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Effectiveness of Green Building Concept through Post Occupancy Evaluation: An Indicative Study

With a vigorous economy, increasing standards of living while preserving the nature is a kind of ideal things to be done. The aim for greener Malaysia should be targeted while the existence of green building is still a new concept to be implemented. This paper aims to study the six main criteria of green building. The effectiveness of the green building concept based on the available criteria is clarified through evaluation that is done towards the post occupancy where tenant satisfactions are taken into account. A questionnaire study was carried out with selected office building within Putrajaya. From the result that is earned, the white ceiling, quality of bin provided, indoor air quality, green roof, water tap with irrigation and recycle material is the most effective way to be applied for the green building office in Malaysia.

Keywords: Green building; office, Malaysia, survey
1.0 Introduction

Green building has advanced building principles and methods that go beyond all present building codes in establishing a better internal environment whilst decreasing the impact to the world. The concerns are basically about energy efficiency, excessive consumption of raw materials, the amount of construction wreckage in landfills together with the health concerns (Sensible House, 2013). Green building is about processes that are environmentally liable and resource-efficient throughout a building’s life. It grows and complements the classic building design, which is concern about the economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building (EPA, 2013).

At present, the development of office buildings and its operation are generally having direct and indirect impacts. Based on the Whole Building Design Guide (WBDG) in 2013, buildings need resources such as energy, water and raw materials, generate waste and discharge dangerous things to the atmosphere. According Moa and Yang (2005), green building has characteristics such as saving resources, reducing energy consumption, lessening pollution together with improving environmental quality. As based on the 10th Malaysia plan and 2010 budget, the government offers RM1.5 million loan to company that applies green building technology. Nowadays, the demands for green buildings will continue to rise as environmental awareness grows and more companies embrace corporate social responsibility (CSR). The multinational companies will be at the head of the trend of progressively implementing to lease green office space wherever possible. The government also plays a role to endorse it with providing soft loan to investor and contractors to build a green building including offices.

2.0 The Criteria of Green Building

The criteria that are applied for green buildings are different from normal building. The criteria of green building would be energy efficiency, water efficiency, indoor air quality, material resources and innovation together with sustainable site planning and management.

<table>
<thead>
<tr>
<th>Main Criteria</th>
<th>Element</th>
<th>Green building</th>
<th>Normal building</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>Type of current Energy generate Equipment for lighting</td>
<td>Direct current from sun Renewal energy by Solar and Photovoltaic Panel Natural Lighting</td>
<td>Alternative current by TNB Electricity Electricity</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td>Supply Efficient water fittings System</td>
<td>Rain water harvesting Apply Grey water recycling</td>
<td>Local Authority for landscaping Nil Direct from supply pipe</td>
</tr>
<tr>
<td><strong>Indoor Air Quality</strong></td>
<td>System</td>
<td>Thermal Comfort Acoustic Comfort Natural Ventilation</td>
<td>Normal Air Condition Nil Nil</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Method Gases for air conditional Painting</td>
<td>Recycle Material Natural Gas Eco-Friendly Painting (non hazardous)</td>
<td>Not Implants The Recycle Method Carbon Dioxides Painting (Hazardous)</td>
</tr>
<tr>
<td><strong>Innovation</strong></td>
<td>Appliance</td>
<td>Recycle Bin</td>
<td>Normal Bin</td>
</tr>
<tr>
<td><strong>Sustainable Site</strong></td>
<td>Design</td>
<td>Greenery and Roof Insulate Concrete Roof And Floor Slab</td>
<td>Roof Without Garden Nil</td>
</tr>
</tbody>
</table>
Green building has some distinctiveness such as saving resources, reducing energy consumption, reducing pollution, improving environmental quality of living room stated (Mao and Yang, 2005). The element of green building applied is better than the traditional concept applied for occupant.

3.0 Research Methodology and Findings

The scope of the study is focusing on the issue of green building with the emphasis of the post occupancy evaluation and facility management of green building in Malaysia. The green building together with the facility is narrowed down to an office building located in Putrajaya, Malaysia. The main reason of this building is chosen is because it is located at the Federal Government Administrative Centre of Malaysia. The building selected for this study is also the first office building in Malaysia that earns the Green Building Index platinum rating, and the first outside of Singapore which obtain the Green Mark platinum rating. Green Mark is the Singapore’s certification scheme for green building.

Following a literature review, a quantitative method of data collection is adopted in this study. 100 sets of questionnaire are distributed to the people occupying an office building and 50 sets of valid response are received. The respondents are among the staffs and visitor that have been selected in order to complete the study. The questionnaire comprises two sections. Section A is more focus on the demographic aspects of the respondents’ related information to make the result accurate. Whereas Section B focus on the satisfaction level of the respondents towards the element applied in the studied building.

From the response received, most of the building users are satisfied with the energy element in the building. There is a high number of respondents strongly agreed for the white ceiling (46%), 46% level of agree for natural lighting, 44% for low e glass and 40% for PV panel.

Figure 2 shows most of the respondents agree with the satisfaction level from water element in their office buildings. 46% from the respondents agree with equipment
waterless urinal applied, 44% from waterless urinal give more benefit to user, 50% from water tap with irrigation is suitable to be applied.

