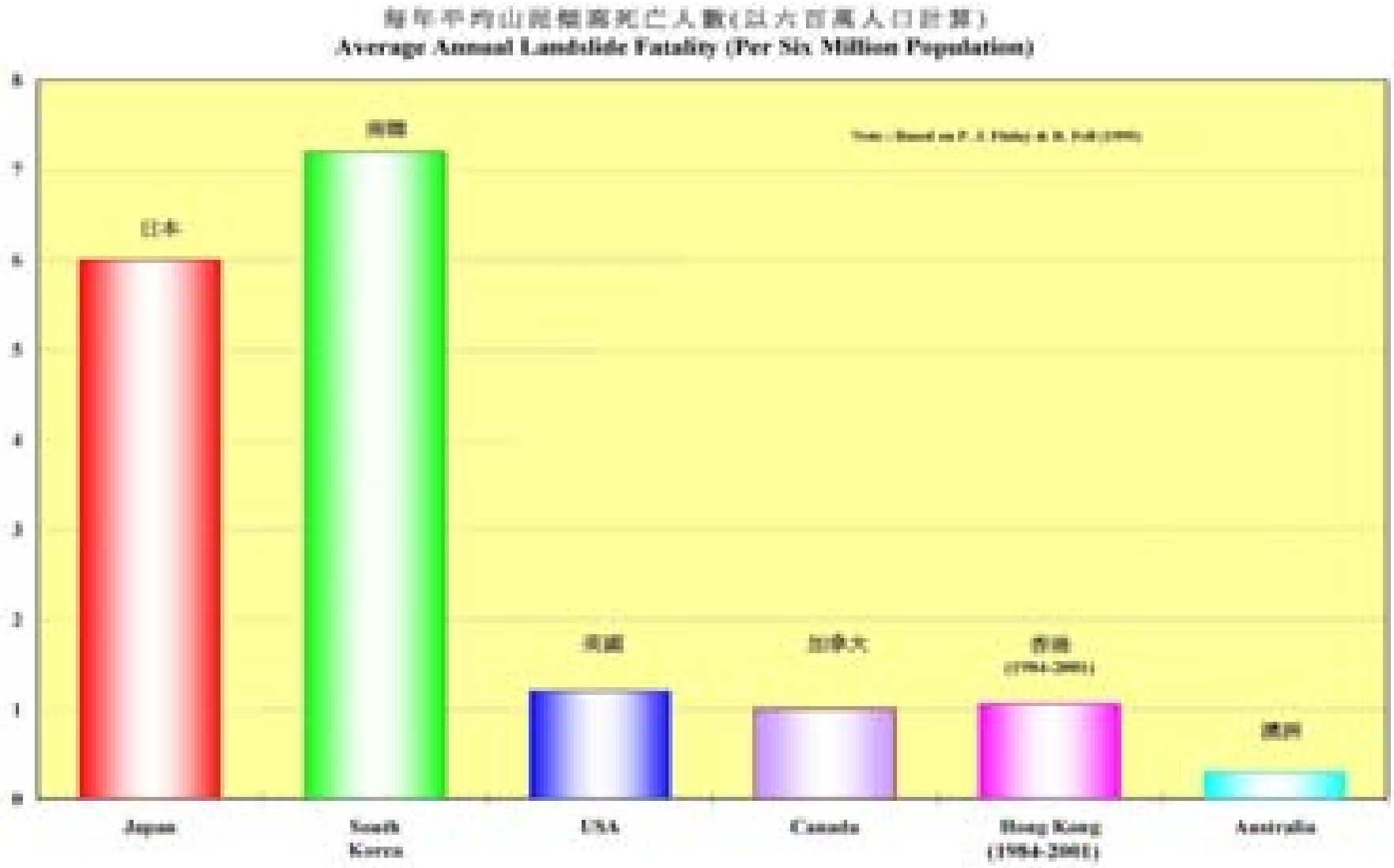
一些重要數據

土木工程拓展署 土力工程處





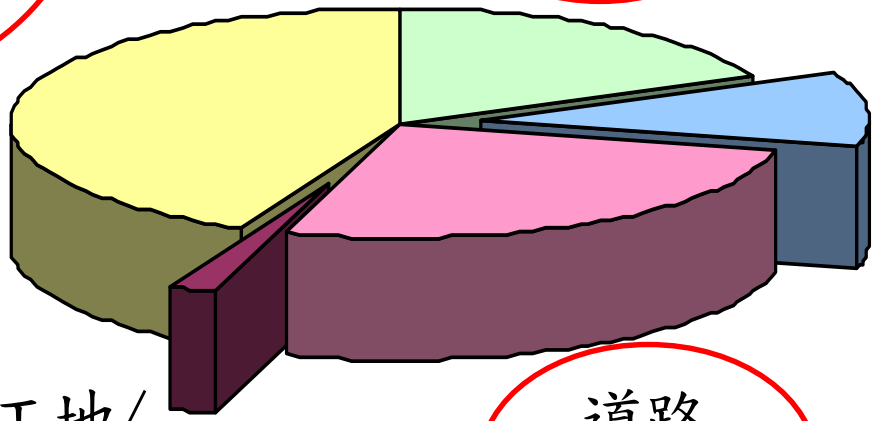
世界各地每年平均出泥傾瀉死亡人數



受山泥傾瀉影響的設施

- ✓ In squatter areas 寮屋區
- ✓ On footpaths, bus shelters, open space etc. 行人路、巴士站、露天場地 等
- ✓ Associated with driving along steep slopes 道路

受山泥傾瀉影響的設施
(1985-2005)



行人路/公園/停車場/後園/露天場地等 43%

寮屋 18%

建築物 11%

道路 26%

其他(如工地/引水道) 2%

- 寮屋區
- 行人路、巴士站露天場地 等
- 道路

87%

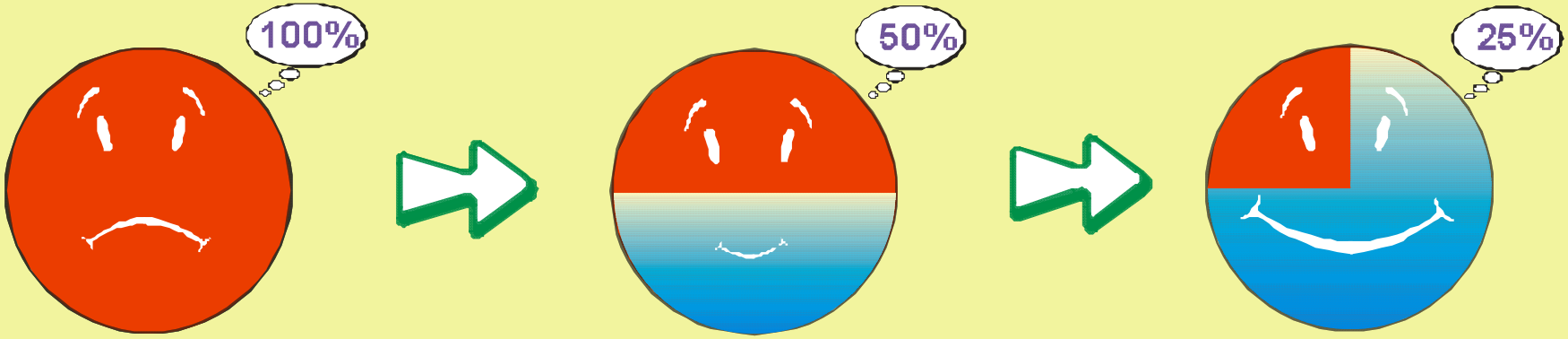
一些重要山泥傾瀉數據

- ✓ 94% 死亡事故在山泥傾瀉警告生效期間發生

- ✓ 78% 死亡事故在下列地點發生：
  - 寮屋區
  - 行人路、巴士站、露天場地 等
  - 道路

減低舊人造斜坡的山泥傾瀉風險

山泥傾瀉風險指標



土力工程處 防止山泥傾瀉計劃

土木工程拓展署 土力工程處


山泥傾瀉風險 ≠ 0

天然山坡的山泥傾瀉

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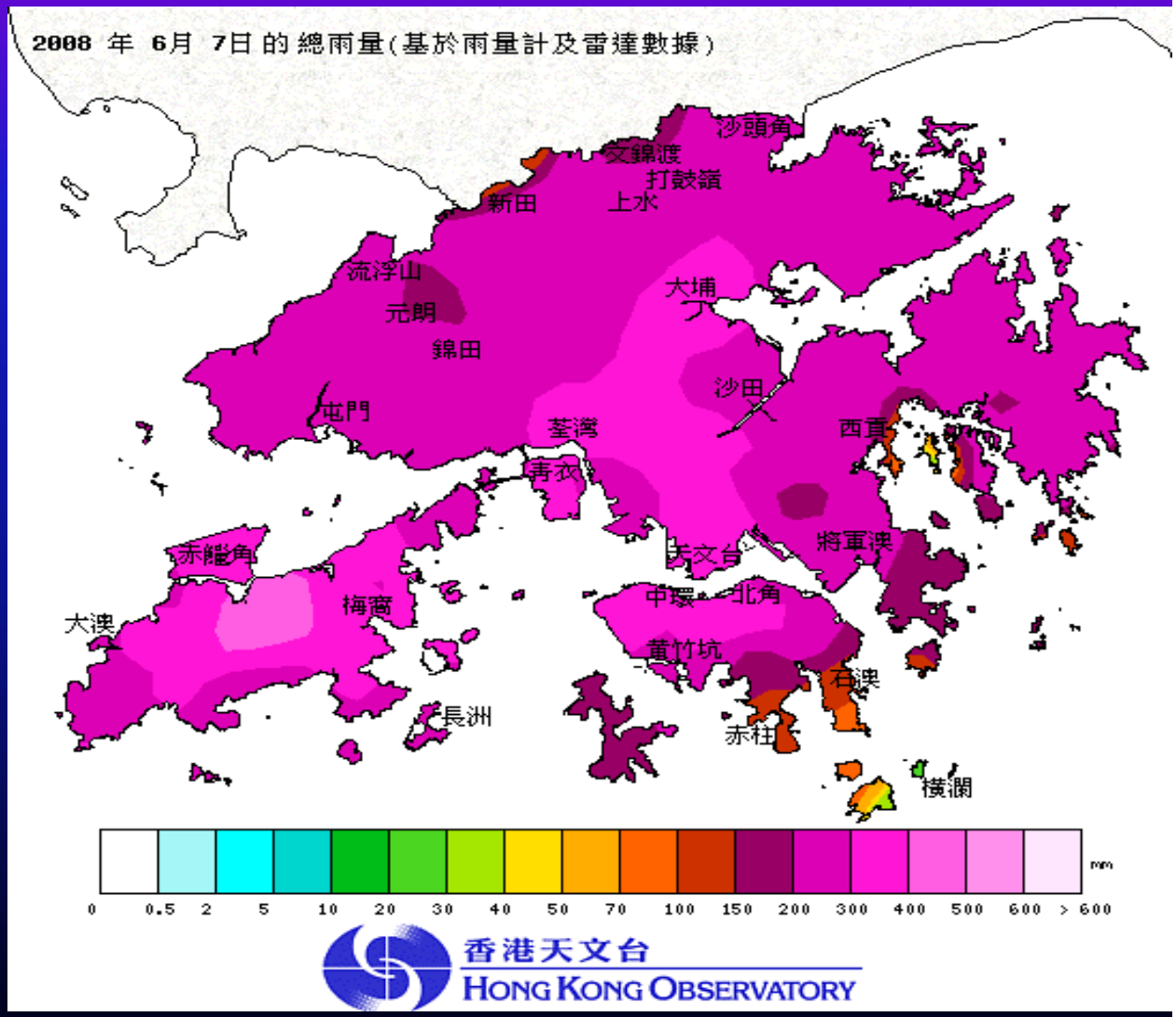
2008年雨量記錄

