



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research  
Vol. 12, Issue, 04, pp.11086-11092, April, 2020

DOI: <https://doi.org/10.24941/ijcr.38361.04.2020>

INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

## RESEARCH ARTICLE

### EVALUATION OF SITE LAYOUT USING SUSTAINABLE NEIGHBORHOOD PRINCIPLE: CASE STUDIES IN JOHOR BAHRU, JOHOR MALAYSIA

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#### ARTICLE INFO

##### Article History:

Received 28<sup>th</sup> January, 2020

Received in revised form

05<sup>th</sup> February, 2020

Accepted 28<sup>th</sup> March, 2020

Published online 30<sup>th</sup> April, 2020

##### Key Words:

Site layout, Evaluation,  
Mutiara Rini,  
Taman Sri Pulai, Johor Malaysia.

#### ABSTRACT

A good residential layout is a sustainable neighborhood layout. This means that a good neighborhood is a community which is developed in such a way that it is well balanced between the environment, economic and social. In this research, the existing layout of two selected sites Mutiara Rini and Taman Sri Pulai in Johor Bahru Johor Malaysia have been discussed and compared with the principles of the sustainable neighborhood as suggested by the UN-Habitat. The main objective of this research is to discuss the good and bad site layouts in selected subject areas. To reach the aim of the research, different housing estates in Johor Bahru and Skudai area were taken into consideration as the subject sites for this project. However, Mutiara Rini and Taman Sri Pulai were selected as subject sites. Desk study about the general profile of Mutiara Rini and Taman Sri Pulai has been done before the site visit. Following this, field trip to Mutiara Rini and Taman Sri Pulai was carried out. Both sites have been observed to evaluate their site layout. However, the finding of this research indicates that the first subject site which is Mutiara Rini has good accessibility but poor public transport system. Furthermore, streets in Mutiara Rini are not safe for pedestrians and cyclists. However, there are limited mixed land-use and mixed-use buildings. However, majority of the land or building in Mutiara Rini is only limited to one usage, which is for residential purposes. The public spaces in Mutiara Rini are not fully connected and integrated. On the other hand, in contrast to Mutiara Rini, Taman Sri Pulai has good accessibility and public transport system. In Term of housing, Terraced houses are the only type of housing in Taman Sri Pulai. At the same time, most of them are single-story which is leading to low-density areas. Furthermore, in term of public amenities, adequate public facilities and amenities are neighboring Taman Sri Pulai.

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Citation: Maqsood Rezayee, Rahmatullah Ibrahimy and Gabriel Hoh Teck Ling. 2020. "Evaluation of Site Layout Using Sustainable Neighborhood Principle: Case Studies in Johor Bahru, Johor Malaysia", *International Journal of Current Research*, 12, (04), 11086-11092.

## INTRODUCTION

A good residential layout is a sustainable neighborhood layout. This means that a good neighborhood is a community which is developed in such a way that it is well balanced between the environment, economic and social (Churchill, 1999). In paper, the existing layout of two selected sites Mutiara Rini and Taman Sri Pulai in Johor Bahru Johor Malaysia have been discussed and compared with the principles of the sustainable neighborhood as suggested by the UN-Habitat, 2014. The five suggested principles include mix land use, adequate space for streets and an efficient street network, high density, social mix, limited land use specialization.

Figure 1. Therefore, the main objective of the project is to discuss the good and bad site layouts. As well as to identify the key elements in a sustainable neighborhood in terms of its physical, social, economic and environmental. With this, it is possible to learn about the good practices in developing of the sustainable neighborhood.



Source: UN-Habitat 2014

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Figure 1. Principles of sustainable neighborhood

## METHODOLOGY

Different housing estates in Johor Bahru and Skudai area were taken into consideration as the subject sites for this project. However, Mutiara Rini and Taman Sri Pulai were selected as subject sites. These two subject sites emerge at different periods, thus, reflect different planning styles in terms of the types of properties, layout, and design. Desk study about the general profile of Mutiara Rini and Taman Sri Pulai has been done before the site visit. The land-use plan for both sites was also obtained from the local authority Majlis Perbandaran Johor Bahru Tengah. Following this, field trip to Mutiara Rini and Taman Sri Pulai was carried out. Both sites have been observed to evaluate their good and bad site layout. Following that the results are recorded via writing and pictures Figure 2.

