Awareness of Public towards Green Infrastructure Components in Increasing Quality of Life

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Abstract

This study attempts to perceive the level of awareness of respondents' towards green infrastructure (GI) component in Labuan housing area with objectives; (i) to analyze the existence of GI attributes in the study area and (ii) to examine the public preferences on these attributes. The questionnaire was distributed among the 386 respondents in housing area (1800 meter radius from the botanical garden). The findings implicate that Labuan Botanical Garden not only contributes to the enhancement of visual quality of the housing areas but also offers recreational and social interaction among the residents.

Keywords: Green infrastructure; Environmental attributes; Visual quality attributes; Botanical garden.

1.0 Introduction

GI is vital in considering our nature life support system (Mell, 2008). It serves many advantages especially on social, health, economic and environment (Mansor et al., 2010; Shukur at al., 2010). The advantages are mitigating the potential impacts on existing and future development and growth. At the same time, GI offers valuables services to the surrounding community (Sreetheran, 2010). Nowadays, people are engaged with this eco-friendly term because they are very concerned about their health from time to time. In the other words, eco-friendly is activities that provide a positive impact on our environment and future generation (Yiu Li et al., 2010; Omar et al., 2010). According to Islam (2008), the community always concerns on their environment. They always find out the best way to improve the condition of their environment (Zinas and Mohd Jusan, 2010). In relation to that concept, GI acts as one of the eco-friendly function of sustainable development.

Identically, Benedict and McMahon (2002) stressed that GI networks consist of hubs and linkages. Hubs of this study refer to the main place for the human and ecosystem. The linkages refer to the connection between one hub to another. The hub and the link have their own functions based on the needs, place and situation. The hubs in this study will be the housing area and Botanical Garden. All GI elements are link to the hubs.

Focusing on the housing sector, GI becomes an influential factor of the house buyer to invest in the housing property. As a proof, Jim and Wendy (2010) explained that GI or green spaces contribute to the sustainability of the cities that preferred by the community (Abdul Karim and Abdul Rasheed, 2010; Abdul Mohit and Elsawahli, 2010). Besides that, a green landscaping presented the characteristics of public local goods and also generates externalities on economic analysis point of view (Chourmet et al., 2008).

Apart from that, the aim of this paper is to find out the public preferences towards their GI components in their surrounding environment. Based on the aim, two main objectives have been determined for this study; to analyse the existence of GI in the study area and to examine the public perspectives on GI attributes.

2.0 Literature Review

Malaysia has enhanced the GI components in its planning and enforcement to maintain the environment, as well as the visual quality of the city. In order to possess the world-class living environment, the metropolitan city of Kuala Lumpur offer an adequate quality of housing with first class accessibility and facilities surrounded by the healthy and safe environment (CHKL, 2003; Mat Nazir et al., 2014). Since 1984, The Kuala Lumpur Structure Plan formulated general policies related to landscape, townscape and conservation, which were generally appropriate (CHKL, 2003) for future development. Kuala Lumpur is aiming for being a sustainable city, which creates a balance between physical, economic, social and environmental development.

Besides that, Putrajaya as another new city in Malaysia also emphasized on the green city concept in their previous, current and future legislation and policies. Generally, the housing area in Putrajaya surrounded by greenery infrastructures such as botanic gardens, water bodies, street planting and ornamental trees. Besides, a buffer zone can be found in

most of the housing areas in Putrajaya to enhance neighbourhood friendly. To make it liveable, the housing area offers an adequate open space, well-planned, well-maintained, well-serviced and well-connected facilities (Qureshi and Ho, 2011). It creates a pleasant view and preserving the environment.

