PAPER 10:
LANDSLIDES IN THE HILLSIDE DEVELOPMENT IN THE HULU KLANG, KLANG VALLEY

Farisham Abu Samah[43]

Abstract

This paper has been written to study on rapid landslide occurrence at the hillside development areas, in the Hulu Kelang. Being an urban area and highly populated, the impacts of these tragedies are detrimental to humans and properties. From literature, it is found that less action were taken by the architects to learn from the mistakes. From the landslides investigations reports, it is shown that landslides were caused mainly by failures of the retaining wall and other combinations factor like lack of maintenance, less coordination during construction stage and design problem. The question is what are architect's roles and contributions in reducing landslides in hillside development in Malaysia. The discussion will be on landslides: the causal factors, the impacts, mitigation actions and architectural aspects to be considered in designing the site plan. The site plan design that has been practiced on the hillside development area in the preview of the landslide tragedies that happened in Hulu Kelang. On the end the architect shall be aware of their roles and apprehend good design practice for hillside development in the future.
Keywords: Hillside, Landslides, Development, Slopes, Building on Slopes, Architect, Architecture,

Acronyms
GPPKB – Garispanduan Pemeliharaan Topografi Semujadi Kawasan Bukit
JPBD – Jabatan Perancang Bandar dan Desa
PWD – Public Work Department of Malaysia

1.0 Introduction

Impressive views, good ventilation and better natural lightings are the leading factors that make hillside housing a very interesting and exclusive area. The hilly and sloppy terrain combined with the creativity of a designer resulted with interesting architecture. The exclusiveness of the architectural design are enhanced with the resort style, making it look elite and resulted with people to lived and own properties in these area. This factor contributes to the increased of property value of the hillside area.

This is one of the reasons why the hillside lands were developed, to make high profit from it. Another reason is insufficient flat land in urban area to develop. Looking from the other side of the story, most people forgot that the hillside is the most sensitive zone, since this area is prone to natural disaster which is landslides. There is a number of landslide disasters happened at this hillside development. The Highland Tower tragedy, the Taman Hill view tragedy and the Slopes failures near the Athenaeum tower are some of the examples of the development failure caused by landslides. It was happened in the urban area of Hulu Klang in the Klang Valley.

In Malaysia, the landslides hazard mitigations problem has not been researched thoroughly. The scopes are broad and involve multidiscipline professionals and issues. Further more it requires

[43] Farisham@jkr.gov.my / acik8889@yahoo.com

serious intention, money and time. (Main Rindam, 1996) Like it or not, actions should be done to resolve the problem, either by the government or private sectors, individual or in groups. By that, the main intention in this research is to create awareness among the people who are involved with property and land development regarding landslide occurrence at hillside area especially the architects.

2.0 Scope and Area of Study

The study will focus on the architectural approach, the theory and practice in the hillside development, aspects to be considered by the architect, in proposing the site layout. The discussion on the development area at the hillside will cover only on the slopes class II and above. (referring to Garispanduan Perancangan dan Pembangunan Kawasan Bukit - GPPKB by Jabatan Perancang Bandar dan Desa, Malaysia – JPBD) The site for the case study is in the Hulu Kelang area, it is chosen because a numbers of tragic landslides occurred here in the last few years. Further more the Hulu Kelang area with high population, thus the impact of the tragedies are detrimental to humans and properties. Serious actions should be taken to reduce or may be prevent it from happening in the future. Refer to figure 2.1: slope categories by JPBD