香港有紀錄以來最高一小時雨量

全年雨量達3066毫米

在6月7日的一場暴雨，天文台錄得一小時雨量達145.5毫米



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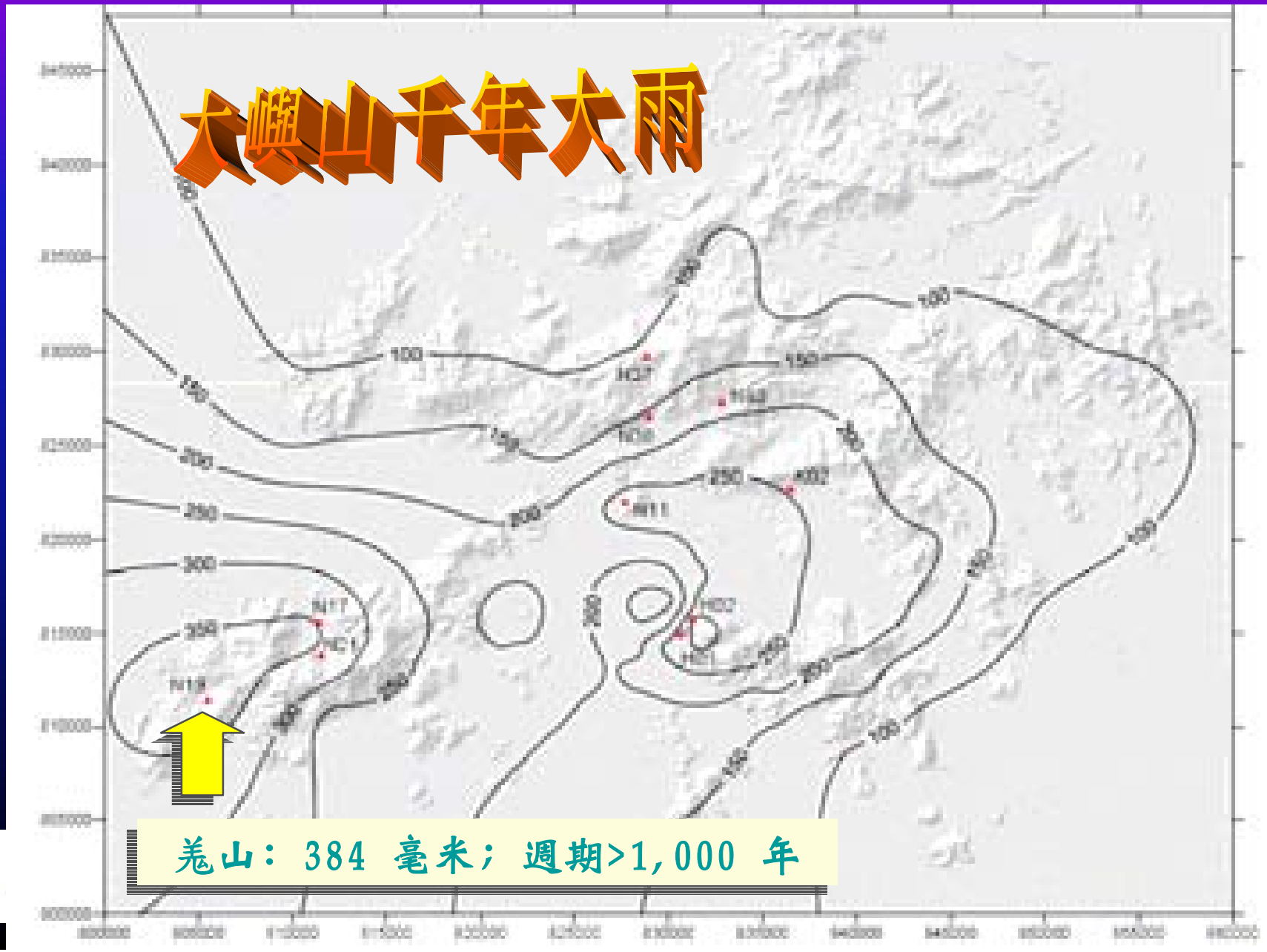
6月6-8日最高4小時累計雨量分佈圖



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6月7日暴雨的滑坡指數=12.3(有紀錄以來最高)

土木工程拓展署 土力工程處

- 直昇機觀察及空中圖片顯示超過1,000宗天然山坡山泥傾瀉

山泥傾瀉造成的破壞

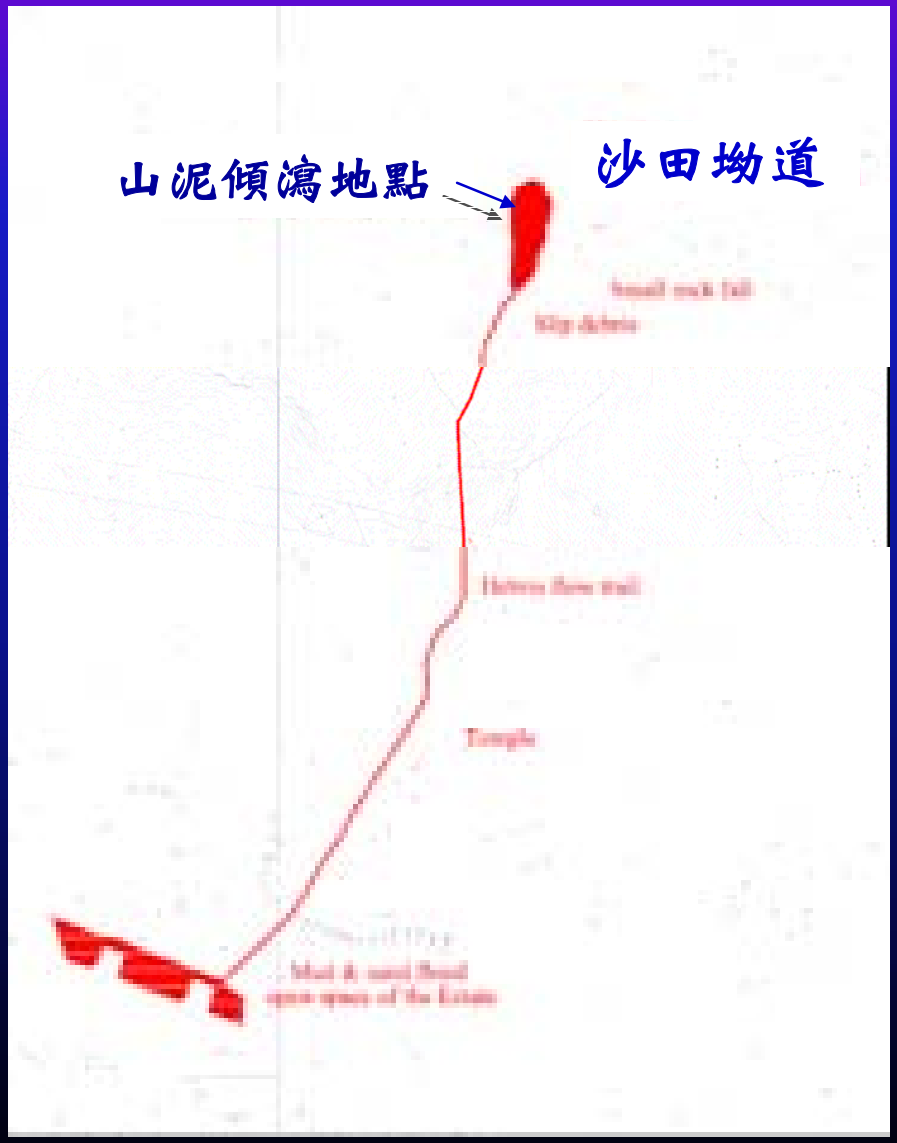
- 大概7%山泥傾瀉影響建築物
- 其餘山泥傾瀉大多影響寮屋、道路、行人路、露天場地等

