The High Rise Low Cost Housing: Sustainable Neighbourhood Elements (Green Elements) in Malaysia

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Abstract. The sustainable development is a vital measure to alleviate the greenhouse gas effect, global warming and any other environment issues. The sustainable neighbourhood concept is not new in Malaysia, however, the concept still needs attention and awareness from the stakeholders. This paper discusses on the sustainable neighbourhood elements specifically green elements application on the high rise low cost housing in Malaysia. Malaysia should have focused sustainable neighbourhood planning and design especially on the high rise low cost housing therefore the future generation can be benefited from this type development.

1. Sustainable Development

In recent years, as a result of developments in the globalisation era, the world has witnessed environmental, social, economic and urban planning changes. These changes have affected the living conditions of the population, natural resources, environment and economy [1]. However, the environmental principle requires that society protect its environmental resources. It assumes that ecosystems have limited regenerative capability and that the earth's land, air, water, and biodiversity will be compromised by irresponsible actions. Population growth combined with excessive consumption, pollution, and depletion of natural resources has pushed the limits of the earth's carrying capacity [2].

According to the Merriam-Webster Online Dictionary the meaning is, ‘capable of being sustained’, and ‘of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged’, and from the Collins English Dictionary, ‘(of economic development, energy sources, etc) capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage’[3]. While according to Ibrahim et al. 2015, the word sustainability derived from Latin word where it means to hold. Hence, sustainable development can be seen as a development that meets the needs of the present without compromising the ability of future generations to meet their needs.
Sustainable development requires a balance between economic growth, social expansion and environmental protection. In order to pursue sustainable development, the construction industry itself has to be sustainable and give emphasis to environmental matter in addition to economic gains and social obligations [6]. It also seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future. Far from requiring the cessation of economic growth, it recognizes that the problems of poverty and underdevelopment cannot be solved unless we have a new era of growth in which developing countries play a large role and reap large benefits [13]. During the past decade, the concept of sustainable development attracted significant attention from researchers, governments of different countries and international environmental organizations. The reason is clear, that is, the increased rate of environmental pollution and degradation [8].

2. Sustainable Development in Malaysia

Ever since the United Nations Conference on the Human Environment in 1972, Malaysia has been serious in dealing with environmental issues. In 1992, Malaysia showed its commitment on the Rio Summit after which the Malaysian National Environmental Policy was established. The policy became the basis for the country to give attention to environmental issues. The figure below represents Malaysia’s sequence of actions and involvements since 1972 [9].

![Figure 1.0: Malaysia’s Involvements in Sustainability Development Agenda since 1972 [9](image)](image)

Malaysia, like many countries across the world, is grappling with the challenge of balancing a growing population and demand, with a natural environment that is increasingly under stress. In a global context of increasing intensity and frequency of extreme weather events, adopting green growth has now become an imperative for Malaysia. It represents Malaysia’s commitment to renew and, indeed, increase its commitment to the environment and long-term sustainability [5].

Efforts to achieve green and sustainable development in Malaysia implemented at the state, agency and organization levels through various programs, such as Local Agenda 21, formulation of Low Carbon Cities : Framework and Assessment System’ by the Ministry of Energy, Green Technology and Water (KETTHA), Green Building Index’ and ‘Green Building Index For Township’ by GBI Sdn.
Bhd., Low Carbon Green City by Putrajaya Corporation, Low Carbon Society Blueprint for Iskandar Malaysia’ by IRDA, implementation of 3R program by the National Solid Waste Management Department, implementation of rainwater harvesting, 1Malaysia Green 1Malaysia Clean Campaign and My Beautiful Neighbourhood’ and my Beautiful Malaysia programs [10].