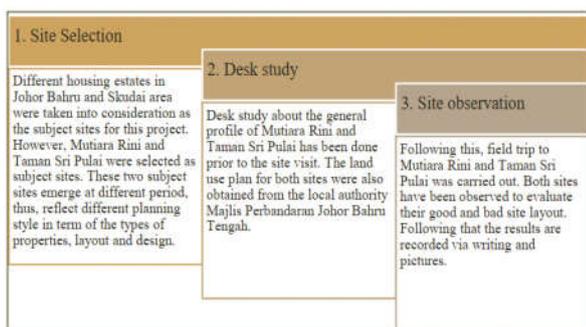
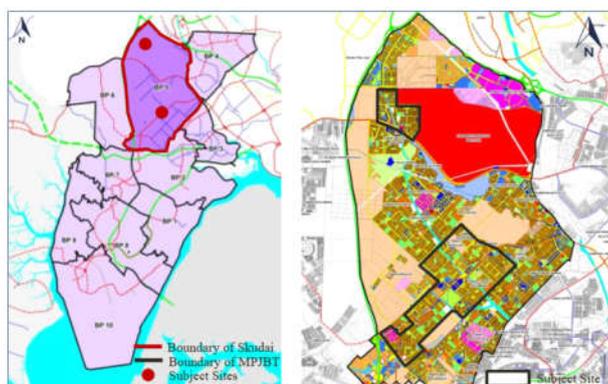


Figure 2. Research Methodology

### Study Areas

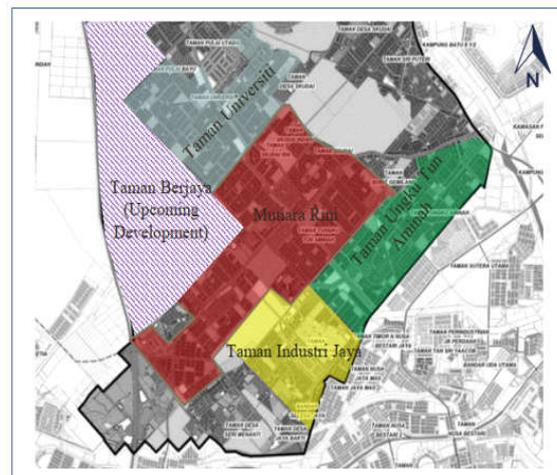
Mutiara Rini and Taman Sri Pulai are located in Skudai, under Majlis Perbandaran Johor Bahru Tengah as shown in Figure 3.



Sources: Adapted from World Weather Online, (2019)

Figure 3. Boundary of Skudai and MPJBT (left), and Location of Subject Sites in Skudai (right)

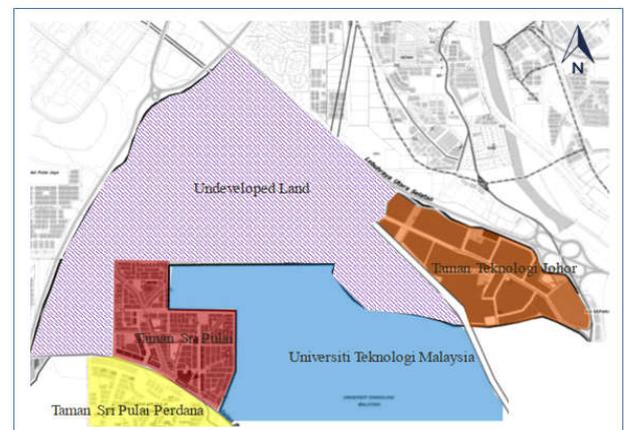
Mutiara Rini is a township sprawls over 1,438 acres of a former oil palm plantation. It is located within the Iskandar Malaysia Economic Corridor, 13km north-west from Johor Bahru City Centre. Furthermore, Mutiara Rini is easily accessible via Skudai Highway and the Second Link Expressway. Mutiara Rini is surrounded by established housing estates namely Taman Universiti, Taman Ungku Tun Aminah, Taman Industri Jaya, and the upcoming Taman Berjaya as shown in Figure 4. This benefits Mutiara Rini as it gets to enjoy plenty of basic amenities from these developments. Examples of basic amenities include malls, public schools, and bus terminal. Launched in 1996, Mutiara Rini has since developed and handed over more than 9,000 houses (<http://www.mutiara-rini.com.my/>).



