



Urban Design Elements with a Case Study at Bandar Sungai Petani of Kedah

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Paper ID: 12A3B

Volume 12 Issue 3

Received 01 October 2020

Received in revised form 19

December 2020

Accepted 04 January 2021

Available online 06 January
2021

Keywords:

Colonial architecture;

City development;

Mental mapping;

Commercial area;

Government office;

Colonial urban element;

Architecture identity.

Abstract

This study focuses on the early development of Bandar Sungai Petani during the early 1990s and the impact of the colonization, resulting in a variety of physical design and configuration that can encourage social fabrics and economy. This study's goal is to justify the identity, history of the early settlement of Bandar Sungai Petani during the early year and the progress of development of urban design influence of typography, lifestyle of the habitants, economic capacity that made the area one of the major towns in Peninsular Malaysia. Sungai Petani is known as an industrial town due to its economic activity. This research method involves observation and data collection.. The study finds that Bandar Sungai Petani has a masterplan with gridiron design, which is systematically arranged although irregularly. The gridiron concept forms primary road networks and linkages with vehicular paths, making the place well connected and having good circulation in the area. The study also shows that the urbanization of Bandar Sungai Petani has been impacted a lot by the trading activity from the early colonial era. Based on research, during the first years, Kuala Muda was once the administrative centre and later moved to Bandar Sungai Petani that was identified as a colonial trading area and has grown into governmental administrative and commercial sectors.

Disciplinary: Architecture and City Planning, History of Southeast Asia.

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Cite This Article:

Rahim, A. A. A., Baharudin, M. A. M., Yasser Arab, Hassan, A. S., Seangklieng, K., Witchayangkoon, B. (2021). Urban Design Elements with a Case Study at Bandar Sungai Petani of Kedah. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 12(3), 12A3B, 1-12. <http://TUENGR.COM/V12/12A3B.pdf> DOI: 10.14456/ITJEMAST.2021.44

1 Introduction

This paper analyses and identifies the five major design elements and principles (paths, edges, districts, nodes and landmarks) that are implemented within the development of the case study area, Bandar Sungai Petani, Kedah. The study is based on an understanding of urban design elements within the colonial city planning environment in Malaysia (Hassan, 2018) referring to the theories of Kevin Lynch (1962) and by implementing mental mapping technique.

Kedah, the thirteen states of Malaysia, is located in the northwestern part of Peninsular Malaysia. Malaysia consists of the mainland and the Langkawi islands. Sungai Petani (Figure 1) is an industrial town in Kedah located in Kuala Muda District. It is the largest town in Kedah. Due to its proximity to Penang, Sungai Petani (Figure 1) is also part of Greater Penang, Malaysia's second-largest conurbation. Penang's well-developed transportation infrastructure is serving the town's logistical needs.

The main objective is to justify the identity, history of the early settlement that was influenced by the colonial years and the progress of development of Bandar Sungai Petani, which made the area one of the major towns in Peninsular Malaysia. The urban study area (Figure 3), Bandar Sungai Petani (Figure 2), is a city centre comprised of a mixture of the commercial, governmental, religious, and educational zone. Bandar Sungai Petani (Figure 3) is easily accessible by a network of roads and railway. Travellers from the capital Kuala Lumpur or other parts of Malaysia can travel to Bandar Sungai Petani using the North-South Expressway. The Federal Road also connects Sungai Petani with several major cities such as Alor Setar, Butterworth and Ipoh.

2 Literature Review

2.1 Irregular Gridiron Urban Layout

The study area covers a portion of Bandar Sungai Petani, located in the middle of the city town. For the urban layout area characteristic, the building blocks were constructed in a gridiron formation (Zakaria et al., 2018; Noresah & Ruslan, 2009). This urban layout design is a fundamental masterplan planning embraced by the British colonial administration (Hassan, 2009). During the British's colonial era, the divide and rule concept has been implemented into the formation of the urban pattern to allocate different ethnic groups into separated settlements (Hassan, 2017). This concept has indirectly affected the urban circulation and civic fabric of the study area. The urban gridiron formation is designed in an irregular pattern due to the study area's topography's alignment.