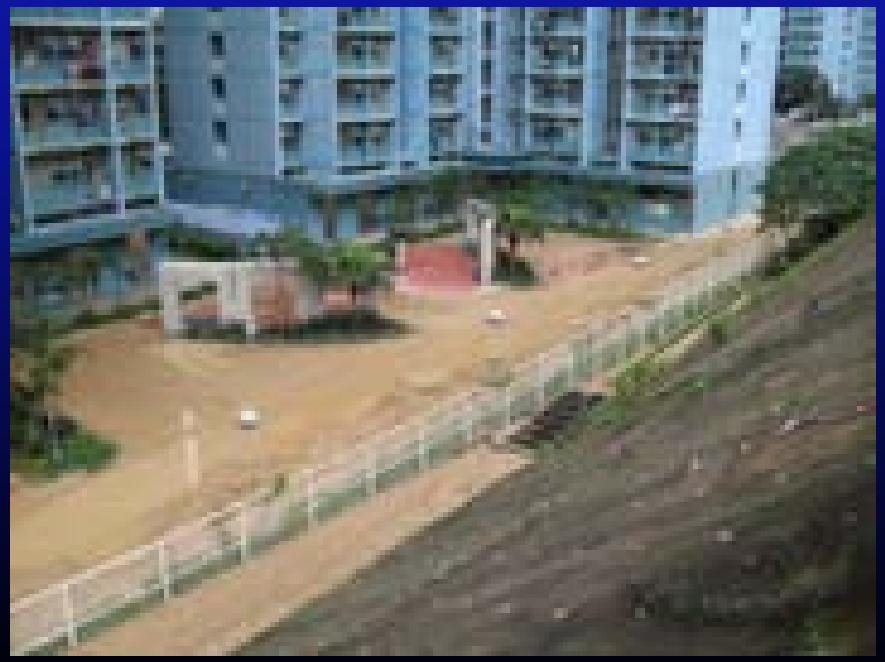
土木工程拓展署 土力工程處

6月7日一場暴雨
引發多宗大型山泥傾瀉

土木工程拓展署 土力工程處

沙田坳道及慈雲山慈正邨對上





進行緊急維修工程

土木工程拓展署 土力工程處

配上迷彩顏色
減低視覺影響

CEDD

GEO

Geotechnical En

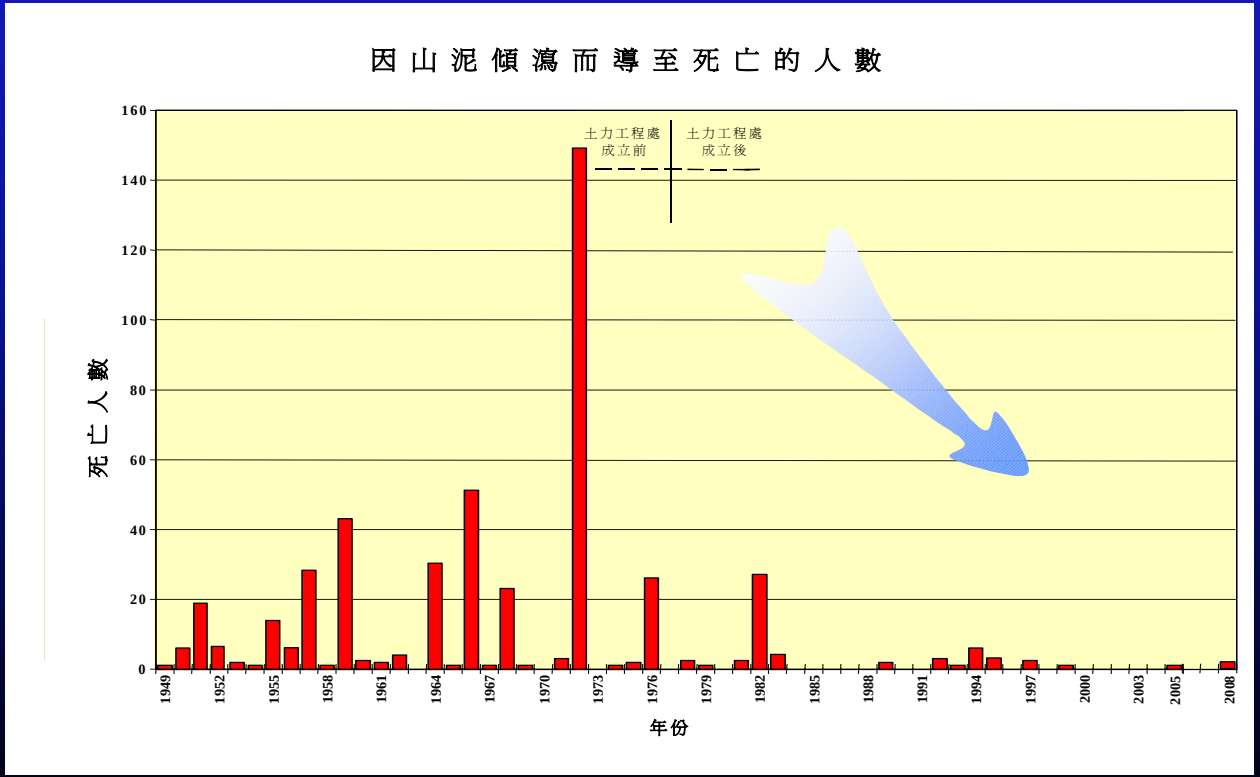
大澳橫坑村

石籠牆

橫坑村

人造斜坡

- ✓ 在今次千年大雨(滑坡指數達12.3級)下，香港斜坡安全系統仍能有效運作，將人造斜坡山泥傾瀉造成的傷亡減到最低，比以前大大進步。



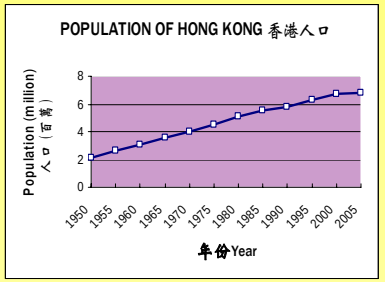
土木工程拓展署 土力工程處

天然山坡

- ✓ 香港的天然山坡今次受到破壞性的嚴重考驗，很多大型山泥傾瀉都是發生在天然山坡上。
- ✓ 政府的長遠防治山泥傾瀉計劃，早在2007年尾通過了行政立法兩會，將會有系統地處理天然山坡，這場特大暴雨顯示了這方向是正確的。

