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## Feasibility Study and Economic Assessment in Green Building Projects

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### Abstract

The purpose of this paper is to explore the concept of a feasibility study and economic assessment in Green Building Projects. The benefits of preparation of financial feasibility study enable the client to decide with considerable confidence whether or not the project is feasible and worth pursuing. The completion of the evaluation and the decision to proceed further with the project is a significant milestone in the development. The methodology used is a direct observation that appropriate in this study. Therefore, the research outcome the project proposed in green building is feasible to continue at Lot 5647, Meru Road, Klang, Selangor, Malaysia.

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*Keywords:* Green building; market analysis; financial analysis; direct observation

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### 1. Introduction

A feasibility study is importance part of the preparation at a stage of pre- contract. In any development, the clients would appoint the valuer or quantity surveyor to prepare the market and financial feasibility study. The

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crucial need for a feasibility study for the clients can evaluate the development has the potential return on investment and viable to develop for the proposed project. Confirmed by Katharina Bause (2014) agreed that the definition of feasibility study in economic sense are investigations that tend to determine whether a product development is a profitable and viable for a client to proceed the proposed development or not. Other than these definition, Corrie,(1991) explain in detail the definition of feasibility study that the assessment of evaluation for proposed project in terms of economic assessment, financial assessment, risk assessment, social and environmental issue. The results of the overall assessment should enable the clients to decide with considerable confidence whether or not the project is feasible and worth pursuing. In green building project, it is vital for the clients to investigate in depth for the market and financial feasibility prepared by the professional consultant. The environment, demand and cost related to green building would base on the criteria stated by Green Building Index (GBI) as follows;

- Energy Efficiency (EE)
- Indoor Environmental Quality (EQ)
- Sustainable Site Planning & Management (SM)
- Material and Resources (MR)
- Water Efficiency (WE)
- Innovation

#### *1.1. Energy Efficiency (EE)*

Improve energy consumption by optimizing building orientation, minimizing solar heat gain through the building envelope, harvesting natural lighting, adopting the best practices in building services including use of renewable energy, and ensuring proper testing, commissioning and regular maintenance.

#### *1.2. Indoor Environment Quality (EQ)*

Achieve good quality performance in indoor air quality, acoustics, visual and thermal comfort. These will involve the use of low volatile organic compound materials, application of quality air filtration, proper control of air temperature, movement and humidity.

#### *1.3. Sustainable Site Planning & Management (SM)*

Selecting appropriate sites with planned access to public transportation, community services, open spaces and landscaping. Avoiding and conserving environmentally sensitive areas through the redevelopment of existing sites and brownfields. Implementing a proper construction management, stormwater management and reducing the strain on existing infrastructure capacity.

#### *1.4. Materials & Resources (MR)*

Promote the use of environment-friendly materials sourced from sustainable sources and recycling. Implement proper construction waste management with storage, collection and re-use of recyclables and construction formwork and waste.

#### *1.5. Water Efficiency (WE)*

Considering a suitable method of rainwater harvesting, water recycling and water-saving fittings in project development.

#### *1.6. Innovation (IN)*

An innovative design and initiatives that meet the objectives of the Green Building Index. Achieving points in these targeted areas will mean that the building will likely be more environment-friendly than those that do not

address the issues. Under the GBI assessment framework, points will also be awarded for achieving and incorporating environment-friendly features that are above current industry practice.

All these criteria should be followed by an architect and engineer in designing the building in the development proposed by the clients. In green building design is more complex than what is usually required in traditional building. Sustainable design typically requires the evaluation of alternative material and system by the designer as well as building modelling and simulation to ensure that the constructed building will meet the owner's performance requirement and follow standards, energy codes and green rating system by the appointed organization (Accredited Facilitator in Green Building). The proposed development should have the identity and creating a real development for the urban area. A suitable theme in of green building development should have their own style for the purpose of attraction from the buyer's and value for money to the clients.