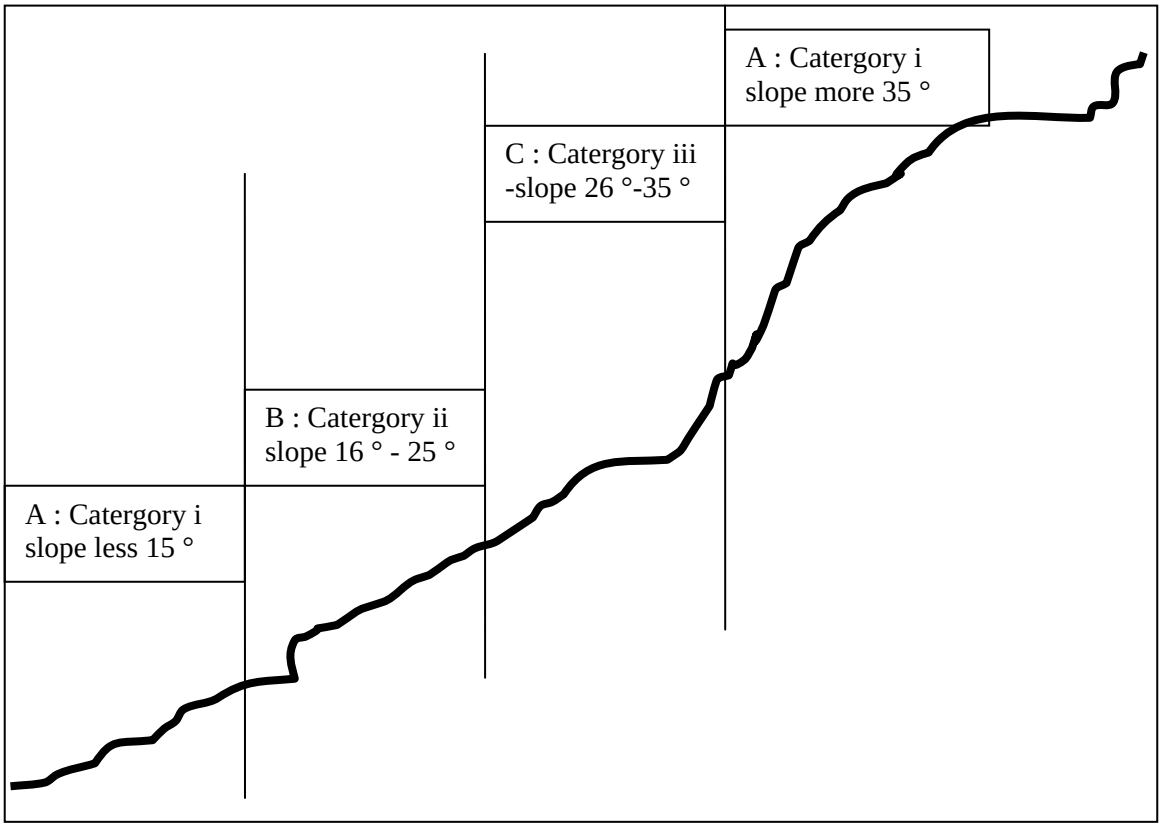


Figure 2.1: Summary of Slope Classifications - source JPBD**, 1997**

3.0 Method of Study

The discussion on the research topic will be based on the landslide tragedies that occurred at hillside development in Hulu Klang area, Malaysia. The investigation report of the landslides tragedy will be analyzed by giving attention on the impact of the disaster on building and development. Causal factors and their impacts on the development relate to architectural approach shall follow. The main outcome from these investigations is a list of design approached that had been practiced, focusing on the site plan. The data analysis of data hopefully can proof on the research assumption that is less architectural approach practiced in the design of a site layout of the hillside development contributes to the landslides incidents.

4.0 Landslides

4.1 Definitions

There are a number of definitions of landslides, ranges from geomorphic features and processes it encompasses. Sharpe (1938) begins to define landslides as “the perceptible downward sliding or falling of a relatively dry mass of earth, rock or mixture of two”. (J.Suhaimi (2006): Sharpe: 1938) It was explain further by Terzahi(1950) ; “ landslides is rapid displacement of rock, residual soil or sediments adjoining a slope and center of gravity of moving the mass advances in a downward and out ward direction”. While, Varnes(1958) defines landslides as “downward and outward movement of slope-forming materials composed of natural rock, soils, artificial fills or combinations of these materials” . Hutchinson(1995) explain landslides as “relatives rapid down slopes movement of soils and rock, which take place characteristically on or more, discrete bounding slip surfaces which define the moving mass”. However “The movement of rocks, debris or earth flowing down a slope” by Cruden (1991) is the most widely used (J.Suhaimi, 2006: Fell, 2000)

4.2 Types of Landslides

The commonly used types of landslides was proposed by Varnes(1978), he categories landslides into five : falls, topples, slides, lateral spread and flows.

TYPE OF MOVEMENT		TYPE OF MATERIAL		
		BEDROCK	ENGINEERING SOIL	
			Predominantly coarse	Predominantly fine
FALLS		Rock fall	Debris fall	Earth fall
TOPPLES		Rock topple	Debris topple	Earth topple
SLIDE	ROTATIONAL	Rock Slide	Debris slide	Earth slide
	TRANSLATIONAL			
LATERAL SPREADS		Rock Spread	Debris spread	
FLOWS		Rock flow (deep creep)	Debris flow (soil creep)	Earth flow (soil creep)
COMPLEX (Combination of two or more principle type of movement)				

Figure 4.1, the types of landslides clarified by Varnes (1978).

