

Governing Sustainable Development for Highland Areas: A Case Study of Subang Jaya, Malaysia

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Abstract: *Rapid urban growth and development sprawling towards highland areas required a comprehensive and prudent development management. The development management system for highland areas need for continuous and prudent monitoring tools and mechanism even though there are existences of various regulations and guidelines and complete development process system for highland development, issues pertinently to continuous geo- disaster that occurred since 1919. Concern arose on unsustainable development, safety measures, development process and control mechanism, professionalism and doubtful decision making. Thus, embedding a balance and sustainable development to accommodate sustainable future living in term of human habitation is crucial .to ensure a sustainable highland development, factors such as safety, environmental preservation, development infrastructure and maintenance need to be addressed accordingly. This paper focuses on revealing the needs of sustainable development for highland areas in accordance to the development stakeholders, legislations and crucial inputs for the development. A case study of high rise development in Subang Jaya, Malaysia shows that there are crucial needs for geotechnical inputs, government interventions, stakeholder's needs and precise highland development guidelines and processes. Furthermore, in determine sustainable development, there are crucial needs for geotechnical inputs, public inputs and prudent planning control documents. Governing sustainable development highland areas needs a comprehensive development process, management and control mechanism.*

Keywords: Highland Areas, Development Legislations, Property Development Process, Sustainable Development

1. Introduction

Development growth in Malaysia is increasing rapidly in pursuing towards developed country in 2020. The urban areas were filled with property development and most of urban areas are highly dense. Currently development has encroached toward highland area as most urban areas have being developed and land become scare. Developing highland areas need an extensive consideration as compared to low lying areas. Highland area is defined as Environmental Sensitive area (ESA,2005) and located above 150 meter from sea level with contour above 150-300 meter (ESA Rank 3) Economic Planning Unit (2002). This area is permissible for development with controlled development where the type and intensity of the development shall be strictly controlled depending on the nature of the constraints. Malaysia has a sufficient development provisions, acts and guidelines to control development on highland areas. Development plan is a crucial planning control instrument which defined the allowable plot ratio, density, slope stabilisation requirement, mitigation, presevation of natural waterways, vegetation etc. However, there are other needs

and consideration that need to be adhered in developing highland areas in macro and micro context for a holistic development control.

Currently continuous Geo disaster incidents in high land areas have developed concern on safety and development sustainability. Public has stated the issues and concern on land use planning, law and regulation, safety management, maintenance, funding, accountability and professionalism pertaining to development sustainability on high land area. Basically public has lost their confident regarding to the development and decision making process. Although there are existence of various regulations and guidelines for highland and steep slope development, issues such as geo-disasters, unsustainable development, public concern, effected development and economic growth remain unsolved. There are needs to formulate best approaches and practices through collaborations of local authorities and the stakeholders in the related project site on highland in ensuring sustainable development on highland areas. The important variable and consideration that need to be adhered need to be formulated. Thus, addressing those issues and needs are crucial to achieve a balance development towards establishing sustainable development on highland areas with added value to safety, environmental protection and sustainability.

2. High Land Development Issues in Malaysia

The rapid growth of development in Malaysia has resulted development encroaches to highland areas. It is also due to the demand of property buyer for highland property for panoramic location (Othman & Alias, 2011). Thus, need for new infrastructure and building construction has disturbed stable highland areas that have challenged the terrain and natural environment. However, the development was not prudently monitored. (Alias, et al., 2014) added that development encroachment has created massive development issues pertinently on geo disaster incidents such as debris fall, landslide, rock fall, and land erosion.