On 24th July 2009, the government of Malaysia unveiled the National Green Technology Policy (NGTP). This was a turning point in the history of initiatives on sustainable development in Malaysia where a policy focusing on technology, solution and road map to minimising impacts of development on the environment is formulated. The policy, built upon four pillars, namely energy, environment, economy and social aspects, underlines the following five main objectives [9]:-

i. Decreasing growth of energy consumption while enhancing economic development;
ii. Facilitating growth of the green technology industry and enhancing its contribution to the national economy;
iii. Increasing national capability and capacity for innovation in green technology development and enhancing Malaysia’s green technology competitiveness in the global arena;
iv. Ensuring sustainable development and conserving the environment for future generations; and
v. Enhancing public education and awareness of green technology and encouraging its widespread use.

The policy also outlines the five (5) strategic thrusts on which the road map for implementation will be concentrated. The success of this policy and its initiatives will be further measured through three sets of sectoral indicators, namely environment, economy and social indicators. One of the indicators under the social perspective is that there “should be more cities, townships and communities in Malaysia embracing green technology and which are classified as green townships” [9].

Whilst green cities or townships have varied definitions and characteristics, more often than not, they have resulted in a definition equivalent to a ‘sustainable city’. It makes more sense that a green city would offer long-term sustainability in a holistic manner. Thus the general definition of a green city can be considered to be the same as sustainable city where the characteristics are made up of the three tenets of sustainable development, namely environment, economy and the social perspective [9].

The key environmental issues including climate change, improving air quality, and protecting the reserve forest and natural resources become the key principle of sustainable development. Now Malaysia is one of the few countries which are on track to meet their targets for reducing greenhouse gas emissions. Concepts like green building, sustainable living indicators and environmental regulation have a central role to play in this process. They can provide long term protection and improves the environment, and deter actions that are damaging to the environment. But there need much attention on the neighbourhood scale as it impacted the society until the grass- root level [12].

3. Sustainable Neighbourhood

Neighborhoods are building blocks of our cities, and, from the early years of twentieth century, planners have experimented with programs for improving the quality of life in urban neighborhoods (Sharif & Murayama 2013). To improve neighbourhood sustainability, a consideration of their
buildings, public spaces, infrastructure, and cooperation between their parts is necessary (Reith & Orova 2015).

Green neighborhood can be defined as a neighborhood that is planned to be integrated with priority to the protection and use of natural resources, application of green technology, green practices and recycling, with the aim of preserving the environment, improving public health, safety and general welfare of city residents (JPBD 2012).

A growing interest in sustainable neighborhoods development has been evolved in the last few years (Abed et al. 2013). Neighbourhood concept was first introduced by Clarence Perry in 1910 to solve the problem of transportation in most of the urban centre and housing area. His concept evolved from Ebenezer Howard Garden City theory and social reformed aimed at growing urban population (Azmi & Karim 2012). Neighbourhood quality plays an important role for development, city officials, planners, realtors and researchers. In order for their construction projects to succeed, developers must understand the types of locations and amenities most valued by buyers (Ardeshiri et al. 2016).

The neighbourhood as a basic module in developing green cities becomes the front line to incorporate efforts in designs and activities to reduce greenhouse gas emissions while meeting a host of other community goals. As the quality of people’s homes is influenced by the spaces around them, there is an increasing recognition that well-designed, well-managed green spaces by and in between housing are crucial to making neighbourhoods liveable, and contribute to people’s quality of life (Rosly & Puzi 2010).

3.1 Sustainable Neighbourhood in Malaysia

Rapid urban development has contributed to the degradation of environmental quality especially the quality of water, air and noise. The unsustainable urban development has impact vastly in the urban neighbourhood infrastructures which lead to negative impact on environment and urban quality of living (Zakaria et al. 2012).

In December 2009, during the United Nations Conference on Climate Change Conference 2009 (COP15) in Copenhagen, Denmark, Malaysia has expressed its commitment to reduce carbon emissions up to 40% by 2020 compared to 2005. In order to achieve these objectives, various initiatives have been implemented immediately, especially by state and local authorities, developers and so on as the executor (JPBD 2012).