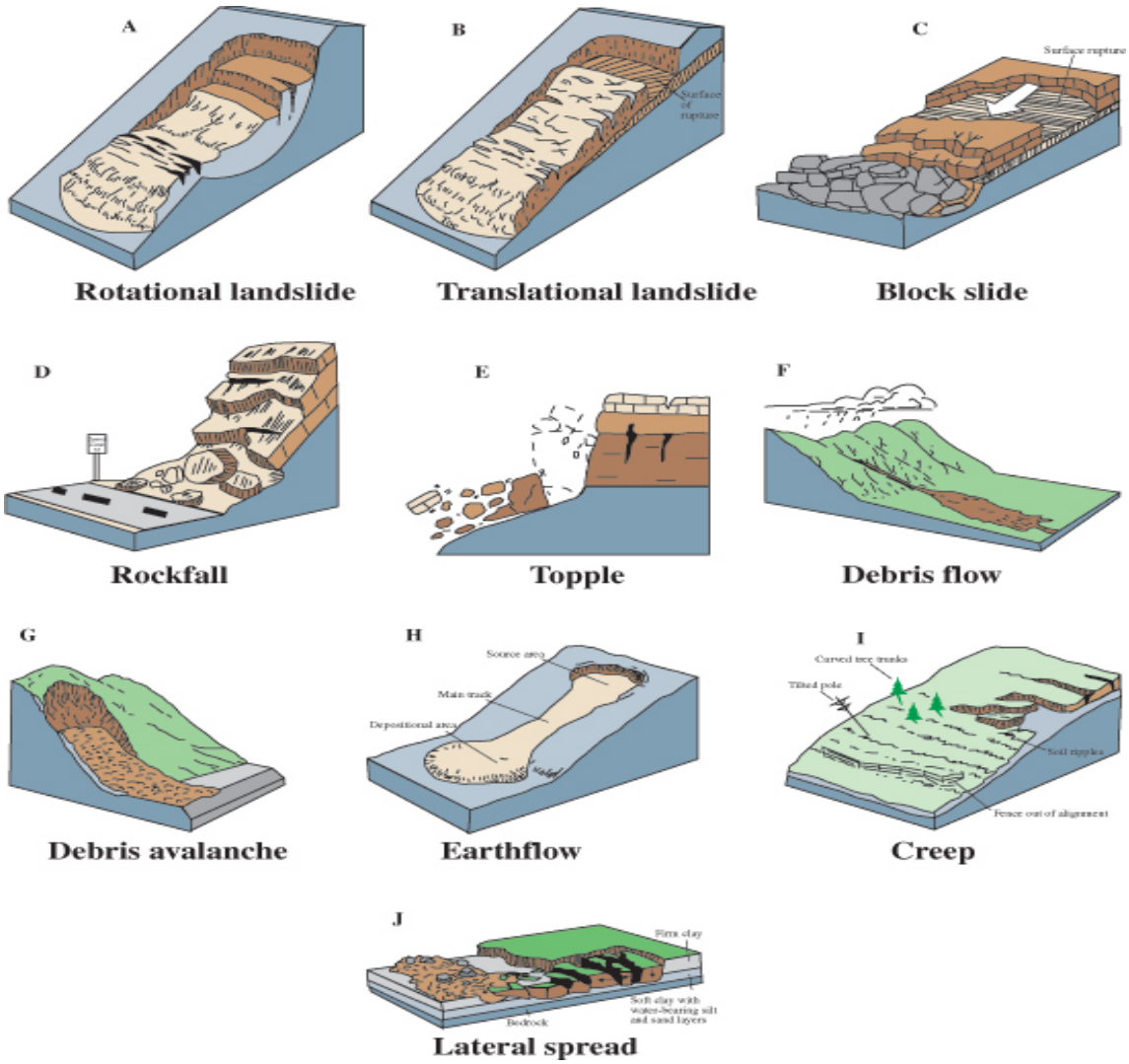


Figure 4.2. Ilustrations on the major types of landslide.

Source - http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html

4.3 Caused of The Slope Failures

A proper attentions and appropriate understanding of conditions and process that caused landslides is required, in order to minimize landslides bad impact in the future development project. Only this can promise the more efficient, quicker and cheaper method could emerge in future. Mihail E.Popescu (…….)

Landslides did not occur due to a single factor, Cruden & Varnes(1996) explains, landslides can triggered by rainfall, earthquakes, volcanic activities, changes in groundwater, disturbances and change of slope profile by construction activities or combinations of these factors. This explanation is supported by N.W, Chan, (1998, 1999, 1997), Main Rindam (1996) and Crozier (1986), landslides did not a happened naturally but it was a result of human actions.

F.S.Andrew (2000) stressed that a pre-requisite to building on a hillside is the recognition of landslips, alterations to landform, loading conditions or subsurface drainage pattern may result in movement or instability. This argument is supported with another statement by. Mihail E.Popescu (…….), the landslides may erect or controlled by one or any combinations factors such as modification of slope geometry, drainage, retaining wall and internal slope

reinforcement. While another research by H.R.Thomas, (2002) find sevens factors can contribute to slopes failures.

	The Cause
1	Overloading slope (weight of building or road)
2	Increase fill on slope without adequate drainage
3	Remove Vegetation
4	Increasing the slope rate
5	Increasing the slope length by cutting at the bottom of slopes
6	Changing surface drainage route
7	Changing in subsurface drainage route

Figure 4.3 Cause of Slope Failure founded by H.R.Thomas, (2002)

W.Mokhtar (2006) stressed that, main factor that caused slopes failure/landslides at numbers site in hillside development in Malaysia are rainfall and storm water activities. Lack of storm water planning and design is the main reason that the caused of landslides at Taman Zoo View / Kampung Pasir. And the same factors go to the occurrence of the Highland Tower tragedy (JKR, 1994)

4.4 The Occurrences in the Klang Valley

Landslides can occur at any land surface, from nearly flat slopes, gentle slopes and mountain area as well as under the sea. In Malaysia, landslides are the most destructive disaster besides flood. (M.S Shaluf & R.A Fakhru'l, 2006) The occurrences mainly were in the highland areas such as Hulu Kelang, Cameroon Highlands and Genting Highlands. The most significant tragedy that threatens human life, building and infrastructures is the highland tower tragedy at the Hulu Kelang. The highland tower tragic tragedy happened in December 1993 followed by a number of tragic episodes that are deadly.

There are 13 incident reported by local newspaper from 1990 to 2006 at Klang Valley which relate to this scope of research. Refer to table 4.1: Record of landslides reported in the Klang Valley from 1990 - 2006

Out of 13 tragedies reported happened in Klang Valley, 6 tragedies occurred in Hulu Kelang area, 2 tragedies in Setapak, 2 tragedies in Puchong and 1 tragedy in Cheras, Balakong and Bukit Tunku. While from 6 landslides incident in Hulu Klang, 3 incidents involved death of peoples. It shows that, landslides disaster is rapidly happening at the Hulu Kelang area and these tragedies were located only a few kilometers away from each other.

