KOLEJ YAYASAN SAAD MELAKA

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THE BUTTERFLY RESIDENCE:

BE PART OF THE SOLUTION NOT THE POLLUTION

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OUR SMART GREEN HOME: THE BUTTERFLY RESIDENCE

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1. INTRODUCTION

" BE PART OF THE SOLUTION NOT THE POLLUTION"

These wise words were spoken by Stephen R. Covey, a well-known educator, who has established the role we should all play in preserving and conserving nature. Hence, any development should neither damage not deteriorate the existing ecosystem any further.

Climate change is an on-going issue, from deadly burning forests in Australia to catastrophic flooding in Indonesia, its fatal consequences affect people from all around the globe. A study conducted by The National Aeronautics and Space Administration found that human activity since the mid-20th century holds accountability for causing 95% of global warming [NASA, 2019]. Hence, vigorous actions must be taken immediately to minimize the detrimental toll on climate and earth's health. Mahatma Gandhi once said, "*Be the change you wish to see in the world*". Thereby, our team believes that change should start from a place closest to yourself; home. We would like to combine elements of technology and ecology to produce our very own Smart Green House.

2. SCOPE OF THE PROJECT

The main objective of our project is to develop a reasonably priced self-sustainable house that incorporates components of green-tech without having to compromise on aesthetical aspects. The name, “The Butterfly Residence” comes from one of the most prominent features in the house, a butterfly-wing shaped solar roof. It also represents the chaos theory, known as the “Butterfly Effect” (Edward N. Lorenz, 1972), which is an idea where small causes might bring in larger effects. In this regard, the seemingly ‘insignificant’ amendments we are taking into making our house a Smart Green Home may have a substantial role in making the environment a better place.

3.0 APPLICATION OF SURVEYING PROFESSIONS

3.1 BUILDING SURVEYING

Construction of the house will begin with the installation of metal rods as the foundation. The main structure is made up of concrete that has undergone a process where bits of irradiated plastic water bottles are added into its mixture. This special mix of concrete helps adds to its resilience by up to 15% [Massachusetts Institute of Technology]. On the other hand, cellulose acts as an insulation to slow the rate of heat transfer. The material is economical, fire resistant and non-palatable for insects. A firm and persistent base is fundamental to withstand the weight of the structure above it, keeping its occupants safe during calamities.

From an architectural stance, the house features a butterfly-wing shaped solar roof that slants inwards to assist in the collection of rainwater and to provide a sufficient surface area for solar panels. Furthermore, an unroofed area that is completely or partially enclosed by walls, known as a courtyard, is positioned at the centre of the house to aid in natural ventilation whilst offering a refreshing view of nature. The living room is equipped with a sunroof, enabling natural light to enter the house. Inexpensive double pane windows complete the house with its energy saving and sound-proof perks [5].

The Butterfly Residence is expected to thrive on renewable energy sources such as solar and wind energy. Both these resources generate power without producing baneful waste and requires little to no maintenance. As for artificial lighting, motion sensored LED bulbs substitute conventional ones as they are harmless and demonstrate high levels of efficiency [9]. Water is obtained through a smart rainwater collection system and stored in large tanks for further usage. Grey water will then be channelled to water the crops in order to optimize water consumption. Artificial lighting, entertainment devices, electrical outlets and security are managed by a home automation system [6]. Through this method, residents are able to gain access and control home appliances through their personal gadgets at any time of the day.

The house plan includes 3 bedrooms, 2 bathrooms, a kitchen, a dining room, a living room, a garage, a courtyard, a mini outdoor farm and a garden. The building and construction of The Butterfly Residence strictly follows the guidelines of the Malaysian Street, Drainage and Building Act 1974. Necessary safety precautions and tests are conducted and evaluated by experts

throughout the stages of construction to avoid any unwanted casualties. It can be concluded that the house does not require any major adjustments in the future as the overall build quality is robust.