## 2. Components of a feasibility study

There are some of a major components included in preparation the market feasibility study and financial analysis for the green building project. (Sangree, 2012) list down the major components of feasibility study as follows;

- Area, demographic, and neighbourhood analysis
- Site review
- Market analysis
- Proposed development usage and pricing analysis
- Financial analysis
- Valuation analysis
- Comparison of value created by projected costs.

### 2.1. Area, demographic, and neighbourhood analysis

The area, demographic and neighbourhood analysis evaluates the local economy surrounding the proposed development. The area analysis focuses on social, economic, government policy, and environmental. These elements will influence the performance of proposed development in green building projects. In-depth information on the data analysis such as population trends, household growth, household economics, area economics and area of existing transportation. A neighbourhood analysis is reviewing in the nearby area.

### 2.2. Site review

The site review evaluates the size, access and visibility, topography, availability of utilities including water and sewer. The following are some issues the study should address:

- Drive-time demographics: what are the population and household income levels within various drive times of the subject property and compare with existing property.
- Site: Is site large enough to support that development?
- Amenities: Are there nearby amenities that would support the proposed projects?
- Governmental impacts: The subject's and valorem taxes, zoning information, sales history, governmental restrictions, environmental regulations, and other factors that may affect the subject property should be analysed.

### 2.3. Market analysis

A thorough market analysis of the need and demand for the development of green projects is a need to investigate and evaluate by the clients. The design factor, sustainability environment and cost are proposed based on the data gathered. This report also influences on the selling price proposed for the target buyer's. Market analysis study is very importance part of the preparation in any kind of proposed development. This part will involve a lot of data collection, analysis and forecasting. The information gathered under this heading as follows;

- Supply, demand and projected absorption

- Development concept and market fit analysis
- Product mix overview
- Product positioning
- Competitive position of project site

The data collected should gather on the information of current supply, future supply, demand, demand drivers and forecast the absorption of the project components. In- depth research to gather the information above is very crucial to ensure the project proposed is value for money to the clients.

#### 2.4. Proposed development usage and pricing analysis

The design concept recommendations and costs include in the scope of analysis and the cost should be contributed to the proposed development in green building projects. Some clients provide the consultants with their plans for the development and others clients request that the expert should analyse and recommend the scope of the development based upon their market research for the feasibility study.

#### 2.5. Financial analysis

The financial analysis section of the report analyzes a green building project capacity to generate income and makes financial projections for future years for the proposed development. As mentioned by Corrie, (1991) the clients must formulate his thoughts on project financing, as the financial conditions will affect the possible options from the beginning. Questions which that should be answered include the following.

- What are the sources of funding?
- What criteria or rules apply?
- How could the project best respond to those rules?

The purpose of this is to prevent further losses and to generate the profits.

#### 2.6. Valuation analysis

The economic value of proposed development in the green building project is calculated through a discounted cash-flow. This analysis utilizes the property's projected net income before debt service and applies a discount rate. The certain country has a specific standard preparation of cash-flow.

### 3. Economic assessment

The economic assessment is concerned with the worth of the project to the community as well as to the developer or user. The economic assessment of a project is different and separate from the financial assessment (Corrie, 1991). The difference in term types of the project either from the public or private sector. In public sector the benefit received from the project implementation for public in term of social benefit as compare to the profit. However, in public project the cost saving for each project implementation is crucial to evaluate. (Corrie, 1991) also suggested in his book that the principles and method of economic assessment can be applied to both public and private sector projects such as below;

- Savings in materials and energy
- Savings in time
- Savings in accidents/damage etc.
- Improved health and welfare
- Improved productivity
- Changes in land use and land values
- Reduction of waste

In green building project for the proposed development is crucial for the clients and consultants to evaluate the

project implementation based on the above method of economic assessment. Investigation of the economic assessment of the project is required to ensure effective and useful result is produce.