Long Term Slope Safety Challenges

- ✓ Population increase
- ✓ Possibility of more extreme weather conditions



長遠防治山泥傾瀉計劃
Post-2010 Landslip Prevention and Mitigation Programme

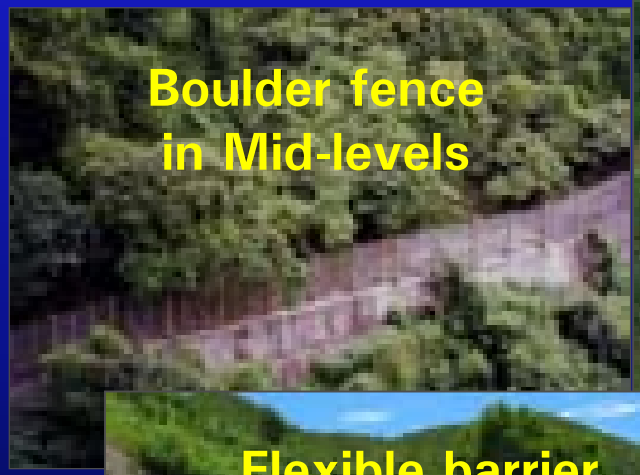
土木工程拓展署 土力工程處

長遠防治山泥傾瀉計劃的每年目標

- 鞏固150個政府人造斜坡
- 為100個私人人造斜坡進行安全篩選研究
- 為30幅天然山坡進行風險緩減工程

防止山泥傾瀉 ⇒ 防治山泥傾瀉

天然山坡山泥傾瀉一般以風險緩減措施處理，
替代大規模的斜坡鞏固工程



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本地的天然山坡山泥傾瀉風險緩減措施

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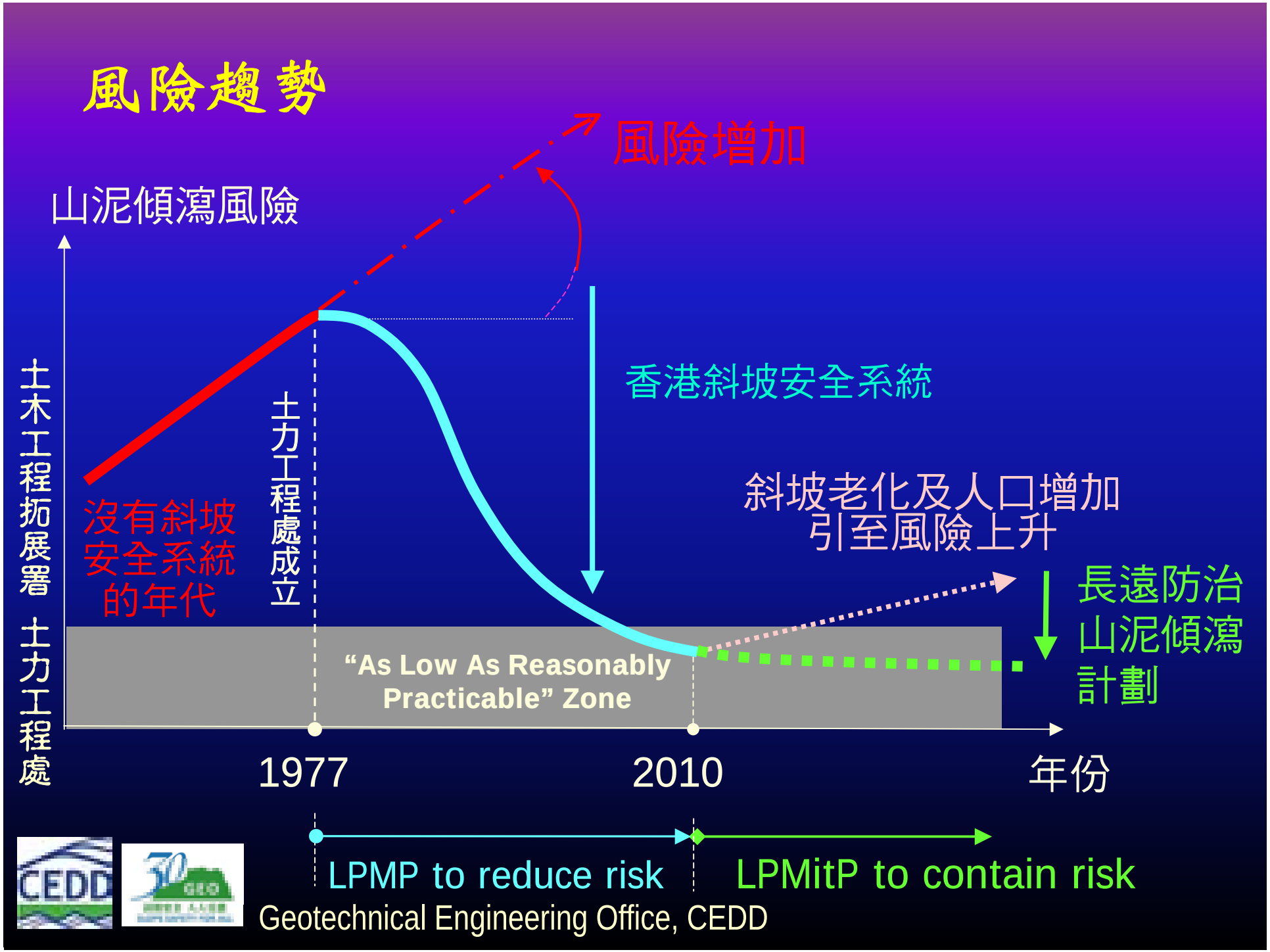
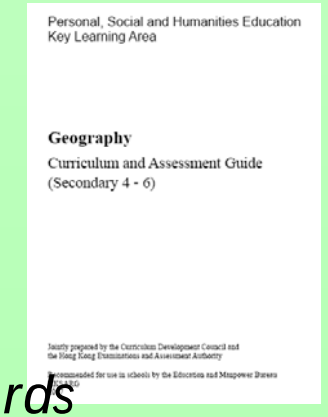

風險趨勢
風險增加
山泥傾瀉風險
土木工程拓展署 土力工程處
土力工程處成立
沒有斜坡安全系統的年代
香港斜坡安全系統
斜坡老化及人口增加引至風險上升
長遠防治山泥傾瀉計劃
"As Low As Reasonably Practicable" Zone
1977
2010
年份
LPMP to reduce risk
LPMitP to contain risk
CEDD
Geotechnical Engineering Office, CEDD


針對NSS課程的一些
補充資料

Background

The New Senior Secondary (NSS) Geography curriculum



Management of geological resources and geological hazards

⇨ How can people manage the geological resources and geological hazards in Hong Kong?

⇨ Geological hazard – Landslides

- Causes of landslides in Hong Kong, including natural and human factors.
- Slope management and landslide prevention, e.g. strengthening slopes, restricting development on slopes, maintaining slopes, regular checking of slopes
- Local example: Sham Wan Landslide

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山泥傾瀉的成因及防範措施

(天然因素)

- Heavy Rainfall 暴雨
  - 堅固斜坡設計
  - 適當排水系統

- 不利的地質 Adverse Geology
  - 岩土研究
  - 城市規劃
  - 斜坡設計指引

(人為因素)

- 設計或施工上的不足
  - 釐定斜坡設計標準
  - 審查斜坡設計
  - 工程施工監察制度

- Lack of Maintenance 缺乏維修
  - 定期維修 - 政府部門及私人斜坡業主共同承擔

土木工程拓展署 土力工程處

斜坡維修的重要

- 許多山泥傾瀉的成因是由於：
  - 排水渠阻塞及破爛　Blockage / damage of drainage system
  - 斜坡護面表層損毀　Damage of slope cover
    ⇨雨水侵蝕表土 Rain infiltration causes erosion
  - 地下水管滲漏　Leakage of buried utilities
    ⇨滲漏及雨水滲入而導致地下水位上升
    seepage / rain infiltration causes rise in ground water table

- 為使斜坡保護設施發揮作用，定期維修包括排水渠，保護面層及地下水管是必要的

斜坡維修的重要

- 水管滲漏或爆裂

1982 牛頭角道山泥傾瀉
（食水管爆裂）

1994 觀龍樓山泥傾瀉
（污水渠滲漏）

斜坡維修的重要

- 39,000 個政府人造斜坡由七個部門負責維修

- 每年在斜坡維修上的費用約為6 億元

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斜坡維修的重要

- 現時，私人斜坡的維修是以自願為原則
- 向私人業主加強斜坡安全的公眾教育

對私人斜坡進行
「安全篩選」並在有
需要時發出
「危險斜坡修葺令」

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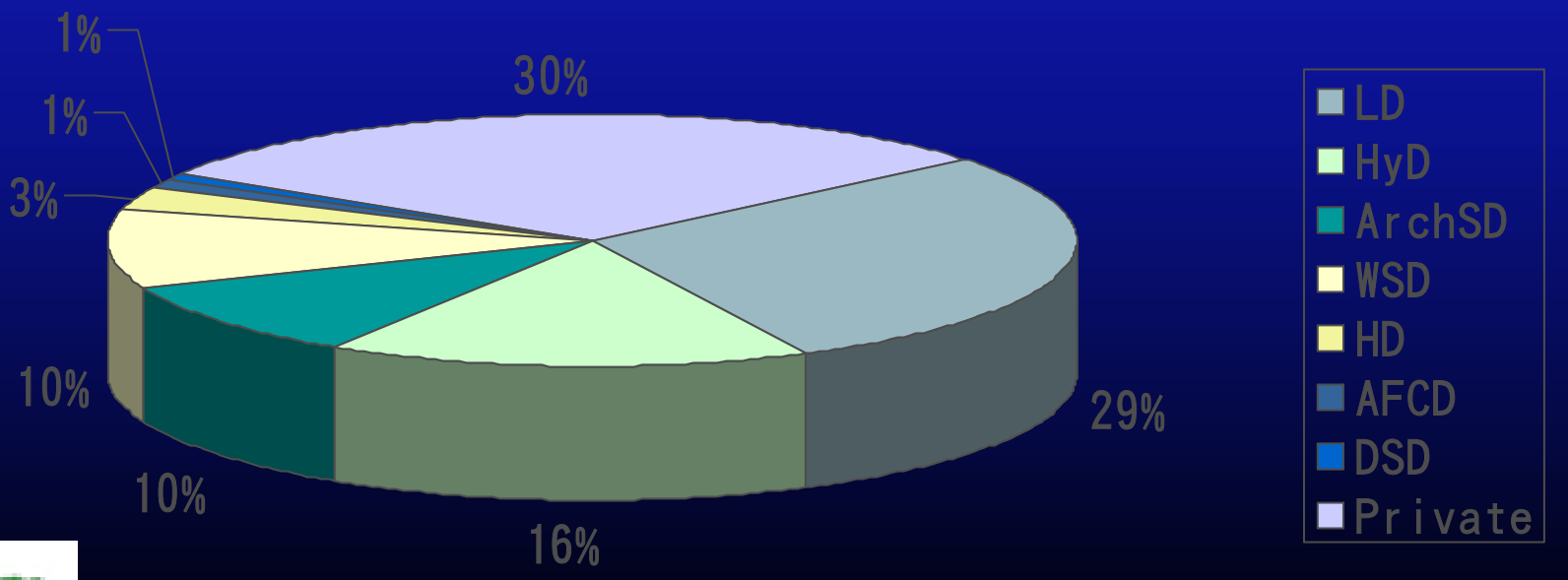
斜坡維修的重要

- ✓ Rests with the slope owners
- ✓ Identified by SIMAR
- ✓

http://www.slope.landsd.gov.hk/smris



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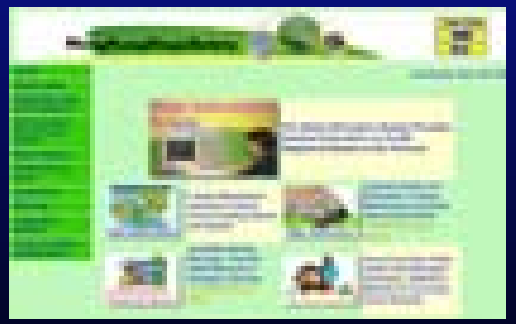
斜坡維修的重要

地政總署的「斜坡維修責任信息系統」

- 直接查閱斜坡維修責任的資料
- 斜坡編號位置及負責人士等資料
- 地址: 北角渣華道**333**號北角政府合署**1**樓
- 預約電話: **2231 3333**
- 網頁: (http://www.slope.landsd.gov.hk/smris/)

SMRIS



- 亦可流瀏覽「香港斜坡安全網頁」
(http://hkss.cedd.gov.hk)