Actions have been taken with development control mechanism with the existence of various legislation, development policies, development plans and guidelines to mitigate environmental sustainability that defined the mitigation and presevation prosedures, allowable development in controlling density, plot ratio, slope stabilisation presevation of natural waterways and vegetation (Anuar and Khairul, 2012). Even then, extensive numbers of geo-diaster events still continues to present (Gue et al., 2002;

Anuar and Khairul, 2012) (refer to Table 1). Samah, F. A. (n.d.) further added geo-disaster happened due to most made slopes (construction) and heavy rainfall. Alias et al., 2014, stated that the geo-disaster were identified since 1919, however major geo-disaster incident found in 1961 with fatality, property and monetary loss .Thus, it shows gap in protecting the environment and determining sustainable development for hill land areas. (Alias et al., 2014) added that the geo-disaster tragedies generally gave an impact to the depreciation of living environment values and property values.

Table 1 Major Geodisaster in Malaysia since 1961

Geo Disaster Location	Date	Consequence	Estimat ed Loss (RM million)
Ringlet, Cameron Highlands, Perak	1961	16 deaths	35
Highland Tower, Selangor	1993	48 deaths	185
Genting Sempah route to Genting highland, Selangor	1995	20 deaths	48
NKVE (Gua Tempurung) Perak	1996	1 death, expressway closed for 14 days	17
Debris Flow Dipang Post, Perak	1996	44 deaths	69
Debris Flow Keningau, Sabah	1996	302 deaths	459
Simunjan, Sarawak	2002	16 deaths	32
KM 44, Simpang Pulai route to Cameron Highlands, Pahang	2000	Road opened in 2004 (4 yrs delay)	355
NKVE (Bukit Lanjan), Selangor	2003	expressway closed for 6 months	860
Kg. Pasir, hulu Klang, selangor	2006	4 deaths	21
Bukit Antarabangsa, Selangor	2008	5 deaths	200
Kampung Baru Cina, Kapit, Sarawak	2007	2 deaths	
Hulu Langat, Selangor	2011	16 deaths	
Puncak setiawangasa, Kuala Lumpur	2012	-	
Putra Height, Selangor	2013	-	
Kuala Lumpur Karak expressway, Pahang	2015	-	
Cameron Highland, Pahang	2016	1 deaths	

Source: Department of Mineral and Geoscience, Selangor, 2015

The geological setting is among the most important aspect that need to take into account in examining any development. The awareness of geological and geographical setting that change upon climate changes and natural disaster is still lacking in the decision making. Previously the geological aspect seems to be neglected in planning development. It was only since 2008 emphasised on geology and climate change has been inserted in the development process (Othman et al., 2011). Besides of development control weaknesses, there are other weaknesses in governing highland development. (Hashim, 2008), explains that the ineffectiveness of environmental management caused by, mis-regulation, fragmented empowerment of legislations and inconsistent decision making (Alias et al., 2011). Ali et al., 2008, added that the complexity of implementing land policy and environmental measure for

environmental protection were worsen as it is influenced by political, economic and social circumstances.

3. Property Development Process for Highland Areas

Development process in Malaysia was governed under the Ministry of Housing and Local Government (MHLG). In April 2007, a centralised mechanism namely the One Stop Centre (OSC) was in place to govern the development process. The OSC is an initiative to improve the government delivery system and act as an independent body to facilitate and monitor the development process at the local authorities (MHLG, 2008). Fig. 1 explains the flow, relevant agencies and documents of the development process. Currently, the OSC has being part of the local authority organisation in every state in Malaysia. Prior to the introduction of the OSC, submission for approval was done separately and in sequence (Abdullah et al., 2011). All planning approvals are subject to the planning permission process referred under Section IV, Town and Country Planning Act, 1976 (Act 172).

(Othman et al., 2014) explained for development that involves highland areas, the development process was extended to special committee held by the state government to pre-evaluate the development permission before final approval by the OSC committee. The special committee is a requirement to the highland development guidelines. However, currently only three (3) states are having these committee and guidelines that is the State of Selangor, Penang and The Federal Territory of Kuala Lumpur. The guidelines is a new development control mechanism to oversee highland development activities through proper planning and control for implementing agencies, developers, property owners, contractors, engineers and the public as a guide in planning, developing and maintaining highland and the surrounding areas. The guidelines mentioned are as follows:

- Garis Panduan Perancangan Pembangunan di Kawasan Bukit dan Cerun bagi Wilayah Persekutuan Kuala Lumpur 2010 (GPWPKL 2010)
- Garis Panduan Perancangan Pembangunan Di Kawasan Bukit Dan Tanah Tinggi Negeri Selangor, 2010
- Penang Guideline for Hill site Development 2012

These guidelines provide an administrative aspects, development control, and development process; and references in planning approval process. Development feasibility, settlement safety, geo hazard risk and management of environmental sensitive area are the main concern is of those guidelines. These guidelines provide mitigating measures for the development process by appointing advisory body (TCPD Selangor, 2010) and safety measures (TCPD Pulau Pinang, 2012).

4. Analysis of Findings and Discussion

This paper is to determine the importance needs for sustainable development on high land areas in the development process. Data collection was made through case study of high rise development in Subang Jaya and content analysis on public engagement documents. The data was analyzed and evaluated to streamline important variable and considerations, technical instruments and reveals the needs and impact towards ensuring sustainable development for highland development.

4.1 Case Study: Housing Development in Subang Jaya

The proposed development by Alam Megah comprises of housing (apartment) and other facilities on 23.16 acre of land (refer Table 2). The site comprises of 800 units of dwelling and other facilities and located on high land in developed urban area (Fig. 1). The proposed site is located on the crest of a low hill which has been subjected to cutting and filling works. Man-made slopes are found surrounding the proposed site with a relatively flat area at the center part the site. Fig. 2 shows the slope terrain analysis of the proposed site. About 58.74% of the site is of flat to gently sloping ground with average slope gradients less or equal to 15°(Class I) which has low geotechnical limitations and highly suitable for development. About 15% of the site is of moderate steep slopes with average gradients from 16° - 25° (Class II) which has moderate geotechnical limitations and moderately suitable for development. Approximately 9.20% of the site is covered by slopes with average slope gradients from 26°-35° (Class III) that has high geotechnical limitations and low suitability for development. About 17.06% of the site is occupied by slopes steeper than 35° (Class IV). The highest ground lies at the center part of the site with the elevation of about RL 106 m whereas the lowest ground lies at the Northern part of the site with elevation of about RL 56 m. The elevation difference of the proposed site is about 50 m.



Figure 1: Project Site



Figure 2: Slope Terrain Analysis

Table 2. Development Components Details

Development Component	Unit	Acre	%
Housing			
2 Apartment Blocks 27 Storey (1322kp-1566kp) including podium basement for car park	384	0.66	2.85
2 Apartment Blocks 19 storey (1082kp-1503kp) including podium base ment for car park	256	0.62	2.68
2 Apartment Blocks 26 ½ storey (1868kp-1880kp) including 4 ½ including Podium Car park	160	0.42	1.81
Sub total	800	1.70	7.34
Others			
Single storey Podium car park and and 2 Semi-Basemen car park	1	2.63	11.36
Elevated Podium car park 4 ½ storey	1	0.64	2.76
Swimming pool	2	0.76	3.28
Green area/playground /landscaping	-	15.54	67.10
Electrical transmission	1	0.06	0.26
Road / car park	-	1.83	7.90
Sub total	4	21.46	92.66
Total	-	23.16	100.00

Source: Alam Megah Development Proposal Report, 2015

4.2 Planning Control

In the development process, there are numbers of crucial laws such as Town and Country Planning Act, 1976, (Act 172) Local Government Act, 1976 (act 171), Environment Quality Act, 1984, Uniform Building By Law, 1984, Street Drainage and Building Act 1974 etc (table 2.1). Beside those laws, there are guidelines such as planning guideline, environmental guidelines, buildings guideline etc. Furthermore, development plans (National Physical Plan, State Structure Plan and Local Plan) that integrate a top down development plan and strategies focusing on physical, environment, economic and social aspects based on the National Development Planning Framework comprises of three level such as national, state and local level towards vision 2020 (national development objective) (Bruton, 2007). These development plans were prepared under the Town and Country Planning Act, 1976 (ACT 172) provisions.