3.0 Methodology

According to the literature reviewed, there are many GI attributes found. Adhere to the current situation in Labuan, the researchers have decided to choose two main attributes. They are the environmental and the visual quality attributes. Then, site inventory on existing GI characteristics was conducted. During site inventory, the checklist was used to record every element and structure that exists in the housing area and botanical garden. This helps the researchers to determine and to understand the physical characteristics of existing GI attributes and network formation in the study area. Then, an interview with the local authority, developer and community were conducted. Next step, a pilot study was conducted for 3 weeks in the study area from 1st January 2013 to 21st January 2013. It involved various parties such as the local authority, developer, house owners, and botanical garden users. During the pilot study, a questionnaire forms were distributed among the respondents. Respondents were asked to answer the entire question in the time frame given and returned to the researchers once completed. Besides that, the researchers also used a social network (Facebook) to interview the community. From the output and comments, the researchers make necessary amendments and then a new set of questionnaire form were distributed to the respondents. 386 respondents (radius 1800 meters) were involved, which were determined by Geographical Information System (GIS). The GIS covered the housing unit and the total area of the study area is 908.02 hectares with the population of 1,158 people (33.3% of total respondents in the study area). It took about 3 months from 1st February 2013 to 1st April 2013 to complete the task. Finally, data entry and analysis were conducted using the software of Social Packages on Statistical System (SPSS version 20.0).

4.0 Results and Discussion

Total respondents were 386 people from 12 selected housing areas. From the outputs, only 63% (237) of them willing to answer all questions in the questionnaire form and the other 37% (149) declined. From the respondents, 62% are male and 38% are female living between radiuses 1800 meters in the study area. The Malays represented the majority of the ethnicity of the respondents with 39% and the Indian was the lowest ethnicity with 1%. The largest percentage of the respondents (72%) was adults between ages of 21 to 45 years old. The majority of the respondents resided in the study area between 1 to 5 years. The respondents of this study were from the 4 to 6 family sizes. Most of the respondents (74%) was married. From the total respondents of 237, 85% of them were aware of GI components. Only 15% of them were not aware of the GI components in their housing area. The frequency of awareness on GI among respondents from Malaysia was 89% equal to 180 people while 11% were non-Malaysian that aware of the GI elements in their housing area. The non-

Malaysian in this study consists of respondents from America, Philippine, and Indonesia.

4.1. The existing green infrastructure component in study areas

Figure 1 represents the existing GI elements that found in the study area. It is divided into 3 components which are in the housing area (hub 1) and botanical garden (hub 2) and the linkages (link) between these two areas. It shows a variety of GI components in the study area that may attract the community to stay in the area.
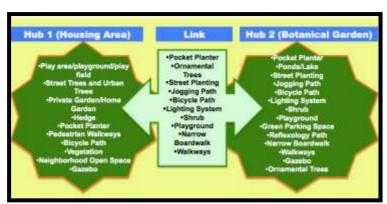
Figure 1:

Existing GI Components in Labuan
(Source: Author)

4.2. Mean results for environmental attributes

Table 1 presents the ranking of the mean results for environmental attributes (priority rating scale is 1=not important at all, 2=low important, 3=neutral, 4=important, 5=extremely important). It is reported that maintenance of the road and surrounding environment was highly preferred. The lowest mean was calculated for the solar system usage (3.82). Maintenance of the road and surrounding environment is ranked highest in the housing area because it provides accessibility to the community.

Table 1: Ranking of mean results of environmental attribute variables

Environmental Attribute	Mean	Rank
Maintenance of the road and surrounding environment	4.85	1
Free from pollution, hazard and soil erosion	4.59	2
Cleanliness of air quality	4.51	3
Shady environment	4.50	4
Green parking space	4.35	5
Street cleaning services	4.30	6
Ability to adapt nature impact	4.19	7
Garbage disposal service	4.18	8
Usage of the solar system	3.82	9

(Source: Author)

52

4.3. Mean results for the visual quality attributes in housing area and botanical garden

Traditionally, the botanical garden serves varieties of recreational activities, educational and trees preservation. Table 3 implies the ranking of the mean result for botanical garden facilities (priority rating scale is 1=very dissatisfied, 2=dissatisfied, 3=neither dissatisfied nor satisfied, 4=satisfied, 5=very satisfied. It can be seen that jogging, bicycle, and reflexology path were highly preferred. By rights, those activities are part of leisure activities. With easy access, whether by walking or cycling, the public can still go to the park without the need to drive. At the same time, it can reduce the cost and time. The kiosk was recorded the lowest because the park has provided only one kiosk at the main entrance.