#### 4. Research methodology

Research Methodology adopted in this research is a qualitative approach. The method of direct observation has been used to analyse the site area of study. Direct observation is a method of collecting evaluative information in which the evaluator watches the research subject in his or her usual environment without altering that environment (Holmes, 2013). Structured direct observations are most appropriate when standardized information needs to be gathered, and result in quantitative data. Unstructured direct observation looks at natural occurrence and provides qualitative data, such as in this research the researcher needs to observe the site directly to get information on the environment in the site area. Both of the methods has been used, however in this paper elaborate on the information of unstructured direct observation. Data recording for direct observation includes narrative notes, video or photographs, recording and combinations of this method. The benefits of this method wrote by Holmes that direct observation provides the highest degree of ecological validity but lowest degree of experimental control. The value of direct observation is directly related to the evaluator's ability to capture detail, determine what is important and interpret what has been observed.

#### 5. Data analysis

The client instructed to carry out feasibility study on the project of mixed development of 10 acre consisting hotels, shopping mall and serviced apartments. The site location at Lot 5647, Meru Road, Klang, Selangor, Malaysia. The data gathered started from 27<sup>th</sup> September 2014 until 27 November 2014.

##### 5.1. Background of the project

Klang is the royal city and former capital of the state of Selangor, Malaysia. It is located within the Klang District in Klang Valley. It is located about 32 km to the west of Kuala Lumpur and 6 km East of Port Klang. Figure 1.0 shows a map of Klang, Selangor, Malaysia. The topography of the site is a rectangular shape and covered with palm oil trees and shrubs. The land is classified as commercial and service use as stated by Planning Unit at Municipal Klang Department, Malaysia.

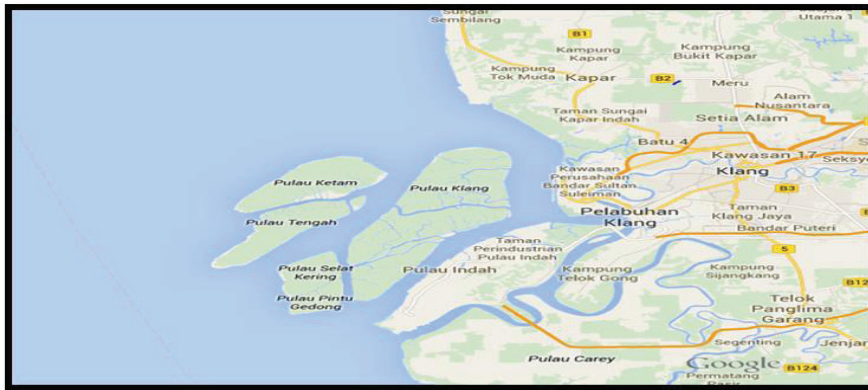


Fig. 1. A map of Klang, Selangor, Malaysia

From direct observation, the proposed site is located nearest to the City Centre of Klang Town. There are several on- going projects residential and commercial building such as office building in the area. The accessibility of the site is nearest to the main road and highway toward to Shah Alam and Kuala Lumpur. The established project most

adjacent to the site such as Klang Central, Giant Hypermarket, Tesco, residential and commercial building. From the observation, most of the established projects did not offer the concept of green building. This result also gives the advantage to the proposed development in green building in the area. Figure 2.0 shows established projects nearest to the proposed site.