Sources: <http://www.mutiara-rini.com.my/>

Figure 4. Neighborhood Surrounding Mutiara Rini

Taman Sri Pulai is a neighborhood sprawls over 411 acres of land. It is located within the Iskandar Malaysia Economic Corridor, 20km north-west from Johor Bahru City Centre. It is easily accessible via Skudai-Pontian Highway and the Second Link Expressway. As of today, there is a total of 3,785 units of houses in Taman Sri Pulai. This translates to 9.2 houses per acres. There is only one township neighboring Taman Sri Pulai, which is Taman Sri Pulai Perdana (Figure 5). However, it is located right next to Universiti Teknologi Malaysia, making students one of the largest residents group in Taman Sri Pulai.



Sources: adapted from Google Map

Figure 5. Neighborhood Surrounding Taman Sri Pulai

### Result and Finding

This section of research presents the finding and results which have been obtained through site observation. The result and finding present the existing situation of site layouts in subject sites. Furthermore, the result and finding evaluate their good and bad layout.

**Evaluation of Existing Site Layout in Mutiara Rini:** This section of research presents the site layout situation in the first subject site Mutiara Rini. As well as evaluates its site layout.

**Good Accessibility but Poor Public Transport System:** Mutiara Rini is easily accessible via Jalan Skudai-Gelang Patah. Furthermore, Lebuhraya Skudai Pontian, Jalan Bertingkat Skudai and the Second Link Expressway are other

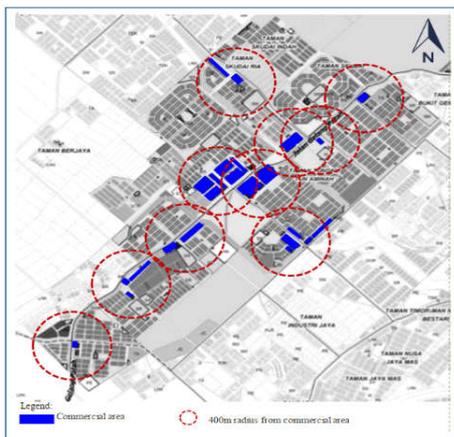
major highways that serving this housing estate. Other than that, there is a bus terminal located in the neighboring township – Taman Ungku Tun Aminah, which is approximately 4km east of Mutiara Rini. The bus terminal offers bus to major cities in Peninsular Malaysia, such as Kuala Lumpur, Ipoh, and Penang Island. Nevertheless, there is very limited public transport passing through Mutiara Rini itself. For instance, there are currently two buses serving Mutiara Rini which are Muafakat Johor Bus Service P202 and Bus no. IM23. In addition to that, this research has found that the interval between each bus is very long, up to half an hour during peak hour and 1 hour off-peak. Figure 6 shows route information for bus no. IM23.



Source: Field Survey (2020)

Figure 6. Route information for bus no. IM23

**Streets Are Not Pedestrian and Cyclist Friendly:** According to Change Lab Solution (2013) three of the important characteristics for a walkable street are, safety, convenient, and comfortable. To be convenient, residents should be able to get to important nodes such as the commercial area, parks and public transits by foot (UN-Habitat, 2014). In this research has been found that most of the houses are located within proximity to parks and open spaces. However, the distance between some houses and the commercial is as far as 1.5km (Figure 7). This signifies that residents will have to travel with their private vehicles even for their daily groceries.



