THE SUSTAINABILITY REALITY OF SUBDIVISION DESIGNS IN ISKANDAR MALAYSIA

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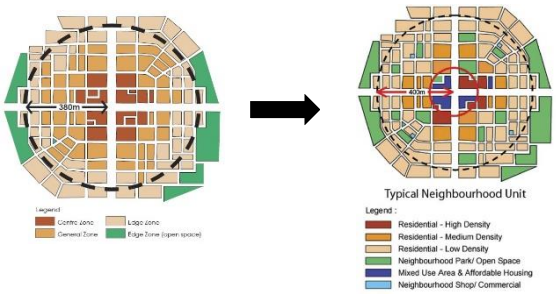
ABSTRACT At the Conference of Parties 15 (COP15) in Copenhagen, Malaysia has proposed a voluntary carbon emission reduction of 40 percent in terms of emissions intensity of GDP (gross domestic product) by the year 2020 compared to the 2005 level. In spite of all the efforts to promote sustainable development in Malaysia, limited research has been carried out about the sustainability reality of subdivision design especially in Iskandar Malaysia. Thus, this study intends to explore the distribution of densities within housing subdivisions in Iskandar Malaysia. Selected number of housing subdivisions from the total of about 400 in Iskandar Malaysia were studied based on the secondary data that included the type of land uses and road network obtained from Iskandar Regional Development Authority (IRDA) office. Residential density analysis was conducted by using ArcGIS10 software to see the density pattern in the subdivisions. The analysis indicated that the trend of designing subdivision in Iskandar Malaysia was going opposite to what was thought of as ideal. Not all housing densities were distributed according to what is expected in theory such as Transit Oriented Development (TOD) which locates higher-density residential at the center of subdivision boundary. What happened in most subdivisions, higher-density residential was located at the fringe whereas low-density residential was located at the center. As high-density area was located at the fringe of the subdivision, there would be more carbon emitted to the atmosphere because more residents need to travel longer distance for their daily routines. Therefore, as Iskandar Malaysia is turning into a region with more and more neighbourhoods to cater for approximately 3 million populations by the year of 2025, a relook at its neighbourhood design can certainly help its vision of becoming a low carbon city.

1. INTRODUCTION

At the Conference of Parties 15 (COP 15) in Copenhagen, our Prime Minister has proposed a voluntary carbon emission reduction of 40 percent in terms of emissions intensity of GDP (gross domestic product) by the year 2020 compared to 2005 levels (Izma, 2010). To support this commitment, Iskandar Malaysia is committed with National Key Economics Areas (NKEA) programmes, national projects which are expected to align with the Clean Development Mechanism (CDM) of the Kyoto Protocol by the United Nations Framework Convention on Climate Change.

2. LITERATURE REVIEW

Despite from all the sustainability approaches being implemented to promote sustainable development in Malaysia, not much research has been carried out in Malaysia about how distribution of housing densities affect travel-induced carbon emission. in other countries, research on how neighbourhood characteristic/urban form can help reduce carbon emission (i.e. VMT) has been conducted widely. Based on research conducted by Ewing and Cervero (2001) regarding the importance of built environment in explaining individuals' travel behaviour, built environment is found to be a significant predictor of vehicle miles travels. Like what have been stated in South Johor Economic Region Comprehensive Development Plan 2006-2025 (CDP 2006-2025), the neighbourhood structure is divided into centre zone, general zone and edge zone. The centre zone which is the nodes are preferably to locate mix-used and high density residential area whereas the medium density residential and low density residential are located surround the core area. The nodes area are not necessarily mix-used, it can be any public focused area such as commercials. Figure 2.1 showed neighbourhood's structure that supposed to be implemented in a neighbourhood.