Principles of green neighbourhood set by (JPBD 2012) are as follows:
(i) emphasis on sustainability and conservation of the environment;
(ii) provide a community area that emphasizes the beauty and comfort of the population;
(iii) has the characteristics of affordable ie for people able to carry out economic activities, have a home, work and recreation in the neighborhood
(iv) creating a harmonious, prosperous, healthy society;
(v) creating local economic activity that is competitive;
(vi) create a highly accessible to the residents of connecting public transport and walking and cycling;
(vii) offers a variety of facilities and services for the daily activities of the population;
(viii) using renewable energy and energy efficiency;
(ix) provide green infrastructure such as rainwater harvesting and district cooling system; and
(x) designing human-scale neighborhood development as in the design of the streetscape, buildings, public spaces and so to ensure a green neighborhood can work well, comfortable and safe;

Federal Department of Town and Country Planning had formulated policies, plans, guidelines and assessment system for urban sustainability, namely [10]:
(i) Malaysian Urban Indicators Network (MURNInet – since 2002) and Malaysia Urban-Rural National Indicator Network for Sustainable Development (MURNInets – 2012). MURNInet and MURNInets were aimed to assess and improve the sustainability level of towns in Malaysia through the performance of a set of sustainable development indicators identified. It is
recognised nationally as one of the most important programs ever undertaken in the country to measure urban sustainability;
(ii) Planning Guidelines for Green Neighbourhood;
(iii) Implementation of Five Green Neighbourhood Initiatives;
(iv) Planning Guidelines for Livable Compact City;
(v) Planning Guidelines for ‘Ubiquitous City’; and
(vi) Planning Guidelines for the Elderly.

3.2 Green Building in Malaysia
The earth’s surface needs to retain some of the sun’s heat in order to regulate mean global temperatures, and naturally occurring gases in our atmosphere such as the ozone, water vapour, methane, nitrous oxide and carbon dioxide serve this purpose by trapping the required amount of heat from the sun so that conditions are conducive to the survival of all living creatures. Global temperature records show that since the start of the industrial age, the temperature of the earth has not risen so rapidly compared to any given 100-year block of recorded history, since the start of recorded history era to date. Carbon dating of the ice columns drilled out of the polar caps also gives support to this evidence by tracing history back to a few million years [9].

![Figure 3.0: The Greenhouse Effect](image)

The building is one of the key elements symbolize a green neighborhood. The main goal of the construction of buildings in the neighborhood are green buildings that meet green building features, namely (JPBD 2012),

1. use energy efficiently;
2. using recycled materials for the construction of buildings;
3. planning and management of sustainable building
4. using green technology innovation;
5. produce quality interior ambience and comfortable for the user; and
6. reflect the identity and culture of the local community.

The promotion of green strategy in housing development has significant contribution to the implementation of sustainable development principles (Zhang et al. 2011). It is believed that 21st century cities must be greener and smarter; hence, promoting sustainable issue for many developing countries. The concept of sustainability is a broad global issue comprising various interrelated studies about people, the environment and society (Ghaffarianhoseini et al. 2013).

4. Methodology
A self-administered survey was conducted to collect data regarding issues and problems of the low cost housing residents. The respondents eligible to participate in the survey were those who stay in the high-rise low cost housing. The data were collected by face-to-face interviews and distribution of questionnaires survey.
For the purpose of analysis of quantitative data collection through questionnaires survey, the Statistical Package for Social Science (SPSS) software version 20.0 was adopted. The objectives of using quantitative approach is to summaries statistically large information such as questionnaires responses feedback translated into figures that can be understood and interpreted.

5. Results and Findings
The research study was conducted in the state of Selangor in peninsular Malaysia. Census 2010 revealed that the total population of Malaysia was 28.3 million. Selangor state has a geographical area of 8,104 square kilometers and a population of 5,462,141 as the most populated state in Malaysia, census 2010 [4].