Sources: Adapted from Majlis Perbandaran Johor Bahru Tengah

Figure 7. Walkability from Housing to Commercial Area Throughout Mutiara Rini

In this research has been found that most of the houses are located within proximity to parks and open spaces. However, the distance between some houses and the commercial is as far as 1.5km (Figure 7). This signifies that residents will have to travel with their private vehicles even for their daily groceries. Streets in Mutiara Rini are not safe for pedestrians and cyclists. This is because only part of the development was equipped

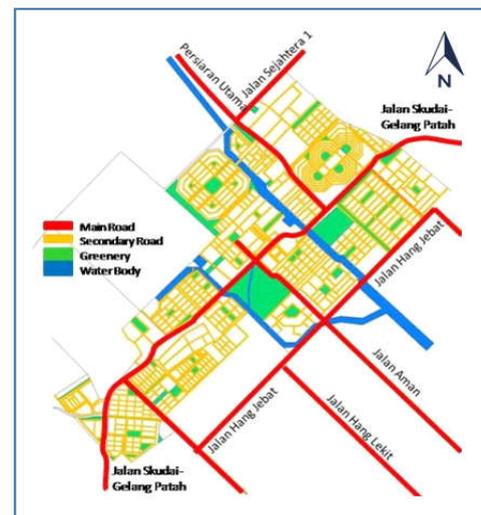
with pedestrian walkway. Most of the streets do not have separation between bike lanes, pedestrian walkways, roads for private vehicle or bus lane. At the same time, there are no overhead bridges or zebra crossing in Mutiara Rini, making it dangerous for pedestrian to cross the busy streets. The streets in Mutiara Rini is not comfortable in terms of both physical and mental. For instance, unlike the earlier phases of Mutiara Rini, there are very few trees planted along the streets especially at the newer developments, making it hot and uncomfortable to walk or cycle. Figure 8.



Source: Field Survey (2019)

Figure 8. Streets in Mutiara Rini without any features for pedestrian and cyclist

**Flexible and Efficient Street Layout:** Mutiara Rini has appropriate number of secondary routes which helps to create a choice of pathways and form development blocks. Primary streets leading to the Jalan Gelang Patah is further supported by community streets and minor streets. Mutiara Rini is using grid street layout. This grid street pattern is straight and there is no change in direction, making the street monotonous and boring Figure 9.



Source: Adapted Majlis Perbandaran Johor Bahru Tengah

Figure 9. Different Hierarchy of Streets in Mutiara Rini

**Limited Mixed Land-use and Mixed-use Buildings:** There are different land uses in Mutiara Rini including the commercial area, public spaces, residential area, and industrial area. However, these land uses are not fully integrated and very much isolated from each other. For example, most of the commercial area is only concentrated at the center of the neighborhood. It would be good as it allows residents from every part of the neighborhood to have the same accessibility to the services. On the other hand, as the neighborhood is very

large, residents at the edge of the neighborhood must travel approximately 1.5km to the center. This is unsustainable as it discourages pedestrian and cyclist traffic. Mixed-use buildings, such as the mix of retail and office spaces are found in the commercial area of Mutiara Rini. However, majority of the land or building in Mutiara Rini is only limited to one usage, which is for residential purposes.

**Different Types of Houses Provided for Different Social Class:** Social mixing is the third element of a sustainable neighborhood. It helps to promote more equitable city. In a social-mixed-neighborhood, there is a mix of people of different age groups, ethnicity and social classes living together (Brower, 1996). To do this, the provision of houses in different price ranges, unit size, and housing types should be given to accommodate people of different incomes. Mutiara Rini provides different types of housing which have different price range to cater to buyer from various social class. For instance, types of houses found in Mutiara Rini include bungalow, cluster house, terraced house, and condominiums. Nevertheless, double-story terraced house is the most abundant housing type in Mutiara Rini. In terms of affordable housing, there are 20 blocks of walk-up apartments towards the east of Mutiara Rini. The government has made compulsory to the developer to provide affordable home with a capped price to cater to the lower-income group. Figure 10.



Source: Field Survey (2019)

Figure 10. Different Types of Houses Provided in Mutiara Rini

**Plenty but Unintegrated Public Space:** Public spaces contribute to the quality of life. It encourages healthy lifestyle and helps to create a sense of place (City and County of Swansea, 2014). In Mutiara Rini, parks with different sizes are provided throughout the neighborhood. Besides, there are a 62 acres Mutiara Rini Urban Forest, and other community spaces such as the international standard cricket Pitch. Different activities and sports can be carried out in these public spaces. Nevertheless, the public spaces in Mutiara Rini are not fully connected and integrated. There is no trail system, sidewalks, pedestrian links or green streets joining up all these areas. Figure 11.