Figure 4.4: Record of the landslides reported happened in the Klang Valley reported happened from 1990 to 2006

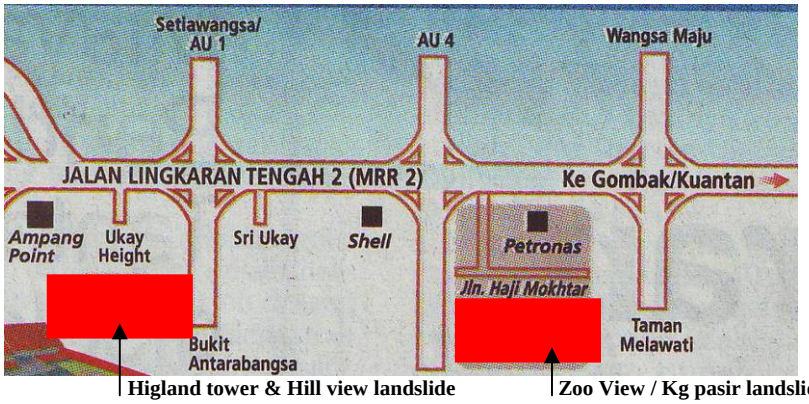


Figure 4.5: Locations on 3 most tragic landslidesdisaster reported happened in Hulu Kelang area between 1990 - 2006

5.0 Current Practice in the Hulu Klang

5.1 Landslides in the Hulu Kelang

The discussion will focus mainly on the most tragic landslide tragedy such as the Highland Tower tragedy, Hill View tragedy and The Taman Zoo View – Kampung Pasir tragedy. The aim is to study and investigate the causal factors of the landslides occurrences. Refer to figure 5.1: tabulation on the landslides data, extracted from the investigations as reported by Public Work Department of Malaysia (PWD) as follows, refer to figure 5.1: tabulation on landslide data extracted from landslides investigations reported by PWD.

As introduction, the first tragic landslides tragedy happened in Hulu Klang area are the Highland Tower landslide. It was happened on 11 December 1993 and caused 48 deaths, toppled one block 16 stories condominium. Another tragic landslide disaster, occur just a few meters away from the highland tower landslides on 20 November 2002. It caused death of 8 people and ruined a two stories bungalow. While on 31 October 2006, one more tragic landslides disaster also happened in Hulu Klang. Caused death of 4 people and damaged 3 blocks long house, the Zoo View – Kampung Pasir landslides, occurred in 31October 2006.

From the table it is shown that, landslides were occurred due to unsuitable design approached adopted and site construction method. Cut and fill method has been used in the hill tower and Zoo View development. In this construction technique, it needs retaining wall to support the land form. In all three cases the retaining wall failed to with stand the lateral load caused from the land movement under ground. In the highland tower, retrogressive slides occur due to the unsettlement of landfill on the development area (as shown in figure 5.2) In the Hill View and Zoo View development, debris flow slides were occurred due to construction or development activity at the above level of the site, debris were flow and hit the building at the lower level. (As shown in figure 5.3 and figure 5.4)

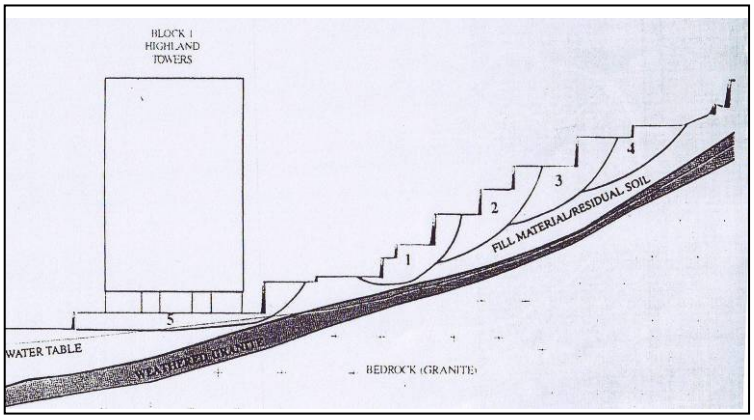


Figure 5.2 : Slope failures in Highland Tower development, Source : PWD, 1994

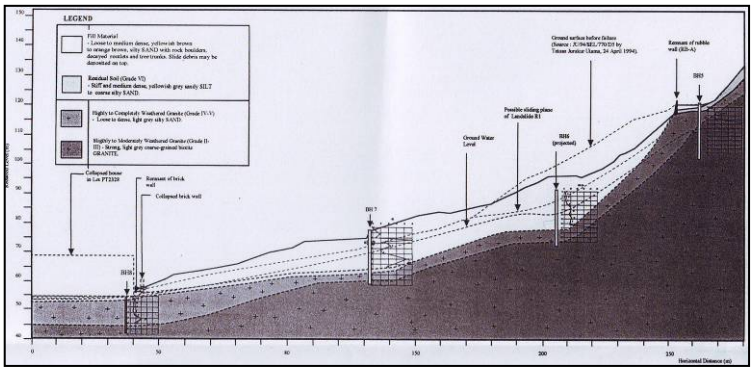


Figure 5.3 : Slope failures in Hill View – Cross Section through the slope failures, Source : PWD, 2003