There were 700 sets of questionnaires distributed to all occupants in the high rise low cost housing in Selangor. However, there were only 510 sets of questionnaires had been returned to the researcher. The questionnaires survey contained two section. These were Demographic information and Sustainable Neighbourhood Elements (Green Elements).

5.1. Section A of the questionnaires: Demographic Information
Section A of the questionnaire survey provided data on the age, gender, marital status, race, education level, total household income levels and employment status of the respondents, Table 1.0 illustrate the demographic information of the respondents in Selangor.

| No | Item                          | Frequency | Percentage |
|----|-------------------------------|-----------|------------|
| 1. | Age (years):                  |           |            |
|    | 20-30                         | 75        | 14.7       |
|    | 31-40                         | 170       | 33.3       |
|    | 41-50                         | 170       | 33.3       |
|    | Above 50                      | 95        | 18.6       |
| 2. | Gender:                       |           |            |
|    | Female                        | 280       | 54.9       |
|    | Male                          | 230       | 45.1       |
| 3. | Marital status:               |           |            |
|    | Married                       | 387       | 75.9       |
|    | Single                        | 67        | 13.1       |
|    | Single mother                 | 39        | 7.6        |
|    | Single father                 | 17        | 3.3        |
| 4. | Race:                         |           |            |
|    | Malay                         | 199       | 39.0       |
|    | Indian                        | 153       | 30.0       |
|    | Chinese                       | 158       | 31.0       |
| 5. | Home ownership:               |           |            |
|    | Owner                         | 179       | 35.1       |
|    | Rent from landlord/owner      | 167       | 32.7       |
|    | Rent from State Government    | 164       | 32.2       |
| 6. | Length of occupancy:          |           |            |
|    | Below 1 year                  | 2         | 0.4        |
|    | 2-4 years                     | 72        | 14.1       |
|    | 5-7 years                     | 138       | 27.1       |
|    | 8-10 years                    | 150       | 29.4       |
|    | More than 10 years            | 148       | 29.0       |
|    | TOTAL                         | 510       | 100%       |
Based on the Table 1.0, 14.7% of the respondents were aged 20-30 years old. A further 33.3% of the respondents fell into 31-40 and 41-50 years old bracket respectively. Aged above 50 years old contributes to 18.6% of the total respondents. Majority respondents residing in low cost housing in Selangor are aged range between 31-50 years old. The results turned out to have similarities such as a study conducted by Sulaiman et al., 2016 that stated the highest of respondent age is 31 to 50 years old are commonly living in low-cost housing area in Malaysia.

There were slightly more female (54.9%) than male (45.1%) among the 510 respondents involved. This might be because the distribution of questionnaires took place during weekday working hours; many male dwellers would have been at work and unable to respond to the questionnaires. Based on the Table 2.0, it is stated that 75.9% of the respondents are married; 13.1% of the respondents are single; 7.6% of the respondents are single mother; and 3.3% of the respondents are single father. As for ethnicity, there were Malay (39%), Chinese (31%) and Indian (30%). The proportion of race is vital to know to make sure that there is multicultural race exist in the high rise low cost housing area community.

It is also showed that 35.1% of the respondents owned their house during the case study period. Another 64.9% of the respondents rented their house, either rented from landlord or the state government. People usually rented a house as they feel convenient to travel to their working place and can save more time. They also can avoid traffic congestion during the peak hours.

There were 29.0% of the respondents had residency lengths of more than 10 years, 29.0% had habitation periods of 8–10 years, 27.1% had habitation periods of 5–7 years, 14.1% had a length of residency of 2–4 years and a further of 0.4% had lived in the low cost house below than a year. This high level prevalence of occupancy for periods over four years as described indicates that the respondents were well-placed to convey their experiences of living in the high rise low cost housing neighbourhoods. These demographic results have; thus, confirmed that the respondents in this case study are reasonably representative of a low cost housing in Malaysia. The duration of occupancy equal to five years or more, means that these respondents have, potentially, developed a sense of community and neighbourliness in the high rise low cost housing in Malaysia.