In terms if green roof is really helpful in order to reduce heat inside the green office building, it can be seen that the higher of agree level is 44% towards the green roof, where it is really helpful in reducing heat inside that particular building. The 36% is strongly agreed and the left response is both of natural and disagreed with 10% of respondents. Besides that, the green roof can reduce the noise during rainy day; it shows that the level agreed towards the green roof can reduce noising during the rainy day. The higher one is strongly agree with 40% and followed with 36% of agree of respondents, the next is 20% of natural and least is 4% of disagree by respondents of green roof can reduce noise during rainy day. Moreover, the colour of roof can give more attraction to the occupants’ show the highest response, which is 42% of agree and followed by 30% of natural respondents. The following is 14% strongly agree and disagree with 10% of respondents and small percentage that is 4% of strongly disagree.

Regarding the green building become more effective by using recycles material, the highest level is 40% agree response and followed by 36% of strongly agree, 14% of natural answer and the lowest is 10% respondents answered for strongly disagree by green building become more effective by using recycle materials. Plus, the green building will contribute a good health for the building occupants illustrate above shown that the highest level is 42% for strongly agree answer followed by 34% of agree and 14% of natural level, 8% respondents strongly disagree and the lowest is 2% for disagree level towards the green building will contribute a good health for the green building occupants. For the green building would help to contribute the sustainable environment by using recycle materials, as illustrated below shows the highest percentage level with 44% for strongly agree, followed by 38% for agree, 10% for strongly disagree and the remaining is 6% for natural together with the lowest is 2% for disagree level. Furthermore, the useful material would contribute to more safety for building occupant shows that 44% respondents are strongly agree and 42% are happy with choosing agree answer. Next are 10% for natural answer by respondents and 4% chose strongly disagree. The useful materials would
save the overall costs shows that the 48% respondents are agree while another 46% are strongly agree. The remaining 2% for each natural, disagree and strongly disagree by the building occupants.

For comfortable with temperature inside the green office building, as illustrated in figure 5, shows that the highest response is agree with 50% of the comfort abilities with the temperature there. While 26% was a strongly agree with the temperature and next is 20% for the natural level and the least is 4% for strongly disagree level of temperature inside the building. Besides that, for satisfaction with the indoor air quality, the provided survey displays the highest with 50% respondents agreed and followed by strongly agree with 32% and remaining is natural with 10% and both disagree and strongly disagree with 4% of respondents. As for the temperature in this building is more practical during all time, it shows the highest response as agree with 42% of level for temperature in this building are more practical during all time. While the strongly agree with 26% and followed by natural with 20% and last is disagree with 12% of respondents towards the temperature in this green office building.

Figure 6 shows the quality of recycle bin provided in the case study building with the highest percentage which is 40% for agree voting and 32% for strongly agree respondents and followed by 18% for the natural voting by the green office building occupants and the lowest is disagree answers that gain 10% of respondents. Besides that, for the quantity of bin provided in this building, it is illustrated that the highest level of the agreed occupants with quantity of bin provided is 36% for strongly agree answer and followed by 30% for agree and next is 22% for natural level and the least is 12% for the disagree level of quantity of bin provided. Other than that, the colour of bin is very helpful in recycling method showing the highest level of agreed occupants with 38% and followed by natural 30% and agrees with 28% and the bottom one is both disagree and strongly disagree with 2% of level answered by the said respondents.

4.0 Discussion

In general, it can be said that the office building are applying and implementing the Green Building criteria well. The findings
are based on the response provided by the green office-building occupants.

From the finding, it has been found that the most effective equipment apply based on available criteria for energy is white ceiling. It shows that most of the respondents strongly agree that white ceiling is the most effective equipment if compared with other equipment like low E glass, photovoltaic (PV) panel and natural lighting. For the innovation, quality of recycle bin is the most effective to apply, compare with other equipments such as quantity of bin and colour of bin. This is because enough quantity is able to help the building to be always clean and clear. It is better compared with the quality and colour where they are not really helping to be better green buildings.

For indoor air quality, respondents are satisfied with temperature and indoor air quality that is provided. This is because the people occupying the green building are suitable with the temperature there. It shows that, the statement saying that indoor quality is warm is really depending on which green building referred to. Besides that, for the sustainable site section, green roof is really helping to reduce heat inside. Reduce heating in the building also can reduce the bill of electricity. This green roof is really able to reduce heat inside compared with the ability of green roof where it can reduce the noise during rainy days and the colour of roof can give more attraction to occupants.

For the water aspects, applying water tap with irrigation is the most effective compared with applying the waterless urinal and waterless urinal give benefit to the building. This is because the water tap with irrigation applied can reduce the usage of wastewater. For materials used, the most effective material and effective equipments would save overall cost. This is because the material applied is from the green labeled, which already has certificate from the US. Furthermore, the green material is more secured than other materials.

5.0 Conclusion

In conclusion, the result shows that the related appliances present at the green building overall are in good condition based on the measurement of their correlated criteria. Besides that, the point of view from the respondents are very important to know whether the people occupied at the said building are suitable or not with the green building concept and equipments applied.

The effectiveness of green building concept based on available criteria stated can also be analysed. The effectiveness is helping out in choosing the materials and equipments during the construction stages. Consequently, from the analysed result that has been getting, it can also help the owner of the said building to know which equipments are suitable to be applied or not. The owner also can detect which one of them is not effective equipments and should not be applied, thus helping to avoid future mistake.

Post occupancy evaluation is one of the best ways to assess the occupants’ satisfaction in the green building together with its management in Malaysia office building. Government should provide initiative to help private firms to be involved in green building developments. Various parties should encourage each other to get involve in the green building development in Malaysia. Further research is suggested to provide a more comprehensive study through the interview with the building manager or facilities management in gaining more details and involve numerous case studies with involvement of more respondents in questionnaire survey.

Reference