Source:SJER CDP 2025

Figure 2.1: Neighbourhood's Structure

3. MATERIALS AND METHOD

For this research, the study area involves over three hundred subdivisions in Iskandar Malaysia, Johor. These subdivisions are located within Iskandar Malaysia with irregular spatial shapes and land areas between 10 acres (minimum) and 3000 acres (maximum). Secondary data was the most required in this research and collected from various local authorities since Iskandar Malaysia is under the jurisdiction of five local authorities. Those local authorities are Johor Bahru Tengah Municipal Council (MPJBT), Johor Bahru Municipal Council (MBJB), Pasir Gudang Municipal Council (MPPG), Kulai Municipal Council (MPKu) and Pontian District Council (MDP). These neighbourhoods were consisting of single-family housing, multifamily housing, and unplanned housing. Since this research was to explore the trend of the distribution of housing densities, unplanned housing that mostly covered by new villages, traditional villages, Orang asli settlements, Felda and squatters was excluded from this research. This research was conducted quantitatively via the calculation of urban form indexes, which is residential density using GIS technique named data management tools, spatial joins, and Hawths tools. During the GIS analysis, researcher encountered some missing data which were the total number of housing units for multifamily housing. In order to obtain the data, a visit to planning department in five local authorities was made. For the purpose of this research, GIS database that obtained from IRDA were updated and the values of missing data were inserted with the required information that were needed for the analysis. The data obtained from these five local authorities helped in finding the residential density in each subdivision involved. Besides, the analysis of residential density of this research was conducted by using ArcGis software and transformed it into 3-Dimensional product by using ArcScene software.

4. RESULT AND DISCUSSION

After population density and residential analysis was conducted, the results indicated that most of subdivision design in Iskandar Malaysia did not meet the expectation of design standards as being introduced in subdivision design guidelines or policies. It turned out the design was unsustainable and encouraging more carbon emission to be released. According to the design guideline by Federal Department of Town and Country Planning Peninsular Malaysia (JPBD) in 2011, they have come out with certain number of housing units for high density, medium density and low density residential and also for townhouses. This guideline should be parallel with the design concept or theory in order to create a sustainable neighbourhood.

Table 3.1: Residential Densities in Peninsular Malaysia.

Residential Densities	Number of Units/acre
High Density Residential (terrace)	20
High Density Residential (high-rise)	30
Medium Density Residential	12
Low Density Residential	6
Townhouses	24

Source: JPBD Peninsular Malaysia (2011)

As Iskandar Malaysia is turning into region with more and more subdivisions to cater approximately 3 million populations by the year of 2025, it was expected the city of Johor Bahru will be denser than other districts. However, not all housing densities were distributed accordingly to our expected theory such as Transit Oriented Development (TOD) which locates high-density residential at the center of subdivision boundary. As what happen in most Iskandar Malaysia's subdivisions nowadays, high-density residential is located at the fringe of it whereas low-density residential is located at the center which is opposite from what TOD concept should be implemented.

The theory in implementing TODs are basically building residential areas around major transportation nodes; most frequently describe as rail stations, but primary access between other public transportation such as buses, highways, and park-and-ride lots as well (Shrivastava and Sharma, 2011). In this context of research, the nodes are referring to commercial areas since Iskandar Malaysia does not own an established public transportation yet. Density is one of the significant urban form elements and proven by numerous research that it gives influence on neighbourhood sustainability (W.M.Rani, 2014). By referring to a research by W.M. Rani (2014), she indicated that high density in urban neighbourhood promoted high accessibility to commercial facilities. This can support the claim that high density residential can encourage people to walk more and less travel by private vehicles. Iskandar Malaysia's housing subdivisions can improve its sustainability by promoting high density residentials preferably at the centre as what transit neighbourhood is. Figure 4.1, Figure 4.2 and Figure 4.3 showed the examples of residential densities per acre of Iskandar Malaysia's subdivisions that were designed against the concept of TOD, eventually would increase the carbon emission to the atmosphere.

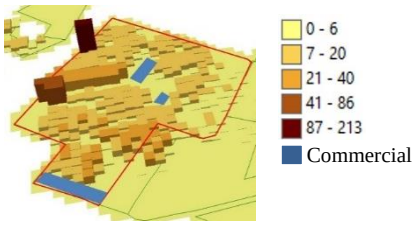


Figure 4.1: Bandar Baru Uda neighbourhood

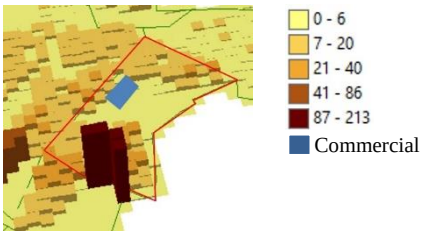


Figure 4.2: Taman Desa Harmoni neighbourhood

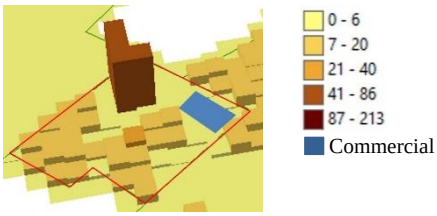


Figure 4.3: Taman Melawati neighbourhood

Table 3.2: Residential Densities in Iskandar Malaysia.