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Shum Wan Road landslide

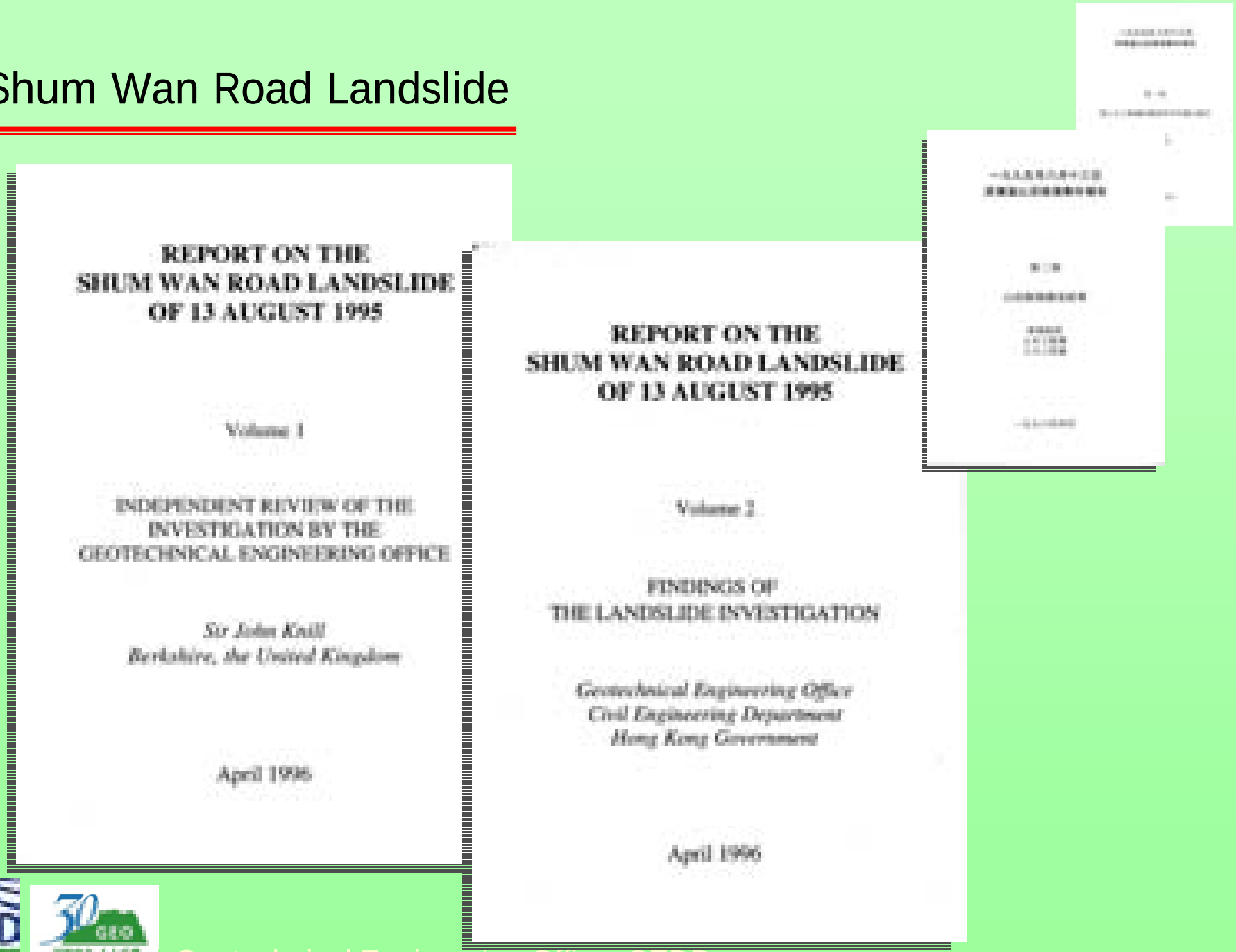
Shum Wan Road
(深灣道) 1995

2 killed

土木工程拓展署 土力工程處

Geotechnical Engineering Office, CEDD

Shum Wan Road Landslide



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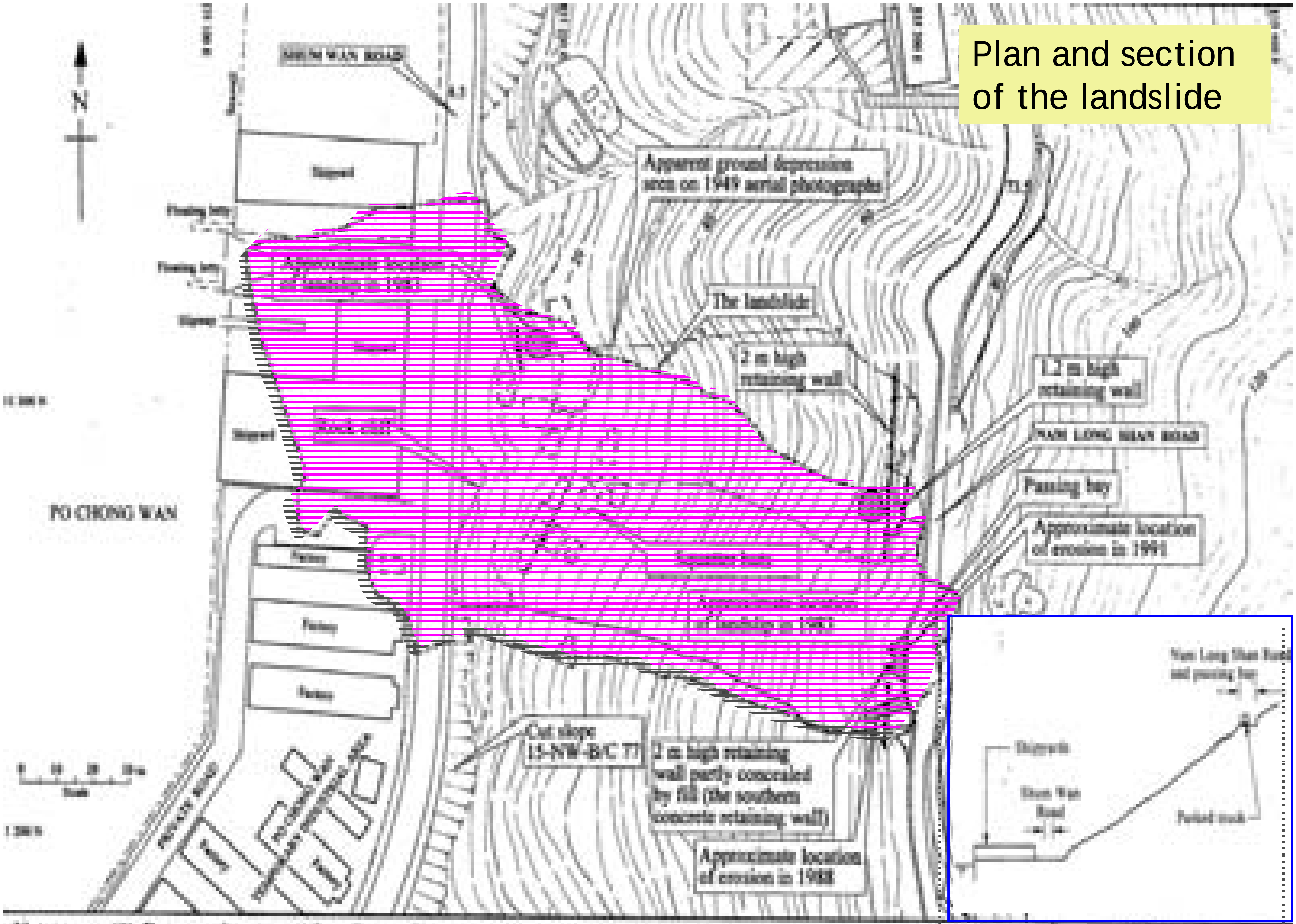
Plan and section of the landslide


N
SHUM WAN ROAD
Apparent ground depression seen on 1949 aerial photographs
Approximate location of landslip in 1983
The landslide
2 m high retaining wall
1.2 m high retaining wall
NAM LONG SHAN ROAD
Passing bay
Approximate location of erosion in 1991
Rock cliff
Squatter huts
Approximate location of landslip in 1983
PO CHONG WAN
Slipway
Factory
Cut slope 15-NW-B/C 77
2 m high retaining wall partly concealed by fill (the southern concrete retaining wall)
Approximate location of erosion in 1988
Nam Long Shan Road and passing bay
Shipyards

Notes : (1) Base map is extracted from Survey Sheets No. 15-NW-4C & No. 15-NW-4D, dated August 1992 & September 1992 respectively, scale 1 : 1000.
(2) Locations of squatter huts are based on Survey Sheet No. 15-NW-4C, dated October 1984, scale 1 : 1000.

Shum Wan Road Landslide

General description of the landslide site

History of the site development

introduce the use of aerial photo

Analysis of rainfall records

HKO/GEO raingauge record

Description of the landslide

Field observations/witness accounts / geology / soil properties / groundwater conditions/water-carrying services