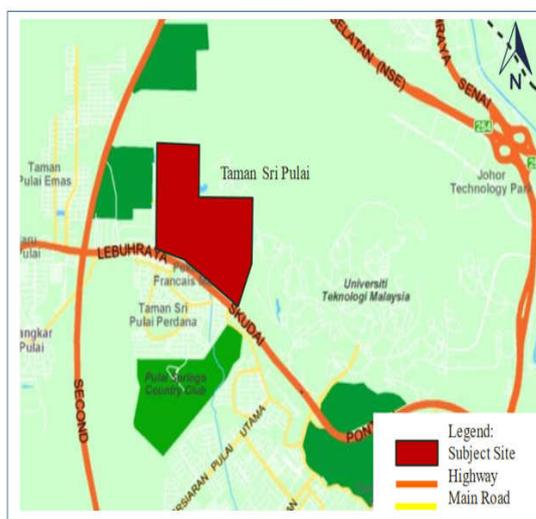


Source: Field Survey (2020)

Figure 11: Schools, Parks and Other Community Spaces in Mutiara Rini

**Evaluation of Existing Site Layout in Taman Sri Pulai:** This section of the research presents the site layout situation in the first subject site Taman Sri Pulai. As well as evaluates its site layout.

**Good Accessibility and Public Transport System:** Taman Sri Pulai has good accessibility via the main highway such as the Skudai-Pontian highway. Driver access via this highway can choose to enter Taman Sri Pulai via two entrances – Jalan Sri Pulai or Teratai. Besides, the third entrance of Universiti Teknologi Malaysia is located at Taman Sri Pulai, making it easily accessible by the students. Figure 12. Even there are just 3,785 households in Taman Sri Pulai, but three buses serving the area. This includes Causeway Link (Handal City) No. 505, and Kembara City No. 606. These two bus lines connect JB Sentral to Pulau Indah and pass by Danga Bay, Tampoi, Skudai, Kangar Pulai and Pulau Indah on the way. Besides, there is also a loop service passing by U Mall, Taman Sri Pulai Perdana and Taman Sri Pulai provided by Maju (P201).



Source: Adapted from Google Map

Figure 12: Major Highway and Main Roads Surrounding Taman Sri Pulai

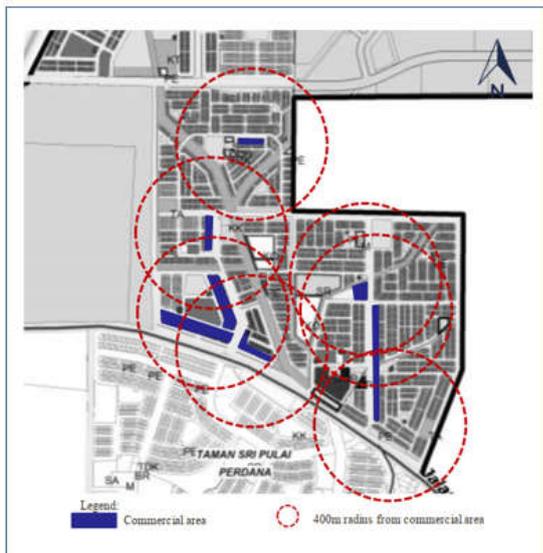
**Streets Are Pedestrian-Friendly but Do Not Encourage Cycling:** Most parts of Taman Sri Pulai, especially the main roads and roads in major commercial area are equipped with pedestrian walkways shaded by trees. Fences have been installed in recent years to ensure the safety of pedestrian. Direct connections to adjacent neighborhoods have been done through providing proper and safe pedestrian cross to those who walk. For instance, there is an overhead bridge cutting across Skudai Pontian highway, linking Taman Sri Pulai to the commercial area of Taman Sri Pulai Perdana. Figure 13.