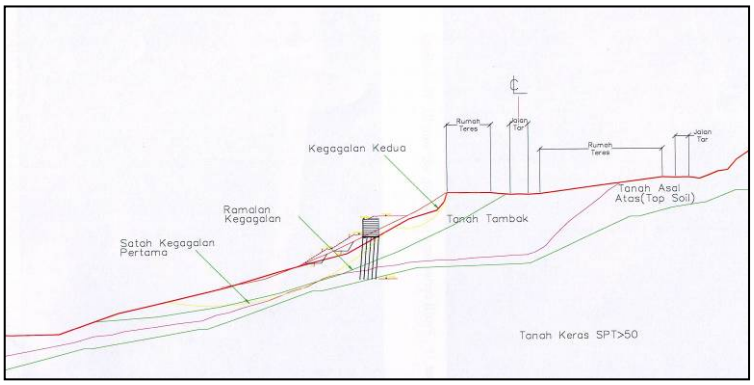


Figure 5.4 : Slope failures in Zoo View – Kampung Pasir landslide
Source: PWD, 2007

Existing water stream in Highland Tower and Zoo View development were diverted away from the existing route flow, in order to construct a new platform level. Times after times, the man made water stream will slowly flow as its original route. And this introduce massive load to the retaining wall and induce to failures of the retaining wall.

AF Shirley (2002) in the hillside development, site investigation should cover as well on the adjacent site of the development. Any construction or development activities on the adjacent site will give some impact on land stability and as contributing factor to choose the suitable design approach. This situation happened in the Zoo View landslides: the construction activities above the hill view failed and the debris hit on the bungalow downward. While the failure of retaining wall at the Zoo View development was collapsed and move downward to Kampong Pasir area, which later on caused on the damages of three numbers of long house.
Nothing in the world is maintenance free, this statement also applied in the hillside development. Less maintenance will disturbed free flowing water on land surface, resulted water pounding and later on will affect the stability of the development area. This scenario has happened in the highland tower development, the land become unstable because of water pounding caused by less maintenance activities.

As conclusion, from the case studies proven that the occurrences of landslides in Hulu Klang are due to the design and construction failure of the retaining wall, lack of maintenance and triggering by rainfall. This shows that suitable design approach in site layout and correct construction method for hillside development is compulsory.

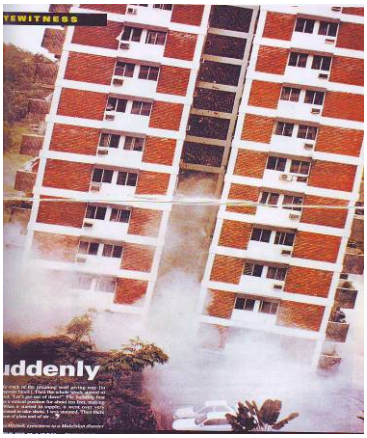
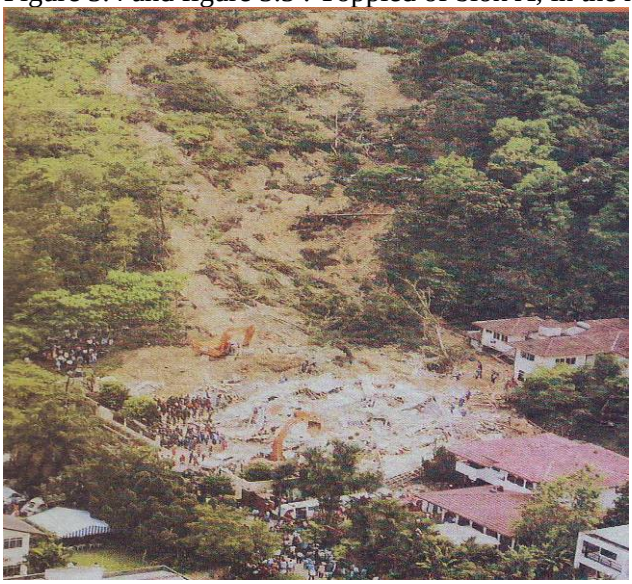


Figure 5.4 and figure 5.5 : Toppled of blok A, in the highland tower development



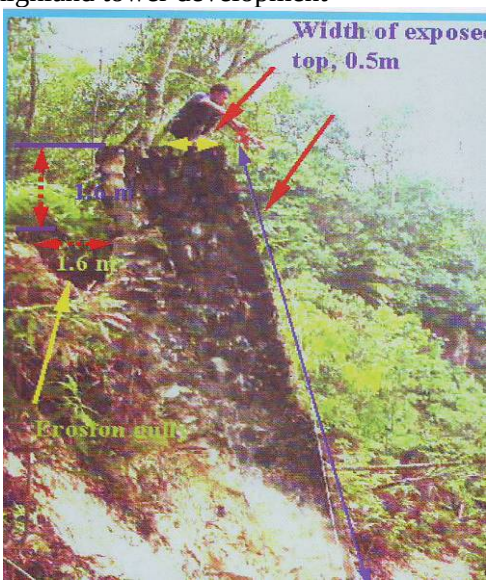


Figure 5.6: Debris flow fall and ruined the bungalow in hill view developmen
Figure 5.7: Retainning wall behind the building in hill view development

Figure 5.8: Retaining wall failed in zoo view development, it flow to kampong pasir area and ruined 3 blocks of long house