Diagnosis of the causes of the landslide

Conclusions

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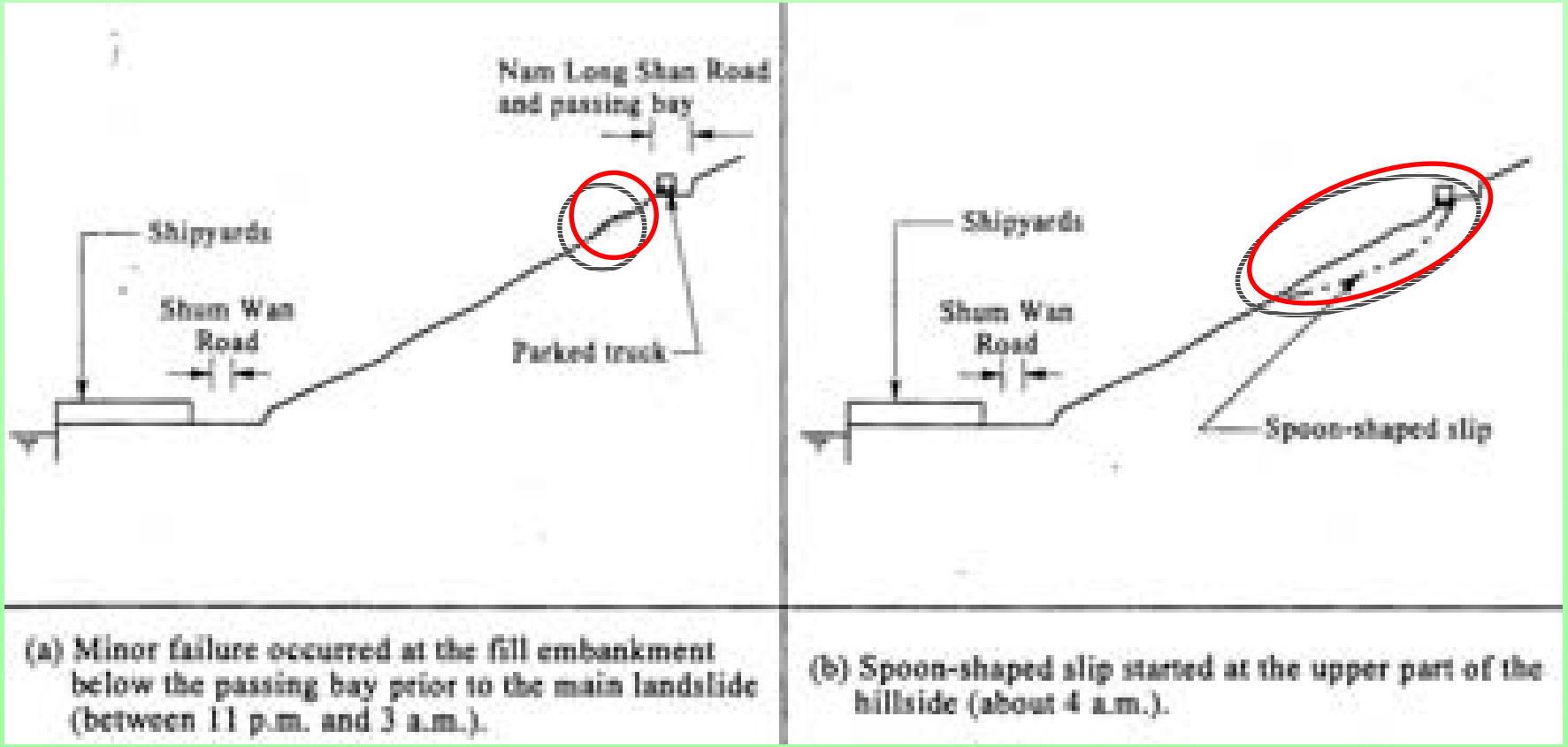
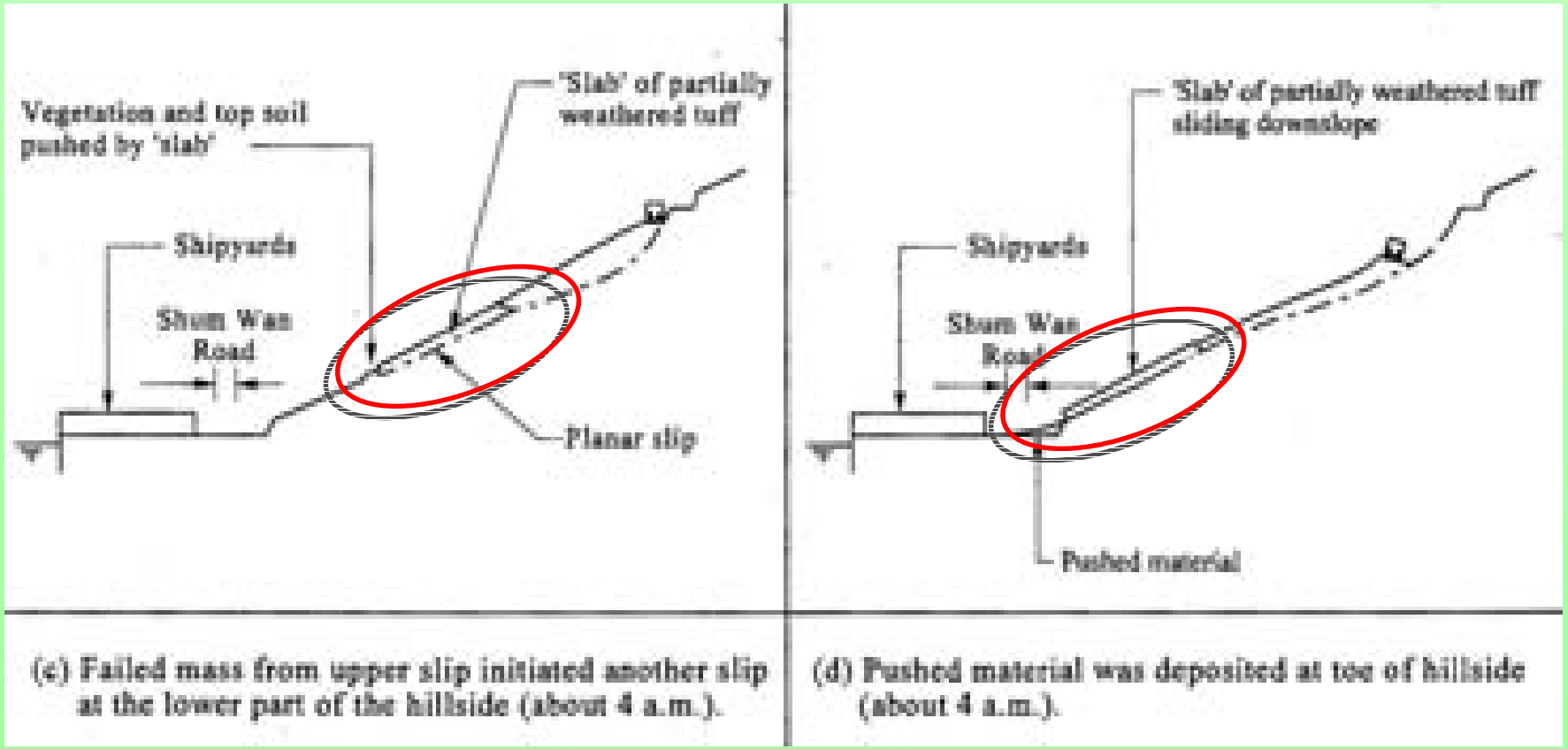
Shum Wan Road Landslide



(a) Minor failure occurred at the fill embankment below the passing bay prior to the main landslide (between 11 p.m. and 3 a.m.).

(b) Spoon-shaped slip started at the upper part of the hillside (about 4 a.m.).

Shum Wan Road Landslide



(c) Failed mass from upper slip initiated another slip at the lower part of the hillside (about 4 a.m.).

(d) Pushed material was deposited at toe of hillside (about 4 a.m.).

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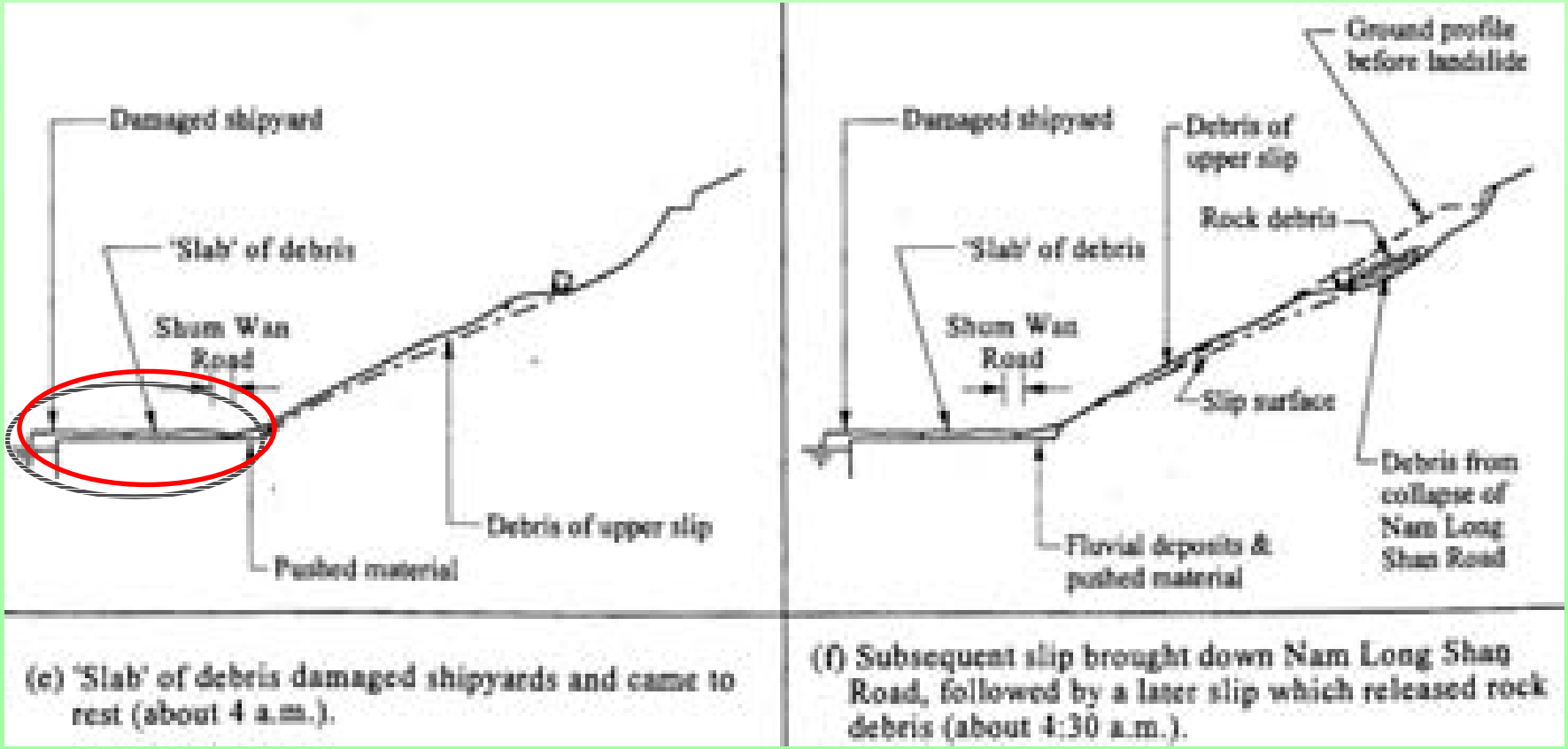
Shum Wan Road Landslide



(e) 'Slab' of debris damaged shipyards and came to rest (about 4 a.m.).

(f) Subsequent slip brought down Nam Long Shan Road, followed by a later slip which released rock debris (about 4:30 a.m.).