Table 2: Ranking of mean results of visual quality in housing area and botanical garden

Visual Quality Attribute (Housing Area)	Mean	Rank
View of the park	4.51	1
Scenic beauty of the housing area	4.05	2
Aesthetical value	4.00	3
Topography	3.92	4
View of the vegetative form	3.84	5
Visual Quality Attribute (Botanical Garden)	Mean	Rank
View of jogging and bicycle path	4.31	1
View of ponds/fishing area	4.11	2
View of ornamental trees	4.06	3
View of playground	3.84	4
View from the tree house	3.46	5

(Source: Author)

4.4. Mean results for the botanical garden facilities

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Table 3: Mean results for botanical garden variables

Botanical Garden Facilities	Mean	Rank
Jogging, bicycle and reflexology path	4.23	1
Ornamental Trees	4.13	2
Guard House	4.09	3
Children's Playground	3.95	4
Herbal Trees	3.91	5
Lighting, Pergola, Facilities	3.90	6
Ponds, Fishing area, and Dustbins	3.89	7
Botanical Garden Facilities	**Mean**	**Rank**
Tree House and Landscape	3.86	8

Entrance, Signage and Parking Area	3.52	9
Instruction Signage and Water Feature	3.48	10
Exercise Station and Public Toilet	3.21	11
Kiosk	3.02	12

(Source: Author)

4.5. Comparison of mean between visual quality attributes and citizenship using t-test

This test involved comparison of means of two groups, which is recorded as 'Malaysian' and 'Non-Malaysian' with the visual quality attributes at housing area. It can be concluded that there is no statistically significant difference between these two groups in their satisfaction levels towards the visual quality attributes although generally the non-Malaysian rated higher for all visual quality attributes except for aesthetical value.

Table 4: Mean results for botanical garden variables

Variables	Malaysian	Non-Malaysian	F	Sig.
View of the park	4.43	4.46	1.816	0.179
Scenic beauty at housing area	4.27	4.46	1.212	0.272
Topography	3.81	3.89	1.030	0.312
Aesthetical Value	3.93	3.65	1.666	0.198
View of vegetative form	3.69	3.73	0.489	0.485

(Source: Author)

4.6. Correlation analysis

Correlation analysis is used to describe the direction and strength of the linear relationship between two variables. Results from Table 5 showed a significant correlation between some of the visual quality attributes and Botanical Garden (BG) variables. Highly significant and positive correlation ($p < 0.01$) is seen between view towards jogging and bicycle path with herbal trees (0.545**); lighting, pergola and facilities (0.498**); ponds and fishing area (0.440**); jogging, bicycle and reflexology path (0.848**); children playground (0.427**); tree house (0.463**); ornamental trees and landscape (0.727**); and guard house (0.561**). The second attribute are a view towards ornamental trees and landscape.The results showed the majority of the variables were significant between each other except for the kiosk variable. There was positive and negative correlations coefficient in this result.

At the same time, view of playgrounds was recorded most significant between each variable except for instruction signage, water features, and kiosk. The rest shows highly significant with correlation $p < 0.01$. Next is view toward ponds. The results recorded that there were significant difference at $p < 0.01$ with herbal tree (0.638**); lighting, pergola (0.575**); ponds, fishing area (0.565**); jogging, bicycle, reflexology path (0.861**); children playground (0.457**); ornamental trees (0.966**); tree house (0.500**); public toilet (0.169**); exercise station (0.169**); dustbin (0.523**); guard house (0.033**).