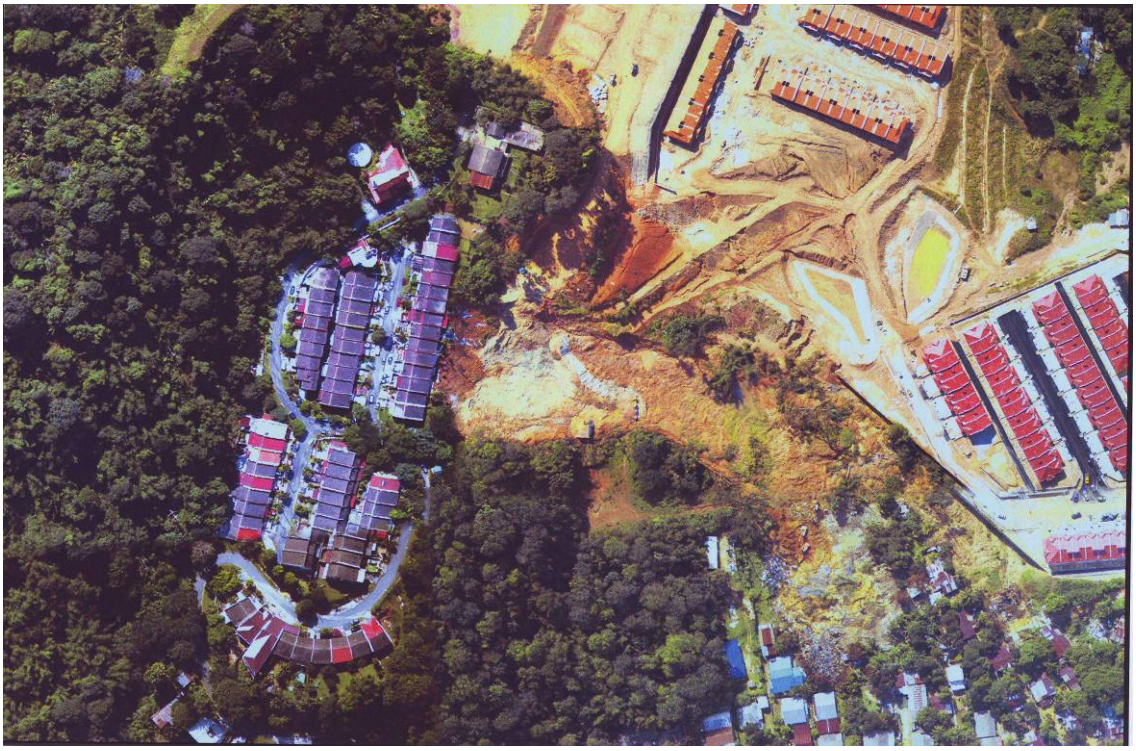


Figure 5.9 : Zoo view – kampong pasir landslides looking from aerial view

6.0 Current Scenario of Hillside Development in the Hulu Klang

The hills of Hulu klang are vulnerable and are being razed to the ground in a mad rush wrongly emulate flat land architecture. A number of structures are built in the hilly region by being totally antithetical to the hills. Buildings, mainly housing are constructed without any degree of consideration of natural terrain.

Figure 6.1 : Insensitive residence, Ukay Perdana
Figure 6.2 : Incongruously built, Ukay Perdana

It looks quite common for hills to be razed to the ground to make room for development. Most of the area of Ukay Pedana, cutting hills in inaccessible places by the local population is standard practice. Projects have been developing with no consideration of the hill and natural environment.

Figure 6.3 : Could be any where: housing at the Ukay Perdana
Figure 6.4: Building was built with no consideration of natural environment: Apartment at Bukit Mas

7.0 Conclusions

Hilly and sloppy terrain promised a very interesting architecture and life style. The exclusiveness encourages people to live and own properties in these territories. This factor contributes of the property value at the hillside areas. However, most of people especially to professionals involved in the construction industries tend to forgot that the hillside is the most vulnerable and very sensitive zone which is prone to natural disaster : landslides.

Detail study from the investigations report of the landslides tragedy that has happened in the Hulu Klang area and an overview from the case study, shown that all of the development was built with the cut and fills method combined with terracing technique. A series of retaining wall were designed and located to support the proposed platform area.

In conclusion, understanding on original terrain is very important; site layout proposal must be done thorough detail site investigations. The selected design approached and method of construction for hillside development given major impact on the safety of the development. There for the hillside area must be designed and constructed, with proper understanding and should be responsive to the natural terrain, in order to protect the stability of the land due to the fact that when the land stability is low or bad the chances of landslide occurrence is very high. Professionals involved in the constructions industries; especially architect must be more conscious and aware on the roles to apprehend good design practice for future hillside development.

Date	Lokasi	No of death	Failures	Type of development
11 .12.1993	Highland Towers	48	Bangunan, Jalan	Perumahan : pangsa
16.10.1995	Bukit Tunku	0	Bangunan, Jalan	Perumahan : Banglo
15.5.1999	Athananeum Tower	0	Jalan	Perumahan : pangsa
5.10.2000	Bukit Antarabangsa	0	Jalan	Perumahan : Teres & pangsa
20.11.2002	Taman Hillview	8	Bangunan, Jalan	Perumahan : Banglo
5.11.2004	Taman Harmonis, Gombak	1	Bangunan, Jalan	Perumahan : Banglo
23.3.2005	Kampung Air Panas, Setapak	0	Bangunan, (13 unit rumah kayu, 3 unit kedai, dewan serbaguna & tadika) Jalan	Perumahan : Kawasan Perkampungan
14.4.2005	Km 22, Lebuhraya Damansara-Puchong	0	Bangunan : 1 unit rumah papan	Perumahan : Kawasan Perkampungan
13.4.2006	Jalan Niah 1, Jinjang Utara	0	Bangunan : Bilik Darjah, Setor	Sekolah : SekRenAgama
11.5.2006	Taman Belimbing, Balakong	0	Bangunan : Kilang Jenis Teres, Jalan	Industri Sederhana
31.5.2006	Kampung Pasir	11	Bangunan, Jalan	Perumahan : teres, setinggan
8.10.2006	Wangsa Maju	0	Jalan	Perumahan : pangsa
17.11.2006	Puchong Jaya	0	Bangunan : Rumah Teres	Perumahan : teres