Source: Field Survey (2020)

Figure 13: Overhead bridge linking Taman Sri Pulai and Taman Sri Pulai Perdana (left), and Jalan Sri Pulai after the installation of pedestrian walkway (right)

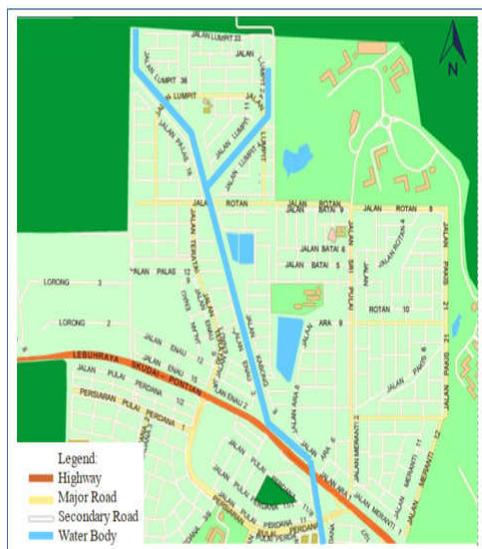
As Taman Sri Pulai is relatively small neighborhood as compared to othertownship. This makes the neighborhood very walkable. For instance, almost the whole Taman Sri Pulai is located within a 400m walking distance from commercial area Figure 14.



Sources: Adapted from Majlis Perbandaran Johor Bahru Tengah

**Figure 14. 400m radius from commercial area throughout Taman Sri Pulai**

Apart from that, Taman Sri Pulai is using grid street layout. This is good as it helps to increase the route options and connections. At the same time, it helps compromise pedestrian safety as it has minimum hiding spaces and concealed areas. Furthermore, different hierarchy of streets has been using in Taman Sri Pulai to give appropriate number of secondary routes that create a choice of pathways Figure 15.



Source: Adapted from Google Map

**Figure 15. Different hierarchy of streets in Taman Sri Pulai**

**Low Density in Taman Sri Pulai Affect the Health of Residence:** According to the data extracted from Malaysia's GIS system, the current houses in Taman Sri Pulai is 3785 houses while the land size is 411 acres.

This translates to 9.2 houses or 37 persons per acre (with consideration of 4 persons per family). This density is considering low as compared to the suggested optimum density by (UN-Habitat, 2014) which is 61 persons per acre. The main reason is that Taman Sri Pulai only has landed houses. There is no high rise residential throughout Taman Sri Pulai. Based on the suggestion by The City of Red Deer (2013), high rise buildings or other high-density developments should be encouraging in accessible locations close to local centers and at important corners and around key open space. Nevertheless, the density throughout Taman Sri Pulai is similar. Based on various cross-sectional evidence, residential density is associated with transport mode choice where higher residential densities positively associated with active transport mode. This means that low-density housing development is likely to increase car dependency, thus increasing overweight and obesity (Giles-Corti, 2014).

**Light Industrial Activities Found Within Commercial Area:** There are different land uses in Taman Sri Pulai, this includes the commercial area, public spaces, residential area, and industrial area. The commercial area is located within walking distance throughout the whole neighborhood. However, there are some light industrial activities carry out within commercial land-use areas. This may be a disturbance for the residence as these light industrials activities cause air and sound pollution. Figure 16.



Source: Field Survey (2019)

**Figure 16: Light industrial and workshop located in commercial area**

**Adequate Public Facilities and Amenities Neighbouring Taman Sri Pulai:** The existing public amenities in Taman Sri Pulai including the primary school, SK Taman Sri Pulai, mosque, mini markets, clinics and petrol kiosks, workshops, restaurants, and others. Due to the low population, there is no high school and hospital within this area. Nevertheless, the nearest secondary school to Taman Sri Pulai being SMK Taman Sri Pulai Perdana which is merely 2 km. As for hospitals, Hospital Pakar Skudai and Impian Emas Medical Center which is located approximately 8km away. In Term of housing, Terraced houses are the only type of housing in Taman Sri Pulai. At the same time, most of them are single-story. (Figure 17). This shows that there is no mix of social class at all within Taman Sri Pulai. People who live in this area are mostly low-income group.



Source: Field Survey (2019)

**Figure 16. Single-storey terrace houses in Taman Sri Pulai**

In term of public amenities, there are some neighborhood parks, and football field in Taman Sri Pulai (see Figure 14). Nevertheless, the total land area of green open space is very limited. It made up of less than 10% of the total land area in Taman Sri Pulai Figure 17.