3.2 GEOMATICS AND LAND SURVEYING

Malaysia experiences hot climate with little seasonal variation as it is located near the equator. The yearly average temperature and amount of rainfall are 27°C and 2540mm respectively (Wikipedia). We have chosen to build our Smart Green Home in Pahang, the largest state in Peninsular Malaysia. Pahang, being geographically diverse, is separated into three ecoregions namely the freshwater systems, the lowland and highland rainforests and the coastline.

For our project, the plot of land purchased will be located at the suburban highlands of the state. We have identified several verified freehold properties in Bukit Tinggi, Bentong that could potentially serve as the base to where our house is built. Bukit Tinggi lies 800 meters above sea level and the he district is complete with an integrated system of public utility mains such as lines for telecommunication, electricity distribution, water mains and wastewater pipes. The surrounding area is moderately developed, easily accessible to the city and other facilities via main highways. In the event of a drought, there is an ample supply of water sourced from rivers and streams that are filtered by 79 water treatment plants around Pahang.

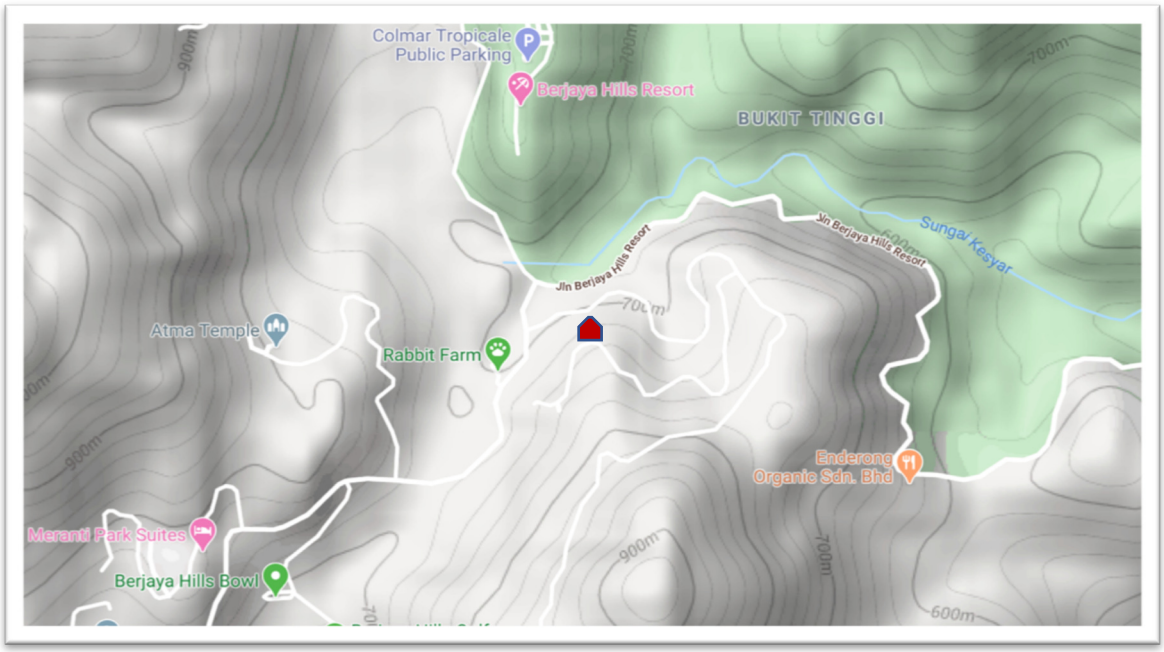
Temperature in the highlands are low, varying from 23 °C during daytime to 16 °C at night. Orographic (mountain) rainfall occurs from the lifting of moist air over a mountain. When air rises and cools, orographic clouds are formed, ultimately turning into condensation and precipitation. Low temperature, in addition to large quantities of sunlight and rain contributes towards growth and fertility of crops. Rapid air movement rotates the wind turbines, generating more electrical energy to power the house. The area is relatively hazard free as landslide protection measures are practiced and monitored by various remote sensing equipment such as Light Detection and Ranging (LiDAR) and Satellite Navigation (GNSS). The environment, being far from the city, is more desirable to live in, lacks heavy traffic and has minimal sound and air pollution.