Finally, the correlation between views of the tree houses with Botanical Garden variables. The results showed only a few significant correlations between these two variables. At $p < 0.01$, the highly significant correlation was seen in instruction signage (0.982**); water

feature (0.982**); dustbin (0.195**) and guard house (0.159**). It can be concluded that view of ornamental trees and landscape has attracted the visitors to come and feel the fresh scenery at the botanical garden. Based on the interview with the respondents, the researcher found that the visitors loved the variety of ornamental trees and landscape provided in the garden thus evoke the feelings of calmness and welcoming the tourist to come to the garden.

Table 5: Correlation analysis for botanical garden variables

Visual Quality Attributes BG Variable	View of Jogging and Bicycle Path	View of Ornamental Trees	View Towards Playground	View of Ponds	View from Tree House
Entrance, Signage and Parking Area	-0.049	-0.531*	-0.295**	0.028	0.016
Herbal Trees	0.545**	0.452**	0.490**	0.638**	0.085
Lighting, Pergola, Facilities	0.498**	0.604**	0.630**	0.575**	0.136*
Ponds, Fishing area	0.440**	0.545**	0.823**	0.565**	0.062
Jogging, bicycle and Reflexology path	0.848**	0.349**	0.577**	0.861**	0.022
Children's Playground	0.427**	0.841**	0.761**	0.457**	0.089
Tree House	0.463**	0.611**	0.994**	0.500**	0.125
Ornamental Trees and Landscape	0.727**	0.308**	0.502**	0.966**	0.985**
Instruction Signage	0.043	0.128*	0.116	-0.063	0.982**
Public Toilet	-0.031	0.258**	0.260**	0.169**	0.075
Water Feature	0.043	0.128*	0.116	0.116	0.982**
Exercise Station	-0.031	0.258**	0.260**	0.169**	0.075
Kiosk	-0.076	0.068	0.107	-0.012	0.069
Dustbins	0.451*	0.541**	0.735**	0.523**	0.195**
Guard House	0.561**	0.361**	0.326**	0.033**	0.159**

(Source: Author)

4.7. Major Findings

i. Public awareness among respondents reported 85 percent of total respondents. It shows that the majority of the respondents in the study area are aware of their GI components.

ii. 89 percent of them were Malaysian and 11 percent were Non-Malaysian. From the interviews, most of the respondents were aware of their environmental consideration and sustainable development but they might not aware or not understand the GI terminology.

iii. Respondents feel the term sounds new whereas it already exists since 19th Century in the United States. In order to encourage public awareness and understand the GI term, local authority or NGO's should play their roles in conducting an awareness campaign or give talks to the public from time to time.

iv. There is a variety of GI components in the study area (in the housing area, Botanical Garden and the link between housing and botanical garden) which

provides a lot of benefits towards the community in the area. All the GI components linked between one to another to create a connection from one hub to another hub.

v.   The most important environmental attribute is the road and surrounding maintenance. Perhaps in future local authority or developer will maintain the facilities from time to time to enhance community satisfaction.

vi.   The most important botanical garden variables are jogging, bicycle and reflexology path, which is shown in the mean results. It means that most community preferred to use jogging, bicycle and reflexology path in the botanical garden. So, the local authority should realize this output in order to preserve or to maintain the cleanliness and safety of those facilities to attract more tourists in future.

vii.   Views of ornamental trees and landscape showed the high significant level at $p<0.01$. It means that the botanical garden users mostly satisfied with the attributes. Besides, the view of the park created a different living experience to the visitors.

viii.   Hence, the visual qualities of the botanical garden need to be improved so that the visitors will feel comfortable and satisfied. These results are supported by other researchers (Noriah et al., 2015). In addition to that, social interaction will be enhanced.

5.0 Conclusion

To sums up, GI provides a lot of advantages towards community and may overcome the impacts caused by the environment. With proper maintenance and implementation of environmental attributes and visual quality attributes, it will add to the higher satisfaction among the housing residents and visitors. GI also enhanced the quality of life in the neighborhood area. The other GI attributes related to the economic view can be explored for future research

Acknowledgement

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