Sources: Adapted from Majlis Perbandaran Johor Bahru Tengah

**Figure 17. Limited Green Space in Taman Sri Pulai**

**Poor Aesthetic Due to Lack of Maintenance:** Generally, houses and shops in Taman Sri Pulai are old. At the same time, there is very limited maintenance or restoration done. Because of this, the façade of these buildings looks old and tired due to fare ware and tare. However, in terms of the greenery, trees and plants are planted especially towards the north of development. Grass at the green areas and well-trimmed. These give a nice view to the neighborhood Figure 18.



Source: Field Survey (2019)

**Figure 18. Trees planted in Taman Sri Pulai for Visual Purpose**

## Conclusion

A good residential layout is a neighborhood layout that is sustainable. This means that a good neighborhood is a community which is developed in such a way that it is well balanced between the environment, economic and social (Churchill, 1999). In paper, the existing layout of two selected sites Mutiara Rini and Taman Sri Pulai in Johor Bahru Johor Malaysia have been discussed and compared with the principles of sustainable neighborhood as suggested by the UN-Habitat, 2014. However, the finding of this research indicates that the first subject site which is Mutiara Rini has good accessibility but poor public transport system. Furthermore, streets in Mutiara Rini are not safe for pedestrians and cyclists. This is because only part of the development was equipped with pedestrian walkway. Most of the streets do not have separation between bike lanes, pedestrian walkways, roads for private vehicle or bus lane. At the same time, there are no overhead bridge or zebra crossing in Mutiara Rini, making it dangerous for pedestrian to cross the busy streets. Therefore, streets in Mutiara Rini streets are not pedestrian and cyclist-friendly. However, Mutiara Rini is using grid street layout which has appropriate number of secondary routes. These secondary routs help to create a choice of pathways and form development blocks which are leading to flexible and efficient street layout.

There are different land uses in Mutiara Rini including the commercial area, public spaces, residential area, and industrial area. However, these land uses are not fully integrated and very much isolated from each other. Therefore, there are limited mixed land-use and mixed-use buildings. However, majority of the land or building in Mutiara Rini is only limited to one usage, which is for residential purposes. Then, Mutiara Rini provides different types of housing including bungalow, cluster house, terraced house, and condominiums. Nevertheless, double-story terraced house is the most abundant housing type in Mutiara Rini. In term of public space in Mutiara Rini, parks with different sizes are provided throughout the neighborhood. Nevertheless, the public spaces in Mutiara Rini are not fully connected and integrated. There is no trail system, sidewalks, pedestrian links or green streets joining up all these areas. Thus, there are plenty but unintegrated public space.

On the other hand, Taman Sri Pulai is accessible via two entrances – Jalan Sri Pulai or Teratai. Besides, the third entrance of Universiti Teknologi Malaysia is located at Taman Sri Pulai, making it easily accessible by the students. Therefore, in contrast to Mutiara Rini, Taman Sri Pulai has good accessibility and public transport system. Apart from that, Taman Sri Pulai is using grid street layout. This is good as it helps to increase the route options and connections. At the same time, it helps compromise pedestrian safety as it has minimum hiding spaces and concealed areas. Besides, most parts of Taman Sri Pulai, especially the main roads and roads in major commercial areas are equipped with pedestrian walkways shaded by trees. Fences have been installed in recent years to ensure the safety of pedestrian. Then, there streets are pedestrian-friendly but do not encourage cycling.

In Term of housing, Terraced houses are the only type of housing in Taman Sri Pulai. At the same time, most of them are single-story. Generally, houses and shops in Taman Sri Pulai are old.

At the same time, there is very limited maintenance or restoration done. Because of this, the façade of these buildings looks old and tired due to fare ware and tare. However, in terms of the greenery, trees and plants are planted especially towards the north of development. Grass at the green areas and well-trimmed. These give a nice view to the neighborhood. Furthermore, in term of public amenities, adequate public facilities and amenities are neighboring Taman Sri Pulai. However, there are some light industrial activities carry out within commercial land-use area. This may be a disturbance for the residence as these light industrials activities cause air and sound pollution. However, Taman Sri Pulai is a low-density area. The main reason is that Taman Sri Pulai only has landed houses. There is no high rise residential throughout Taman Sri Pulai.

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