Cluster Analysis of 284 Households in the Klang Valley on Green Building Awareness

Abstract

Recently, numerous adverse impacts to the environment from human activities had lead-to destruction and increasing the CO_2 emissions in the air. However, countries development should be continued in order to stimulate economic growth. The construction sector,particularly housing,is one ofthenational economybranch that has begun tooriented the conceptof green and energy efficientfor the sake of 'green environmental' by decreasing the energy consumption. Thus,the measurement of the awareness level of green building must be done in order to examine the ability of the community in implementing such green and energy efficiency in effort to reduce the environmental degradation.

As Malaysia climate factor; hot and humid throughout the year,residential buildings have difficulties in achieving the comfort without the aid of refrigeration equipment like air conditioners. Airtight or passive house concept which is commonly used in the 4 seasons climate, actually also very suitable in the context of Malaysia by simply changing the functions;cooling and dehumidification methods perform an important part, while heatingaccumulation in the building is unnecessary.

This thesis aim to explore related quality of understanding and acceptance in the consciousness of green and energy efficient building especially home concept. This

thesis also identifies the public's willingness to invest in green and energy efficient homes for their own use. The investigation on a total of 243 respondents through surveys and interviews were conducted in the vicinity of Klang Valley involving urban, semi-urban and rural residents.

Although in general people have awareness of green concepts, but their ability to afford on green and energy efficient home is still at a low level.The low and middle income people do not capable to invest in such large portion for the mean of green buildings.

Overall, great planning is needed to ensure the success of green andenergy-efficient buildings , especially in urban areas as well as a higher chance coincide with theconcept of environmental conditions are implemented .

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1) Introduction: "Green Building Reconsidered"

After almost five years since the GBI came to Malaysia, we can revisit and reconsider the question: "What is a Green Building?"

There is no doubt that it is an efficient building that has energy efficient with environment friendly thus provides healthy life style towards human. It is "...a building that has been constructed or renovated to incorporate design techniques, technologies, and materials that minimize its overall environmental

impacts."[1] That accounts not only for the energy consumption, but also for its mid-and long term CSR: A green building is a structure that is environmentally responsible and resource-efficient throughout its life-cycle. These objectives expand and complement the classical building design in terms of economy, utility, durability, and comfort.

Green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environment degradation (RRR)

For example, green buildings may incorporate **sustainable materials** in their construction (e.g., reused, recycled-content, or made from renewable resources); create healthy indoor environments with minimal pollutants (e.g., reduced product emissions); and/or feature landscaping that reduces water usage (e.g., by using native plants that survive without extra watering).

3: What are the benefits of green building?

Buildings have an enormous impact on the environment, human health, and the economy. The successful adoption of green building strategies can maximize both the economic and environmental performance of buildings. Specific environmental, economic and social benefits are listed in Why Build Green?

Research continues to identify and clarify all of these benefits and costs of green building, and of how to achieve the greatest benefits at the lowest costs.

4: How do buildings affect climate change?

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[1] The Massachusetts Technology Collaborative Renewable Trust

The energy used to heat and power our buildings leads to the consumption of large amounts of energy, mainly from burning fossil fuels - oil, natural gas and coal - which generate significant amounts of carbon dioxide (CO_2), the most widespread greenhouse gas. Buildings in the U.S. contribute 38.1 per cent of the nation's total carbon dioxide emissions. In

Reducing the energy use and greenhouse gas emissions produced by buildings is therefore fundamental to the effort to slow the pace of global climate change. Buildings may be associated with the release of greenhouse gases in other ways, for example, construction and demolition debris that degrades in landfills may generate methane, and the extraction and manufacturing of building materials may also generate greenhouse gas emissions

2) Literature Review Yus

<Background, definition of green building, energy efficiency>

3) Methodology

For this green building awareness study, we mobilize 70 students at the School of Business to target five respondents each for their individual assignment in the subject Business Research Methods. The access to our population which is normally an insurmountable stumbling block for many researchers on the ground was simple. The reason is that our students targeted relatives, neighbors and friends which means a pre-selection that can lead into the argument being bias. After conducting a pilot run and a pre-test with 12 respondents based on qualitative interviews, we derived a quantitative questionnaire with a 34 variables. The response rate was 100% of those students who delivered their assignments totaling in 285 filled in questionnaires. This study with this size of population can claim a representativity for 65,000 samples in the overall population with a significant error rate of 5%.