5.2. Sustainable Neighbourhood Elements (Green Elements)
Section B of the questionnaire requires the respondents to rate their level of agreement regarding proposed green elements in the high rise low cost housing. The respondents were need to rate their agreement level based on five numerical Likert-scale; “1” (Strongly agree), “2” (Agree), “3” (Neutral), “4” (Disagree), and “5” (Strongly disagree). Table 2.0 illustrates the occupants’ agreement level towards the listed elements.

Table 2.0: Percentage of ‘strongly agree and agree’ level on the high rise low cost housing green elements

| No | Green elements          | Strongly agree | Agree | Strongly Agree & Agree | Percentage |
|----|-------------------------|----------------|-------|-------------------------|------------|
| 1  | Shady trees             | 344            | 123   | 467                     | 91.6%      |
| 2  | Diversifying landscaping | 334            | 86    | 420                     | 82.4%      |
| 3  | Preserved greenery      | 165            | 166   | 331                     | 64.9%      |
| 4  | Green network           | 188            | 131   | 319                     | 62.5%      |
| 5  | Garden                  | 266            | 43    | 309                     | 60.6%      |
| 6  | Green roof              | 186            | 120   | 306                     | 60.0%      |
| 7  | Building orientation    | 195            | 111   | 306                     | 60.0%      |
| 8  | Community agriculture   | 177            | 122   | 299                     | 58.6%      |
| 9  | Tall trees              | 89             | 97    | 186                     | 36.5%      |
| 10 | Natural ponds           | 71             | 114   | 185                     | 36.3%      |
As shown in Table 2.0 above, 8 out of 10 elements were having more than 50% respondents that strongly agree and agree to the sustainable green element. Top of the list is provision of shaded trees at 91.6%. Diversifying landscape followed next with 82.4% as this gives no only the comfort of having greeneries but provide the aesthetic look to the neighbourhood area. 64.9% respondents both strongly agree and agree that natural greeneries at the low cost housing area must be preserved. Secondary or planted greeneries may take time to grow and mature. Availability of garden is agreed and strongly agreed by 60.6% of respondents. Subsequently, 60.0% respondents in support of garden roof. The next green element is related to construction of the building orientating to the direction of the sun. This element is agreed by 60.0% of the respondents. Tall trees and natural ponds both recorded 36.5% and 36.3% respectively.

Table 3.0: Percentage of ‘strongly disagree and disagree’ level on the high rise low cost housing green elements

| No | Green elements            | Strongly disagree | Disagree | Strongly disagree & disagree | Percentage |
|----|---------------------------|-------------------|----------|------------------------------|------------|
| 1  | Natural ponds             | 14                | 156      | 170                          | 33.3%      |
| 2  | Community agriculture     | 53                | 83       | 136                          | 26.7%      |
| 3  | Tall trees                | 33                | 80       | 113                          | 22.2%      |
| 4  | Garden                    | 71                | 38       | 109                          | 21.4%      |
| 5  | Building orientation      | 38                | 68       | 106                          | 20.8%      |
| 6  | Green network             | 33                | 32       | 65                           | 12.7%      |
| 7  | Preserved greenery        | 13                | 48       | 61                           | 12.0%      |
| 8  | Diversifying landscaping  | 17                | 31       | 48                           | 9.4%       |
| 9  | Green roof                | 17                | 24       | 41                           | 8.0%       |
| 10 | Shady trees               | 20                | 3        | 23                           | 4.5%       |