Figure 1.1: Landslide tragedy reported happened in the Klang Valley from 1990 – 2006 (which are relates to the scope of this research)

Tragedy	**Highland Towers**	**Taman Hillview**	**Kampung Pasir**
Date	11 .12.1993	20.11.2002	31.5.2006
Time	1.30 pm.	4.30 am	4.45 pm
Location	lot 494, 465 & 653 Hulu Klang	lot PT2328 Hulu Klang	At the crest of slope of Taman Zoo View
Degree of slopes	> 25°	> 25°	> 25°
Slope category refer to GPPKB by JPBD	III	III	III
No of Death	48	8	4
No of injuries	No info	No info	No info
Failures	Building Access road Parking Services	Building Access road Parking Services	Building No info No info No info
Development	Housing	Housing	Housing

	Type	Mix housing	Single housing	Squatters / Terrace
	No of Building in the development	3	1	3 unit long house / 15 unit terrace house
	No of Building fail	1	1	3 unit long house
	Height	14	2	1 / 2
	Const.bldg	R.C	R.C	Timber
	Failures	Toppled Collapsed	The debris flown down hill & fall down upon the house	The debris flown down hill & fall down upon the house
	Fail bldg locate at	fill	No info	No info
	Const..site (grading)	Cut & Fill Terracing	Cut & Fill Terracing	Fill – the existing valley was filled
	Const.started	1974	No info	No info
	Const.comp	1978	No info	No info
Natural water flow (underground / surface)		Yes – underground & surface	No information	Yes – surface
	Diverted flow	Yes – the original route was filled	No information	Yes – the original route was filled
Types of slides		retrogressive slides	Debris flow	Debris flow
	Causal Factors	Design Failure Less maintenance	Land clearing activities slope benching filling of two former valleys above / adjacent site.	- Failure of the retaining wall - Natural geological condition (located in a fault zone and found to be a valley)
	Triggering Factors	Rain fall Surface water drainage	Rainfall	Existence of stream river path flow from taman zoo view straight to kampong pasir

Figure 5.1: Conclusion by tabulation on the Landslides Data, Source : PWD 1994, 2002, 2007

References

1.The Highland Tower Judgment
Http://Www.Lawyerment.Com
2. Dr Mohd Asbi Othman, 1996Some Thoughts On The Collapse Of The Highland Towers, Hulu Kelang, Selangor, Malaysia.
3. (R.B.Olshansky,1989) Landslide Hazard Reduction : The Need For Greater Government Involvement, Department Of Urban And Regional Planning, University Of Illinois
Http://Www.Riskinstitute.Org
4. (Omar Moin, 2006), Mainstreaming Disaster Risk Reduction Into Development Polocy, Planning And Implemention. Proceeding Seminar Paper On "Mengutamakan Pengurangan Risiko Bencana Dalam Pembangunan Dasar Perancanagan Dan Perlaksanaan". Kuala Lumpur, Malaysia.

4. (Omar Moin, 2006), Hygo Framework For Actions 2005 – 2015. Proceeding Seminar Paper On "Mengutamakan Pengurangan Risiko Bencana Dalam Pembangunan Dasar Perancanagan Dan Perlaksanaan". Kuala Lumpur, Malaysia.

5. (S.S.Gue And Y.C.Tan, 2003)The Engineering Aspects Of Hillside Development, Gue And Partners Sdn Bhd, Malaysia
Http://Www.Gueandpartners.Com.My

6. IEM Seminar On Geotechnical Engineering 2000, Penang.
Hill-Site Development – Planning, Design, Construction And Maintenance Considerations
By : Ir. Dr. Gue See Sew & Ir. Tan Yean Chin 22-23 September 2000
Page 1

7. Hill-Site Development – Planning, Design, Construction And
Maintenance Considerations

8. The Engineering Aspects Of Hill-Site Development

9. (H.R.Thomas,2002) Site Planning And Design Handbook, Mc Graw Companies, New York

10. B.J.Simson And M.T.Purdy (1984), Housing On Sloping Sites-A Design Guide, Construction Press, New York

11. N.W.Chan, 1999, 43 Insiden Kejadian Tanah Runtuh `Major' 1987 – 1997, USM

12. R.Olshansky(1999)Volume 22, Number 3 / May, 1998Regulation Of Hillside Development In The United States , Environmental Management Journal, Springer New York

13. Ahmad Sanusi Hassan (2005), Senibina Tanah Paya – Analisis Dan Kajian Rekabentuk Senibina, USM

14. Mihail E.Popescu(…….) Landslides Causal Factors And Landslides Remedial Actions, Ilinois Institute Of Technology, Chicago, USA

17. Ngai Weng Chan Mar 1998 Responding To Landslide Hazards In Rapidly Developing Malaysia: A Case Of Economics Versus Environmental Protection Journal: Disaster Prevention And Management Volume: 7 Issue: 1 Page: 14 - 27 ISSN: 0965-3562

22. Ibrahim Mohamed Shaluf, Fakhru'l-Razi Ahmadun2006, Disaster Types In Malaysia: An Overview, Journal : Disaster Prevention And Management1. Volume: 2 Issue2 Page:86 - 298

23. W.Mokhtar(2006), Storm Water Management Practices For Hillside Development In Malaysia, Proceeding Paper In International Conference On Slopes, Malaysia, 2006,6^{th}-9^{th} August 2006.

24. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 1

25 Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 2

26. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 3

27. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 4

28. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 5

29. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 1994, Lapuran Kejadian Tanah Runtuh Highland Tower, Ampang, Selangor. Vol 6

30. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 2006, Lapuran Kejadian Tanah Runtuh Di Kampung Pasir, Hulu Kelang, Selangor

31. Ibu Pejabat Jabatan Kerja Raya Malaysia (Ipjkr), 2007, Lapuran Awal Kejadian Tanah Runtuh Di Wangsa Maju, Kuala Lumpur.

32. Jabatan Kerajaan Tempatan, Kementerian Perumahan Dan Kerajaan Tempatan (Kpkt), 1996) Garispanduan Pembangunan Di Kawasan Bukit

33. Lembaga Arkitek Malaysia (Lam) 1996, Akta Akitek 1968

34. Lembaga Arkitek Malaysia (Lam) 1996, Tatacara Perlakuan Arkitek

35. Lembaga Arkitek Malaysia (Lam) 1996, Scales Of Minimum Fees

36. Nawal Al-Hosany And Hisham Elkadi 2001., Sustainability Approaches For Incarceration Architecture, School Of Architecture Planning And Landscape, University Of Newcastle, Newcastle Upon Tyne Ne1 7ru, Uk

37. Olshansky Robert B, Vol. 64, 1998 Aicp, Planning For Hillside Development, Improving Compliance With Regulations: Choices And Outcomes For Local Government. Journal Article By Raymond J. Burby, Peter J. May, Robert C. Paterson; Journal Of The American Planning Association

38. Pertubuhan Arkitek Malaysia (Pam) 1996 Code Of Professional Conduct

39. Http:/Www.Lawyerment.Com.My/Library/Doc/Laws/Casecode/11082000-01-12.Shtml The Highlantowers Judgement, Civil Suit No S5 – 21 – 174 – 1996

40. Akta Perancang Bandar Dan Desa

41. Pollit 1980 Hill Housing : A Comparative Study Granada Publishing Great Britain

45. Australian And New Zealand Environment And Conservation Council, (1998). National Water Quality Management Strategy : Implementation Guidelines

46. Department Of Regional Development And Environment Executive Secretariat For Economic And Social Affairs Organization Of American States, (1991)Primer On Natural Hazard Management In Integrated Regional Development Planning, With Support From The Office Of Foreign Disaster Assistance United States Agency For International Development, Washington, D.C.

47. Ibrahim Mohamed Shaluf, Fakhru'l-Razi Ahmadun 2006 Disaster Types In Malaysia: An Overview P.286 - 298 Journal: Disaster Prevention And Management, Emerald Group Publishing Limited ISSN: 0965-3562 (Http://Www.Emeraldinsight.Com/10.1108/09653560610659838)

50. LANDSLIDES - Technical Hazard Sheet - Natural Disaster Profiles Http://Www.Who.Int/Hac/Techguidance/Ems/Landslides/En/Index.Html

51. Douglas,2004 : Jamaluddin,1996, Aplikasi GIS Untuk Mengenalpasti Kawasan Yang Berisiko Tanah Runtuh, Fakulti Alama Bina, UTM.

52. Robert B. Olshansky , (……..) Dealing With Public Risks Involved In Land Use Planning -- A Public Entity Risk Institute Symposium Landslide Hazard Reduction: The Need For Greater Government Involvement, Department Of Urban & Regional Planning, University Of Illinois - Urbana/Champaign

53. Akta Perancang Bandar Dan Wilayah (Town And Country Planning Act) – Guidelines To Protect The Natural Topography And Prevent Indiscriminate Hill Cutting.

55. Robert L. Wold, Jr Candace L. Jochim.(……..) Landslide Loss Reduction: A Guide For State And Local Government Planning, Colorado Division Of Disaster Emergency Services And Colorado Geological Survey

57. Dato' Dr Abu Bakar Jaafar 1984 Environmental Planning For Hillside Development Ikram Seminar On Geotecnical Aspects Of Hillside Development Kuala Lumpur, Malaysia

58. Rajendra Navaratnam 2002 Implications Of The Highland Towers Judgment In Relation To The Duties Of Building Professionals In Malaysia

59. Yi Xiong 2003 Hillside Architecture In China, Carleton University

60. Ir. Dr. Gue See Sew 2003 The Engineering Aspects Of Hill-Site Development The National Institute Of Valuation (INSPEN), Valuation And Property Services Department, Ministry Of Finance Malaysia. Kuala Lumpur

62. Andrew F Shirley BUILDING IN AREAS OF LANDSLIP, SUBSIDENCE & ROCKFALL

63. Khan, A.N., Housing And Landslides: A Case Study Of Murree, Pakistan Nottingham, 42-5367