As our students' homes are scattered all over Klang Valley, we were able to send them into three different main clusters (urban, sub-urban and rural areas). Furthermore, we received a clustered few of the whole Klang Valley:

<Picture of Klang Valley>

4) Research findings

Population in Klang Valley believes with … % that the climate in Malaysia since 2000 is getting hotter. Only a few respondents think that nothing change, and none of them thought it is getting colder.

However, we find … % respondents who perceive that there are more rainy days to be reported. Indeed getting hotter and more rainy days are categories which do not exclude each other.

Out of five questions, we created the so-called "Green Building Awareness Index". This index consists of the following categories:

1. Source of information on green buildings: The more information a person use, the higher the index (high, medium, low).
2. Knowledge about green buildings and its application for residential areas (0, 1=little, 2=medium and 3=high).
3. Frequency of having seen green buildings (follows the same logic from 0, 1 and 2)
4. Effectiveness of promotions for green buildings to create awareness among Malaysians (1=strongly agree, 2=moderately agree and 0=disagree)
5. Benefits and opinions about the energy performance of a green building (a scale 1, 2, 3)

We have compared the necessity of the implementations of green buildings in urban, sub-urban and rural areas. Our finding shows that in kampong areas green buildings are deemed not to be necessary (… % compare to …% in urban/sub-urban).

5) The awareness among Malaysians concerning the utilization of renewable energy in the future favors solar energy (…%) and biomass (…%). Conversely, nuclear energy scores as the least preferred energy together with a relatively completely unknown resource which is geothermal energy (…%). Wind energy, which might be applicable in the East Coast scores …%, and finally hydro energy is rated at …%. All these renewable energies are significantly almost perceive similarly once we compared our main three clusters urban, sub-urban and rural areas.

iii/1) The most important question we targeted through this research is about the readiness of people embarking on such a green building for their own usage. The figures show the following significant results: For those respondents which run air-condition units, they would spent RM… on average (standard deviation RM…). At the same time, they are expecting to receive back their money in … years (s^2=…).

The following table can prove the correlation between willingness to invest for this green building and the respective payback period.

For those respondents who do not dispose air-condition units and still run electrical fans, the picture looks different. This part of our population would invest RM… on average (s^2=…), if the monthly electricity bill would not exceed more than 10% as by now.

Among all participants of our survey, it is believes that the insulated green building refer above will decrease the utilities "expenses" by … - … %. Presently, …% believe that a green building is more expensive than common concrete and brick buildings. Only …% thinks that the building which is energy efficient will cost them less than the predominant building technology.

iv/8 and 9) Of course, our team anticipated a strong correlation between the readiness to invest into the green building and their total monthly income. In addition, the most important question regarding the capabilities of household is not the gross income per household, but the monthly cash flow. Interestingly, our findings show that there is no clear correlation between readiness to invest into green building and the monthly capability of a household to budget for this purpose.

<Table>

<Interpretation>

iii/4) On the same count, …% of our population believes that it is not affordable to own this building nowadays.

iii/3) Among the choice whether to buy or retrofit a building into green … % go for the buying option, with the remaining …% would go for the retrofitting one.

iv/2) At first sight, the type of cooling appliances that Malaysians are currently using reveals two different approaches: the overwhelming majority of …% are still using air circulating indoor fans, whereas …% as a growing minority are already choosing air-conditioners (split units) over the indoor fans. What the glazing of their present houses is concern; the following table will illuminate the distribution:

It shows that the majority is using … windows, whereas there is not a single household choosing double panes.

iv/3) The most critical question we rose in this survey is whether the occupancies of residential buildings in Klang Valley are choosing any protection against dengue fever. The result shows that a small minority is not concerned about dengue fever measure at all (…%). Among the prevalent mosquito protection measures it is the closed doors which scores number one with …%, the usage of mosquito nets (number two with …%), number three that usage of mosquito coils with …% and finally the application of insect repellent with …% as the least preferred measure.

5) Conclusion