The expected measurements of our Smart Green Home are of those equivalent to a large bungalow, around 8000 square feet. The actual structure

of the house only covers two-thirds of the land while the balance provides room for the development of wind turbines, a farm and food garden.

It is vital for us to confirm that the plot of land we choose is safe and verified by local state authorities. Poor land administration puts lives at stake besides hindering investment and commendable land usage.

3.2.1 TOPOGROPHIC VIEW OF THE LOCATION





Bukit Tinggi, Bentong: Pahang, Malaysia.
= area where the house is to be built.

3.3 PROPERTY SURVEYING

The Butterfly Residence will be built on an empty plot of land in a suburban hilly residential area in Pahang called Bukit Tinggi. The process of purchase begins with a real estate transaction. By federal law, sellers are required to disclose certain information regarding the home, including its history of construction, previous ownerships and others. Only then, shall we propose a purchase offer to reach neutral agreement on all terms with the dealer before issuing the official contract. Inspections will be conducted to determine the truth value of the information that the seller has disclosed. If the report differs from said information, we will have the prime decision to renegotiate and cancel the transaction. After mortgage evaluation is done, the legal title home is transferred to our party.

In order to prevent errors in the development of our residence, land use control and property management is essential. Our home must be built in accordance to regulations to limit population density, noise and pollution. Classification of the house is under single family residential as it is a three-story stand-alone contemporary structure intended for one family. The 8000 square feet of land used will be carefully managed to avoid harming natural resources around it.

There is no doubt that climate change is one of the greatest issues we face in today's world. As a result, consumers are becoming more mindful and aware of the impact their procuring choices have on the environment. Consequently, more people are on the lookout for sustainable homes that produce fewer emissions and reduce carbon footprint. The population of Malaysia is expected to grow up to 40 million people by 2050, increasing the need for adequate housing (The Edge Markets). These factors in addition to the fact that value of real estate only appreciates in time brings us to the conclusion that the demand for affordable Smart Green Homes, similar to ours, will gradually increase in the future. Thus, home developers will have to increase the supply of Smart Green Homes to cater towards high demand in such residential areas.

Site-value methodology, a method used to evaluate all non-rural land, including land zoned rural-residential areas will be used to value the Butterfly Residence. Other properties in Bukit Tinggi are normal moderately priced freehold terraces and apartments. These factors increase the value of the

Butterfly Residence as it introduces an eco-friendly modern take towards sustainable living.

3.4 QUANTITY SURVEYING

We have done a study for the probable cost of construction for the above project based on supplied information such as the architectural drawing of the house.

3.4.1 BRIEF DEVELOPMENT DESCRIPTION

The proposed development consists of the:

- One(1) x full 2 floor home
- One (1) x Solar panel roof
- Six(6)x double-pane windows
- One(1)x courtyard and farm

Typically, each floor comprises of a bedroom/living area, bathroom and kitchenette.

3.4.2 CONSTRUCTION COST ESTIMATE

Description	**Amount (RM)**
Total Construction Cost	**1,612,704**
Add Consultants Fees	34,141
Total Development Cost (excl. GST)	1,646,845
Add GST	164,684
Total Development Cost (incl. GST)	1,811,529

3.4.3 ESTIMATE DETAILS

According to the architectural drawing, this is the estimated cost.

Professional fees	**Amount (RM)**
Development cost	420,000
Construction cost	640,000
Materials	336,540

Excavation	Amount (RM)
Cost per square feet	14.54
Solar panels	**Amount (RM)**
18 Off Grid Solar Panels 100Kw	**5,000**
Installment fees	2,000
Wind Turbine	**Amount (RM)**
Item cost	80,000

3.4.4 DETAILS OF MATERIALS INCLUDING INSTALLMENTS

Materials	Qty	UNIT	COST
Cement	4000	Bags	57,750
TMT Steel	20	Tonnes	50,000
Double- pane windows	6	Piece/Window	1040
Concrete blocks	5000	Block	160,000