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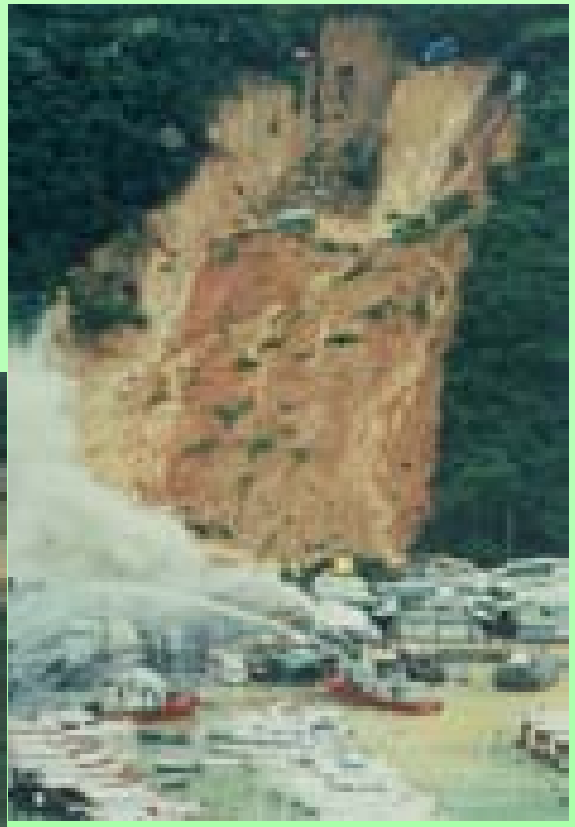
Shum Wan Road Landslide



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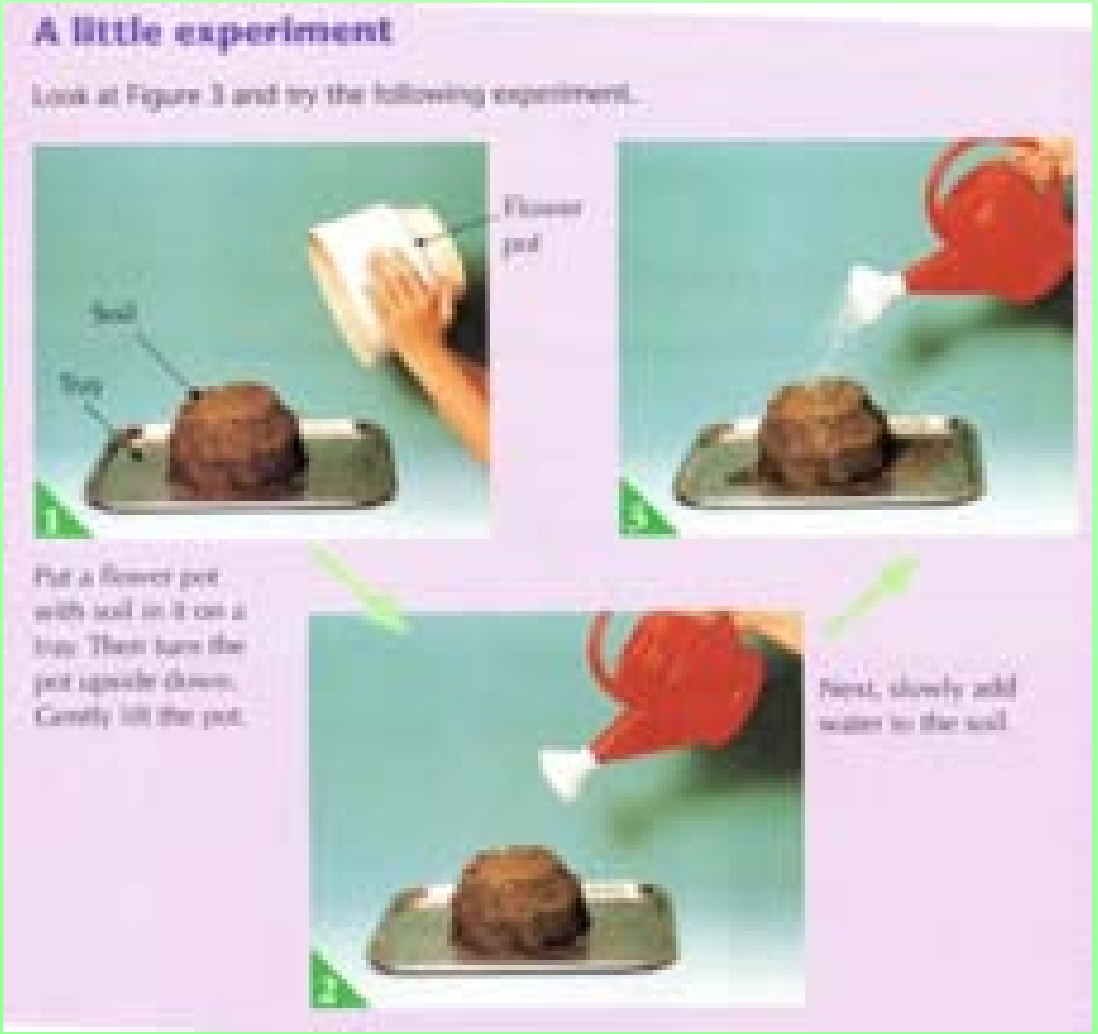
Shum Wan Road Landslide

The main landslide involved two distinct parts that occurred almost simultaneously.

Causes of landslide:

- ⇨ *Presence of weak layers in the ground*
- ⇨ *Ingress of water during prolonged heavy rainfall*
- ⇨ *Minor failure of fill embankment below a passing bay on Nam Long Shan Road*
- ⇨ *Partial blockage of drainage system*

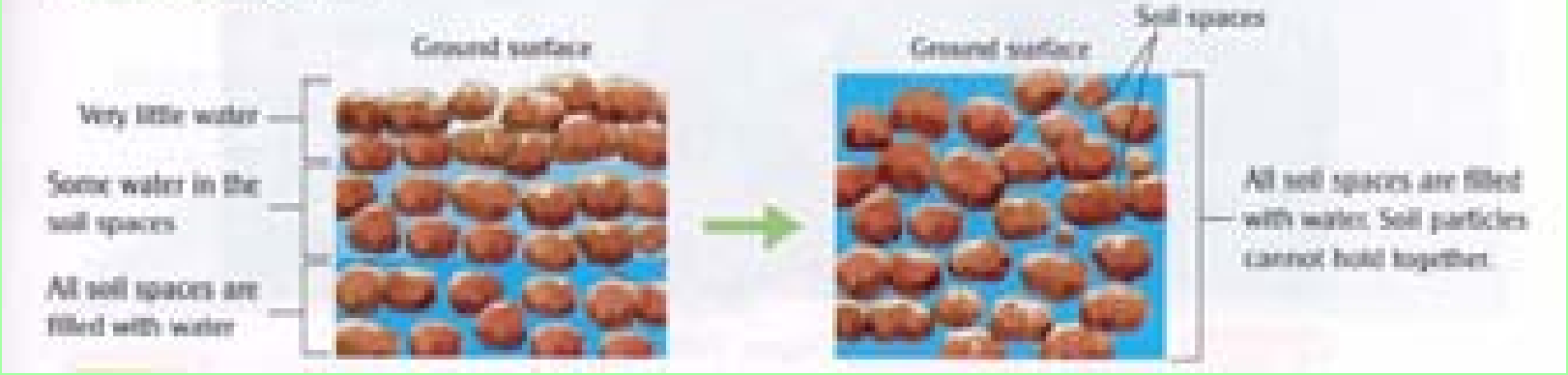
Some observations on the “landslide” chapter of existing textbook



土木工程拓展署 土力工程處

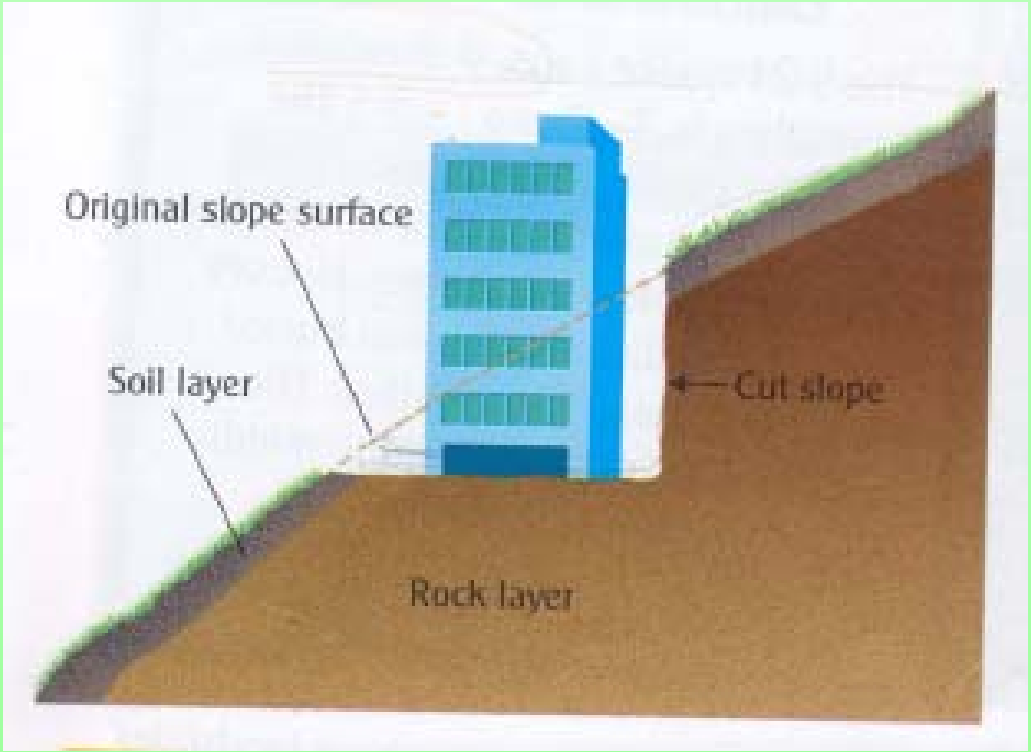
Some observations on the “landslide” chapter of existing textbook

When too much rain falls on a slope over a short period of time, the soil becomes saturated. The soil particles are unable to stick together and become loose. The soil mass may move downslope and landslides may occur. See Figure 4.