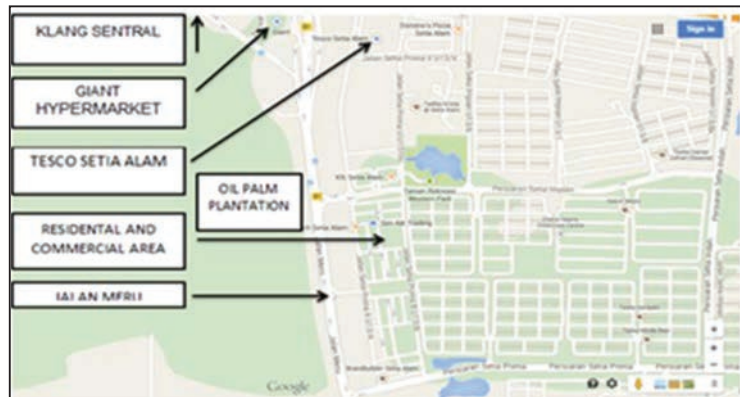


Fig. 2. Project site

## 5.2. Strength, weaknesses, opportunity and threat of proposed development (SWOT)

SWOT analysis is a structured planning method is used to evaluate the strengths, weaknesses, opportunities and threats conducted to investigate the proposed development. The data received after observation has been done at site as follows;

### 5.2.1. Strength

- Freehold tenure for the land
- The land is not a Malay Reservation Land
- The area within the Klang is currently developed by the state authority.
- The proposed site is located at a main road frontage and same level with the road which can give increase in value of the land
- The population in Klang and Shah Alam is high. Besides, the proposed site can attract more people because it is near to the commercial, residential and industrial area.
- The location is well connected with electricity, water supply and communication system. There are also schools, train system, shuttle bus and others in the vicinity.

### 5.2.2. Weaknesses

- Traffic congestion is the major problem. It causes problems to reach to the proposed site.
- The land is currently undulating in terrain and covered by palm oil trees and shrubs.
- The weaknesses of this project, where there are several competitors that exist in its vicinity of Klang. All of these can influence the subject property.
- There are on-going constructions existed in the nearby area; may affect the movement of the project.

### 5.2.3. Opportunity

- It can be a success development between its locality that will provide various types of products, facilities and amenities to the users.
- The proposed development provides many facilities and amenities with a full range of product choices that can fulfill the needs of people.
- The proposed development can cater people from local and foreigner

- The retail industry will stand to benefit from the Government's implementation of the 12 Key National Economic Areas (NKEAs) (where retail is listed as 1 of the focus area) under the Economic Transformation Programme (ETP) to transform Malaysia into a developed, competitive and high income economy by year 2020.
- Furthermore, there is not much green building, and this might give some advantages for investments for the project; because the fact that there are fewer competitors for green- based buildings.
- Natural topography and fresh air that benefit to the proposed development

#### 5.2.4. Threats

- Rising in construction material costs and inflation caused the extra payment is necessary. Thus, the development tends to give a higher price once it is completed and it is very critical for the purchaser to support the revival scheme.

From the above SWOT analysis indicates that in terms of site suitability, population, facilities and location is appropriate for this project to continue. Other than that, the design features should be considered such as energy efficiency, façade of the building should considered on the natural daylighting, a material selected, mechanical and natural ventilation, water efficiency and other. These factors contribute to the sustainable building environment and could attract the current and future population to settle down for the future home. The SWOT analysis is useful for the clients before any new development proceeds, it can help the client to identify the strength, opportunities, threats and weakness for the proposed development.

## 6. Financial analysis

The financial analysis referred to as financial statement analysis through a preparation of cash-flow for budgeting of the proposed project in green building. The assessment was based on the viability, stability and profitability of a proposed mixed development in the green building project. The evaluation of income and expenses occur in the development project was measure as follows;

### 6.1. Income

The income from the proposed development need to prepare according to the market selling for the mixed development projects that include three (3) types of proposed project such as hotel, shopping mall and serviced apartment. The basis of the evaluation is a comparison of project capital and operating and maintenance costs with the revenues accruing to the project (Corrie, 1991). His also mentioned that the calculation should be based on the product sales, use of facilities and provision of services. The comparison should be made in constant price terms, and should extend throughout the service life of the project.

### 6.2. Cost of the project

The cost of the can be classified as cost for pre and post- development stage.