4 BENEFITS OF THE DEVELOPMENT

Expenses are diminished with the development of our project. Electricity consumption plays a major role in determining the price of our bills. As stated earlier, solar panels generate and store energy that can later be converted into electricity. Though they might seem costly upfront, these solar panels are durable with an average lifetime of 25 years. The cost to spend on the maintenance over time will be much less, due to the long-lasting materials used and the viable architecture. Studies have shown that an average household can save up to RM124,833 over the lifetime of a solar panel (Energy Sage). Besides solar energy, our residence is equipped with wind turbines that turn kinetic energy into electrical energy. Similar to solar panels, these wind turbines don not produce atmospheric emissions that cause acid rain or thinning of the ozone layer. The mini outdoor farm that we chose to incorporate will breed animals such as chickens and goats to provide an alternative for purchasing eggs and goat milk. According to Jeong, goat milk contains less sugar (lactose), 13% more calcium, 25% more vitamin B6, 46% more vitamin A, and 134% more potassium than regular cow's milk.

Other than that, our smart green home is self-sufficient and self-sustainable. The concrete used in most parts of the house has undergone a process where bits of irradiated plastic bottles are added into the concoction. This particular concoction has better tenacity by 15% in contrast to traditional concrete, which is less durable, expensive and emits more carbon dioxide. Solar panels and wind turbines utilise renewable energy sources that acts as eco-friendly generators to power the entire house. These solar panels, used along-side motion censored LED light bulbs consume less energy to run. On average, switching to LED saves up to RM376 a year in electricity bills (The Greenage). As our smart green home promotes a healthy lifestyle, we included a garden where most herbs, food and vegetables are cultivated. Fresh produce sold at grocery stores normally contain toxic pesticides and unhealthy preservatives. Harmful chemicals used in the agriculture industry, such as Organophosphate (OP) are often linked to cancer, Alzheimer disease and even birth defects. By cultivating own food, one can be assured of its quality and cleanliness. Moreover, having a personal garden promotes physical activity as you need take the initiative in caring for the plants.

Our smart green home emphasises on the safety and solace of its residents. The latest technologies have been implemented, decreasing the risk of accidents caused by natural disasters. Firstly, cellulose operates as an

insulation layer so that less heat can be transferred from time to time. Cellulose, being non-combustible, lowers the chance of the house catching fire. In order to build a strong house, metal rods are placed deep into the soil before a layer of concrete is poured. This crosses out all the possibilities of unexpected soil erosions and landslides to occur. Urban citizens are frequently exposed to high levels of toxic gases coming from vehicle exhausts and factories. Conversely, in places with higher altitude, residents inhale cleaner air, thus avoiding them from developing pollutant-caused breathing problems. Besides, living in hilly districts reduces the risk or suffering from heart diseases. Low oxygen spurs genes to create more blood vessels, hence proving the statement that people who live at high altitudes live longer (Science Daily). At the same time, lighting, entertainment and climate appliances are operated by a Smart Home Automation System. Through this system, owners of the home are able to monitor and control their homes from remote locations. This network accentuates the security and safety of the house .

5. THE BUTTERFLY RESIDENCE AND WHY IS THIS A WINNING PROJECT?

1. The application of four surveying professions
    - Our team has studied the 4 surveying professions thoroughly and applied the knowledge we obtained to our original ideas in order to create an exemplary Smart green Home.
2. We utilised state of art environmentally friendly technology
    - Comprehensive research was done to discover various cutting edge ultra-modern green technology initiatives that were incorporated in every aspect of designing to construction of our home.
3. Our Project promotes a unique sustainable way of living
    - Through the execution of our project, we are able to understand the importance of green technology and self-sufficiency which is a needed concept to practice at this time of climate crisis. We are able to raise awareness through mediums such as social media, thus catching the attention of the general public and urging them to take part in saving our planet.

6. CONCLUSION

As stated earlier, our motto is to:

" BE PART OF THE SOLUTION NOT THE POLLUTION"

In a nutshell, we believe it is our duty as dwellers of the earth to protect and gradually recover its wellbeing from being continuously harmed. Hence, development of projects similar to the Butterfly Residence should be made available for people to purchase as they serve as optimal solutions to current environmental issues.

[2463 Words (Excluding headings and bibliography)]

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