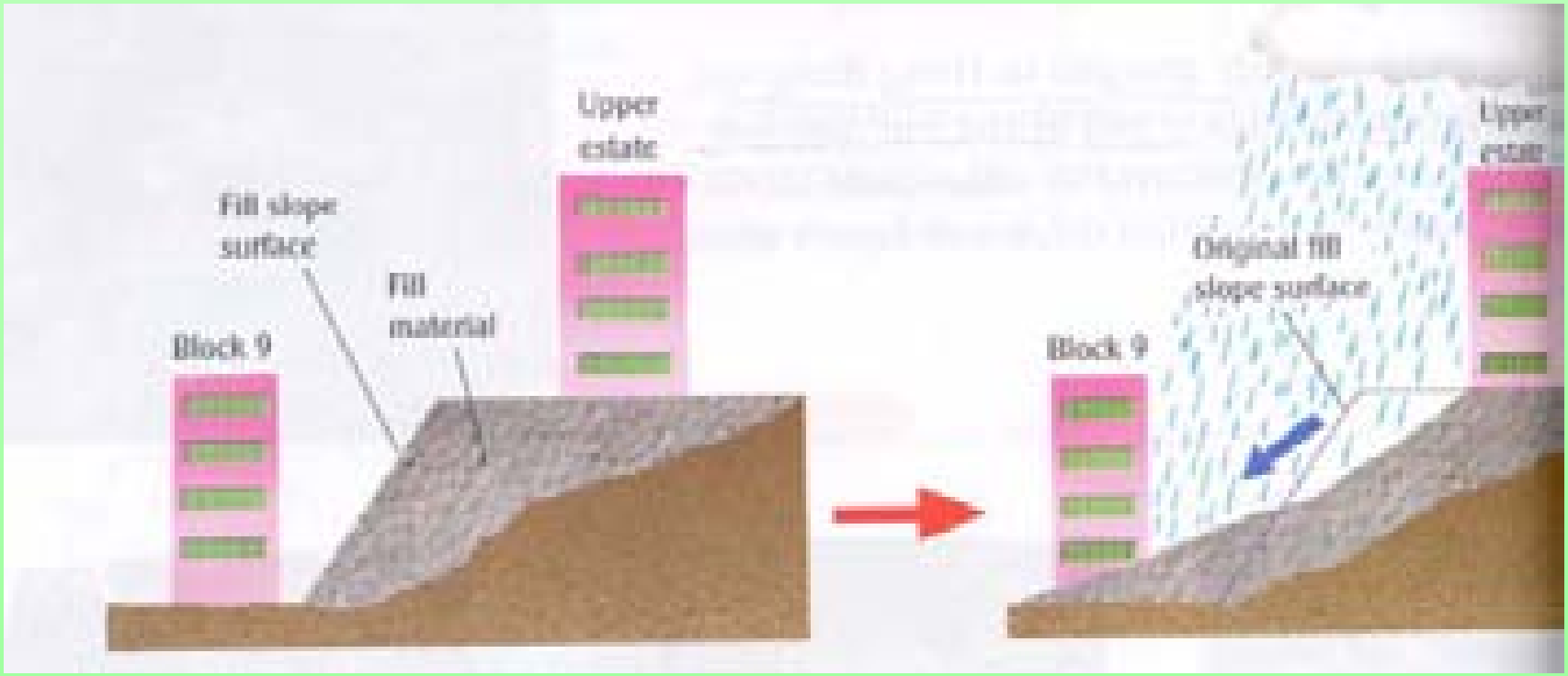


土木工程拓展署 土力工程處

Some observations on the “landslide” chapter of existing textbook



Some observations on the “landslide” chapter of existing textbook



Some observations on the “landslide” chapter of existing textbook

2 What can you do to prevent landslides if you were one of the following:

a an officer of the Geotechnical Engineering Office (土力工程處)?

b a private land developer?

c an owner of a private flat located on a hillslope?

d a district board member?

土木工程拓展署 土力工程處

Teaching Support Materials Kit（教學支援教材套）

At the request of the EDB, GEO have prepared this teaching materials for the NSS Geography curriculum under the topics of **Natural Hazards** and **Earth Science**

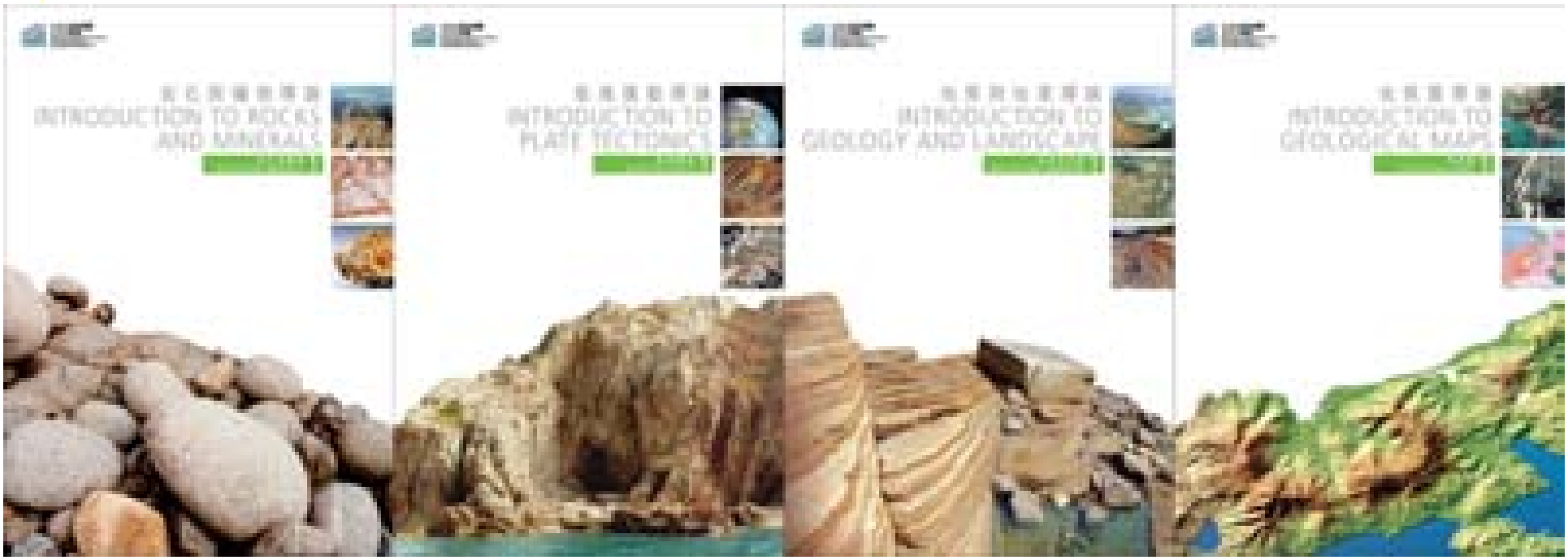
Teaching Support Materials Kit（教學支援教材套）

The Kit consists of

- 14 booklets
- 4 posters
- 3 CDs
- Other supplementary information sheets

Teaching Support Materials Kit (教學支援教材套)

14 booklets



Teaching Support Materials Kit (教學支援教材套)

教學支援教材套內容
Contents of the Teaching Support Materials Kit

小冊子 Booklet No.	題目 Title	
1	岩石與礦物 Rocks and Minerals	Level 1 岩石與礦物概論 INTRODUCTION TO ROCKS AND MINERALS
2		Level 2 岩石循環與岩石鑑定 THE ROCK CYCLE AND ROCK IDENTIFICATION
3		Level 3 香港的岩石與礦物 HONG KONG ROCKS AND MINERALS
4	板塊運動 Plate Tectonics	Level 1 板塊運動概論 INTRODUCTION TO PLATE TECTONICS
5		Level 2 火山、地震與板塊運動 VOLCANOES, EARTHQUAKES AND PLATE TECTONICS
6		Level 3 香港的構造演化 TECTONIC EVOLUTION OF HONG KONG
7	地質與地景 Geology and Landscape	Level 1 地質與地景概論 INTRODUCTION TO GEOLOGY AND LANDSCAPE
8		Level 2 地質與地貌的相互作用 INTERPLAY OF GEOLOGY AND GEOMORPHOLOGY
9		Level 3 香港的地景 HONG KONG LANDSCAPES
10	地質圖 Geological Maps	Level 1 地質圖概論 INTRODUCTION TO GEOLOGICAL MAPS
11		Level 2 閱讀地質圖 GEOLOGICAL MAP READING
12		Level 3 香港的地質圖 GEOLOGICAL MAPS OF HONG KONG
13	香港斜坡安全 HONG KONG SLOPE SAFETY	
14	香港的山泥傾瀉 LANDSLIDES IN HONG KONG	
海報 Posters	1. 香港地質時代表 Hong Kong Geological Time Scale 3. 香港斜坡安全系統 Hong Kong Slope Safety System	2. 香港的岩石與礦物 Hong Kong Rocks and Minerals 4. 自1900年起香港嚴重的山泥傾瀉事件 Serious Landslides in Hong Kong since 1900
光碟 CD	1. 香港斜坡安全與綠化 Safe and Green Slopes in Hong Kong 2. 1972年寶珊道山泥傾瀉事件的三維動畫 3D animation of 1972 Po Shan Road landslide 3. 14本小冊子及4張海報的pdf檔 pdf files of all 14 booklets and 4 posters	

Teaching Support Materials Kit （教學支援教材套）


Conclusions
Landslide hazards cannot be avoided !
山泥傾瀉災害不可能完全避免
Landslide disasters can !
山泥傾瀉災難卻可以減少
\Conclusions

謝 謝