Green elements are often related to the environmental factor. It is shown in the above Table 3.0 that respondents’ response to disagree or strongly disagree with green element is low. It indicates that respondents agree that sustainable green elements are important to be implemented at their low cost housing area. Nonetheless there are 33.3% respondents disagree or strongly disagree with the provision of natural pond at their housing area. Natural pond acts as climate control to its surrounding area. Community agriculture element is ranked second at 26.7% and followed by tall trees element with 22.2% respondents either disagree or strongly disagree. Allocation of an area within or neighboring to the low cost area for the purpose of small agricultural activities also serves as a common socializing place for the residents. Besides, residents may sell the crops for additional income. Another 21.4% respondents disagree with the provision of garden. Merely 20.8% respondents disagree with the building orientation as they do not foresee any significant impact on their daily lives. Three elements having less than 10% respondents that disagree and strong disagree respectively are diversifying landscaping (9.4%), green roof (8.0%) and shady trees (4.5%). These elements are regarded as one of the important green elements for implementation at low cost housing area. The second last green elements having only 8.0% respondents disagree that green roof is to be made available at their low cost house. This could be due to the understanding on the actual meaning and the effect of implementation of green roof. Only 4.5% respondents disagree that shady trees must be provided at low cost housing area.

Table 4.0: Percentage of ‘neutral’ level on the high rise low cost housing green elements

| No | Green elements | Neutral | Percentage |
|----|----------------|---------|------------|
|    |                |         |            |


|   | Sustainable Green Element       | Percentage |
|---|---------------------------------|------------|
| 1 | Tall trees                      | 41.4%      |
| 2 | Green roof                      | 32.0%      |
| 3 | Natural ponds                   | 30.4%      |
| 4 | Green network                   | 24.7%      |
| 5 | Preserved greenery              | 23.1%      |
| 6 | Building orientation            | 19.2%      |
| 7 | Garden                          | 18.0%      |
| 8 | Community agriculture           | 14.7%      |
| 9 | Diversifying landscaping        | 8.2%       |
|10 | Shady trees                     | 3.9%       |

Table 4.0 above shows percentage of respondents in neutral position, neither they agree nor disagree with sustainable green elements. Top three elements are tall trees (41.4%), green roof (32.0%) and natural ponds (30.4%). Respondents approach these elements in view of associated risk it carry or lack understanding on the benefits of these elements.

Chart 1.0: Comparison of agreement level on the sustainable green elements

Chart 1.0 above shows the comparison of respondents that are strongly agree and agree, strongly disagree and disagree, and neutral on the sustainable green elements at the high rise low cost housing area. In general, respondents strongly agree and agree with all green elements except for tall trees and natural pond which respondents for strongly disagree, disagree and neutral surpasses those who strongly agree and agree. It is understood that both of these green elements carry risks for example parents are concern with the presence of natural pond within the vicinity of their housing area which may lead to issues of children playing in the pond or even drowning. Nonetheless, from the sustainable green element perspective, these elements are necessary to be made available. Shady trees are more preferred by respondents as opposed to tall trees as there were many cases of tall trees uprooted due to strong wind during bad weather. It is apparent that safety factor plays important role from the mindset of respondents as opposed to the benefits brought by these essential green elements.

6. Discussion
Globalization era has reshaped the needs for the provision of sustainable development in order to cater for the demand in providing better living conditions, preserving the environment and natural resources and at the same time continue on with the development. Malaysia is not left behind in terms of efforts
and commitment in dealing with environmental issues. Policies, guidelines and targets had been set by public and private sector to ensure environmental issues is addressed in every development phase of construction.

The research focuses on implementation of sustainable green elements at high rise low cost housing is Selangor. It is apparent from the result that majority low cost dwellers agree that sustainable green element must be implemented at their low cost housing area. This shows that the level of understanding on the requirement and the needs for such elements to be present is acceptably high. Other stakeholders such as the developers and local authorities are at the position to put in place such environmental elements. The cost of implementation of sustainable green elements at the high end buildings might be acceptable but to implement such initiatives at low cost housing is still a challenge due to the associated cost to provide for such facilities. However this must not be the reason which leads to lack of implementation albeit requirements and standards set by the Government. Nonetheless, some of the green element can also be provided by the dwellers for example by planting shaded tress and creating specific area for a garden and landscaping.

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