The most crucial initial reference for development is the development plan which provide strategies and approaches in development with legalisation provision. It defined the allowable plot ratio, density, slope stabilisation requirement, mitigation, presevation of natural waterways, vegetation etc. However, those guidelines have weaknesses that need to be overcome such as on the implementation and the intensity of the provision in those guidelines.

The consideration in permitting development and its density as indicated in the current guidelines were based on the following variables:

- i. Development Suitability classes
- ii. Height / contour level
- iii. Slope gradient
- iv. Environmental Sensitive area (ESA) classes
- v. Risk Classification.
- vi. Technical report such as such as Development Proposal report, Geo-Technical Report, Erosion and Sediment Control Report, Environmental Impact Assessment Report and Earthworks Plan.

4.3 Geotechnical Inputs

4.3.1 Topography and Subsoil Condition

The existing level for the proposed site ranges from RL 56m to RL 106m. The natural groundwater level is generally low for the proposed development. Subsoil mainly consists of Sandy clay and Clayey sand. The following effective shear strength parameters for the overburden soil interpreted from consolidated isotropically undrained triaxial compression tests and direct shear box tests (60mmx60mm & 300mmx300mm) are adopted for slope stability analyses:-

- Overburden Soils with 'N' < 50 : $\Phi = 32^\circ$, $c' = 3$ kPa
- Overburden Soils with 'N' > 50 : $\Phi = 32^\circ$, $c' = 15$ kPa

4.3.2 Geotechnical Design of Slope

For new engineering slopes, the required FOS is in 1.4 in accordance to the "geotechnical Manual for Slopes" of the Hong Kong Geotechnical Engineering Office's (GEO). The slopes design is accordance to guidelines of slopes engineering.

Branch, Works Department (JKR), and the minimum FOS for Slope shall be not less than 1.5. Thus, slopes in the proposed site shall be designed to meet the FOS requirement by both GEO and Works Department. It is recommended gradient for cut slope is gentler than 1V:1.5H with 1.5m width berm and the height for each berm not exceeding 6m. Gradient for fill slope should gentler than 1V:2H with 1.5m width berm and the height for each berm not exceeding 6m.

In the stability analyses, all possible localized and global slip surfaces were checked using Spencer Methods for circular failure. Whereby, proposed platform with slopes are designed to achieve required FOS by re-profiling to gentler slope gradient or by strengthening the slopes using soil nails.

Presently, all the strengthening works proposed for the site can achieve the required FOS of 1.5. It is recommended to carry out instrumentation monitoring works over the construction period up to end of defects liability period to gauge the performance of the engineered slopes and monitor the groundwater fluctuation. Instrumentation monitoring scheme consists of the following instruments (subject to change in later stage to suit the site conditions) could be adopted:-

- a. Inclinometers – Horizontal ground movement monitoring.

- b. Building Settlement Markers/Settlement Markers – vertical movement monitoring.
- c. Observation Wells/Standpipes – Groundwater fluctuation monitoring

4.3.3 Geotechnical recommendations

- a. Monitoring the engineered slopes and ground water fluctuation through instrumenting monitoring works including horizontal ground movement monitoring, vertical movement monitoring for building settlement markers/settlement markers and ground water fluctuation monitoring (observations on wells/stand pipes).
- b. Improving the stability of slopes through slope strengthening design that adhere to the FOS requirement minimum at 1.4 and adopting measurable slope stabilisation and strengthening techniques.
- c. Slope maintenance inspections need to be carried out including routine maintenances inspections and engineering inspections for maintenance.