#### 6.2.1. Pre – Development cost

- Site Investigation
- Surveying Fees (strata title and final title)
- Plan and submission fees
- Contribution to local authorities
- Professional fees
- Management and supervision fees
- Legal fees
- Advertisement fees



### 6.2.2. Post – Development cost

- Construction cost (mixed development)
- Building cost
- Mechanical and Electrical cost (solar and rainwater harvesting method)
- Infrastructure cost

From the above income and expenses analysis has been evaluated, sensitivity analysis of the results could also be analysed, to test the effect of changes in such variables as cost levels, pricing or tariff structures, revenues, and timing and phasing of development. In green building projects, the analysis will consider the commercial robustness of the scheme and sustainability of the development. The evaluation should be conducted in constant price terms but the future flows of costs and revenues will be subject to inflation (Russell R. Currie, 2009). This should be considered in the calculation of the inflow and outflow of the cash-flow preparation. The cash-flow produced should be expressed in money or current price terms. Other than that, forecast rates of inflation and levels of interest rates can be tested to show the effect on payback period and other aspects such as project funding. Further assessment design to explore other financial implication would include statements on the source and application of funds; analysis of liquidity and profitability ratios and impact of operating (as well as capital) costs (Corrie, 1991).

At the end of preparation of cash-flow, the quantity surveyor would advice to the client on the market return from the investment to the client. The yardstick such as return on investment (ROI) has been measure and evaluate based on the formula as follow;

$$\text{ROI} = (\text{Financial value} - \text{project cost}) \times 100\%$$

This pattern is crucial to measure and its benefits to the clients as a reference to know either the project proposed is profitable to proceed or not. Other than that, the crucial of ROI to the clients are as follows;

- It quantifies project value – the clients can see the ringgit figures of a project's worth.
- It can build stakeholder support on the decision to implement the proposed project.
- It can lead to project prioritization – ROI helps determine the project's ranking among other priorities.

From this result, the financial viability of the project can be shows to the clients. A project can be said to be financially viable if it meets the objectives of profitability from the outcomes of proposed development.

## 7. Conclusion

From the study above, the study can be concluded that the results of the overall evaluation of market and financial feasibility study provide the information and implication to the clients either to proceed or discontinue of project proposed for the development. The client ability is to evaluate of the overall evaluation with considerable confidence whether or not the project is feasible and worth pursuing. If the clients decided to proceed, the improvement of the aims and scope of the project is necessary to take account of the modifications that may have appeared at the stage of a feasibility study. In green building project, the cost of construction and market need was depends on the requirement suggested by the Green Building Requirement. From this research done for market and financial feasibility study, this project is viable to continue based on the factors of suitability of the site, fulfill the requirement by the authority, market need and profitable investment to the clients. This feasibility study created according to the market, projected usage, and financial analysis. This would help clients on the reliable information to help in their decision-making process for the above project. Next stage, the consultant team should prepare the design concept according to the Green Building Requirement. The designer should include the sustainability requirement on the material selected, natural and mechanical ventilation and landscape design that considered to the natural environment in Malaysia. , the research outcome the project proposed in green building is feasible to continue at Lot 5647, Meru Road, Klang, Selangor, Malaysia.



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## References

- Che, B. A., Izzarul, H. M. H., Jamalunlaili, A., & Jasmee, J. (2012). Stakeholders' perception on buffer zone potential implementation: a preliminary study of Tasek Bera, Malaysia. *Social Behavioral Science*, 50, 582-590.
- Corrie, R. K. (1991). *Project evaluation*: Thomas Telford Ltd, London.
- Holmes, A.. (2013). Direct observation. *encyclopedia of autism spectrum disorders*, 980-981.
- Katharina Bause, Aline Radimersky, Marinette Iwanicki, Albert Albers. (2014). Feasibility studies in the product development process. *Elsevier*, 21, 473-478.
- Russell R. Currie, Sheilagh Seaton, Franz Wesley. (2009). Determining stakeholder for feasibility analysis. *Pergamon*, 36 (1), 41-63.
- Sangree, David J. (2012). Perform market analysis with a feasibility study for indoor waterpark resorts and outdoor waterparks. *The Appraisal Journal*, 149-156.