Neighbourhood	Year	Number of Units/acre
Bandar Baru Uda	1980s	11
Taman Desa Harmoni	1990s	13
Taman Melawati	2000s	13

Showed that the trend of residential densities above, it implied that the high density residentials were placed at the fringe of subdivision's boundary. The location of commercials showed that it was unevenly distributed and located far from high density residential and low density residential as well. This trend of neighbourhood design not only increasing the travel by private automobiles but resulting in high carbon emission as Johor Bahru is expected to experience more than 800 car ownership per 1,000 populations in 2025 (CDP 2006-2025). Other than that, the center zone should be accessible not only high density residential but to low density residential as well. The aim of transit neighbourhood is that to promote walkable communities and with good accessibility to the core area, people would tend to walk rather than hop in their cars to move. Besides, this is one of the factors why it is preferable to locate the commercial areas at the center zone or core zone; so that either high density or low density residential could decrease their automobiles consumption.

Furthermore, the reality of Iskandar Malaysia's subdivision is that high density residential areas were located at the fringe of the subdivision's boundary, but on the contrary low density residential was located at the center of neighbourhood boundary. This was clearly showed that the subdivision designs in Iskandar Malaysia still did not change from early 1980s until 2008 meaning that sustainability approach did not being well implemented. According to Litman (2015), density could affect travel activities through high accessibility meaning that by increasing densities could reduce travel distance to certain destinations and also increased the amount of destinations that could be accessed by walking and cycling. Hence, transit neighbourhood is one of the best approach to address carbon emission reduction because it encourages walkable communities by increasing its accessibility to commercial areas; that also offers energy efficiency which consume less gallon of fuels (Brownstone and Golob, 2009).

The reasons behind this problem still remain unclear whether town planners were seeking profit by focussing on low-density housing development or any reasons that they tend to build houses that way. In addition, the other reasons might be the tendency to focus more on aesthetical aspect such as loop, curvilinear or other aesthetical designs rather than creating a functional subdivision layout. For instance, cul-de-sac neighbourhood might represent an advance in design efficiency for automobile movement but unfortunately it is not preferable to design such way for the sake of pedestrian and transit movement. These cul-de-sacs made pedestrians also often have to walk in long distances because the existing through-paths were cut off by cul-de-sacs, and also transit vehicle could not enter the area to pick up passengers (Cervero and Gorham, 1995). So, because they did not have other choice, driving seemed more efficient that could bring them to any destinations with less travel time.

In addition, most research in subdivision's designs and travel behaviour agreed that traditional neighbourhood which create access to services and facilities tend to have less consumption of private automobiles than suburban neighbourhood which being designed with inefficient transport modes (Bhat and Guo, 2007; Du et. al, 2015; Cervero and Garham, 1995; Anderson, Kanaroglou and Miller, 1996; Dieleman, Dijst and Burghouwt; 2002). Inefficient transport modes create difficulties in accessing certain destination whether through public transit, walking or cycling. Resulting from that, people would tend to own a car as their main mode of transportation.

5. CONCLUSION

Thus, we can see the distribution of housing densities in Iskandar Malaysia is varied for each subdivision and most of it locate the high density residentials at the fringe of subdivisions rather than the center. This will eventually increase the carbon emission as residents would find difficult to move from one place to another. As Iskandar Malaysia is turning into region with more and more neighbourhoods to cater approximately 3 million populations by the year of 2025, it is becoming a concern to planners that neighbourhood designs nowadays are focusing on aesthetic design rather than efficient design

(Majid et. al, 2014). Eventually, it encourages residents to travel more by cars. Therefore, steps need to be taken so that the future neighbourhoods' development will take into consideration the impact of these developments to carbon emissions. As Malaysia is about to achieve its target of reducing carbon emission by 40 percent, by studying back on neighbourhood designs is seen to give change to current amount of carbon emission.

Lastly, transport policy should involve in the direction of change in land uses not only in terms of physical aspect but most importantly how they cater the environmental effects due to the increasing of carbon emission. Other than that, policymakers should be responsible to relook at the spatial patterns in a neighbourhood (Nunns, 2014) while looking for opportunities to improve the existing neighbourhood design in the future for a better living.

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