4.4 Public Engagement Inputs

In the development process, public engagement was exercised in the pre-development stage namely at the local plan preparation process in accordance to section 14(1) Act 172. However, in the development application process, the public engagement exercise is not compulsory. The SJMC has initiated public engagement program to ensure the public and interested parties in collaboration with the state authority (State of Selangor), consultant, developer and political members to gain feedback from the public (stakeholders) to pursue the balance and sustainable development and to inform the involved stakeholders and public in projects within their area especially sensitive area such as highland area. For this project, 2 public briefings and 6 public hearing meetings has been undertaken before the planning approval. The outcomes of the meetings are as follows:

1. Concern on land slide risk for steep slopes areas
2. Concern on traffic conjections due to additional traffic from the project and aslo due to single access of the project.
3. Safety concern due to highland development the may effect the developed surrounding areas including current residents and dwellings.
4. Concern on mitigation approach towards slope stability.
5. Landslide caused by water lock issue.
6. Upstream development affecting downstream existing development.
7. Concern on sufficiency of buffer zone and building set back.

There are two (2) major effects and implications from the public engagement initiated as follows:

1. Review on the project planning approval.
2. Review of planning guidelines and legislative requirements for high land areas.

4.5 Summary of Findings

The crucial facts revealed from the analysis were there are needs to streamline important variable and considerations, technical instruments and public needs in ensuring sustainable development on highland areas. Thus, precise variables and tools are crucial to be streamlined in the development continuous monitoring to maintain its

sustainability should be adhered. In ensuring sustainable development on highland areas, prudent legislations and guidelines, public engagement inputs, planning control documents and geotechnical inputs are crucial. These viable and tools could ensure and mitigate the sustainability concern such as:

4.5.1 Safety

Safety concern was mitigating through enforcing FOS at 1.5. To ensure sustainability of the development, site evaluation should determine the site readiness in term of construction foundation, slope safety and efficient infrastructures in consideration on design, criteria and cost. Approaches to ensure the achievement of safe and sustainable high land development areas are as follows:

- Developments have to be monitor at every stage of development which is pre, during and post.
- Improve safety design for slope, infrastructure and buildings.
- Allocate sufficient fund for slope stabilisation that source from government authority and private owners.
- Geotechnical inputs

4.5.2 Legislation and guideline

Generally, current legislation and guideline is efficient. However, it should allocate more provision for public engagement in the planning approval stage, construction stage and monitoring stage. It is to ensure the social sustainability in ensuring sustainable development for highland areas in macro and micro context to ensure sound living habitat which is safe, peaceful and balance ambiance.

7.5.3 Geotechnical Inputs

Geotechnical inputs were being crucial tools in highland development process. It determines the site readiness and mitigation action in ensuring safety and sustainability of the site. The geotechnical variables on FOS requirement, monitoring and maintaining slope measures, stabilisation and strengthening engineering slope and structure is very important to be adhere in developing highland areas.

7.5.4 Public Engagement Inputs

Involving public in the development process is crucial especially in determining the localisation needs and concerns. The public engagement program should be legalised throughout the whole process of development. This is to ensure the local public habitation could be improve and preserve in the present of new development.

4.5.5 Planning Control Documents

Planning control documents such as development plan, guidelines, act and regulation is crucial to adhere in the development process. It has outlined considerations in permitting highland development (*para 4.2*) focusing on stability and safety of the development. However, the planning should be stringent on sensitive areas such as highland area, forest, water catchment areas etc.

8. Conclusions

The needs of sustainable development for highland areas should be in accordance to the development stakeholders, legislations, crucial variable, considerations and inputs for the development. A case study of high rise development in Subang Jaya, Malaysia shows that there are crucial needs for geo-technical inputs, government interventions, stakeholder's needs and precise highland development guidelines and processes. Furthermore, in determine sustainable development, there are crucial needs for geotechnical inputs, public inputs and prudent planning control documents. Highland development requires continuous monitoring, maintaining and managing mechanism in the implementation processes. The development guidelines and legislation should indicate the needs of public engagement specifically and balance with the developer's preferences without compromising the importance and requirements of geotechnical and planning control documents. These will be the primary tools on governing sustainable development for highland areas to ensure a comprehensive development process and management mechanism to spearhead towards sustainable development.

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