2.2 Trading Centre

The urban fabric of the area and the buildings' design amplify the symbolism of the colonial triumph, which later the democracy system. (Moughtin, 1999; Shirvani, 1985). The British fascination with the monetary policy has led to the creation of the administrative centre at the study area as the colonial town of pre-industrial societies is founded in response to the mercantile sector's growth (Hassan, 2018). The outcome of this prolific economic prosperity inevitably shapes

Bandar Sungai Petani's urbanization as it has become the area that helps to improve the community living standards and employment status. (DSM, 2010) Bandar Sungai Petani is now one of the important trading centres in Kedah after Alor Setar. The Sungai Petani railway station that served Keretapi Tanah Melayu Berhad as the main transportation helps grow trading affairs to import and export the merchandise goods. The study area is the most densely built-up areas in the city typified by an agglomeration of governmental and private administrative offices, financial institutions and commercial shophouses due to its direct involvement in trades. Administrative offices like the custom building were strategically nestled within the midst of harbour complexes to empower the government control over the whole town figuratively.

2.3 Urban Design Elements

Kevin Lynch (1960) discusses urban design by observing a city's visual and physical form at an urban scale. The principle composes five urban design elements: the path, edge, district, node, and landmark (Pauzi, 2018; Lin et al., 2019; Meenar, 2019). With this approach, the urban design elements are to analyze the impact of urban design of a city on its function, history, name or meaning (Larice & Macdonald, 2013, Dempsey et al., 2010).



Figure 1: Key Plan

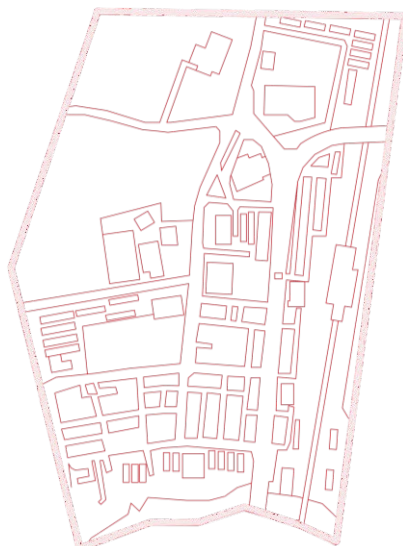


Figure 2: Location plan

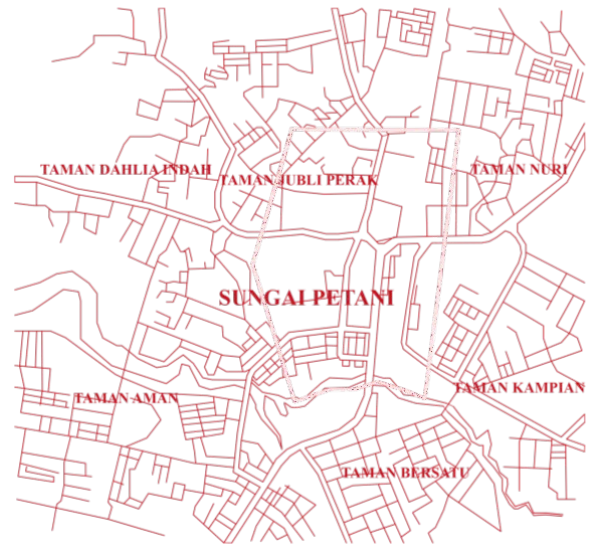


Figure 3: Layout plan of the study area

2.4 Background of Case Study

The urbanization of Sungai Petani (Figure 2) started in 1912 when W.G. Maxwell, Kedah's 1st British Adviser, chose Sungai Petani (Figure 1) to replace the older coastal town of Kota Kuala Muda as the new administrative centre for Central Kedah. Sungai Petani was strategically located between Kulim and Butterworth in the south and Alor Setar in the north. Since the 1990s, the housing sector has boom in Sungai Petani as the town received significant investment by real estate developers. The study area (Figure 3) however consists of mainly governmental and commercial sectors. The study area houses the oldest golf club in the State of Kedah, having been established in 1922 by British planters. The golf course covered 40 acres (160,000 m²) of prime land provides green space to balance the rapid pace of development of the town with environmental conservation. Besides the unique colonial facade of the Sungai Petani Clubhouse, other buildings around the study area can also be influenced by the colonial architecture style. Examples of the building are the HSBC

Bank, Kuala Muda District Police Station, the clock tower, and the area's shophouses. The study area (Figure 3) also comprises religious buildings and institutions like Sultan Muzaffar Shah Mosque, Abdul Rahman Mosque, SMK Khir Johari and MSU College Sungai Petani. Other public facilities in the area include Sungai Petani KTM Station, Sultan Abdul Hamid Sports Complex, post office and banks.

3 Research Method

The main purpose of the research is to identify the five urban design elements according to the theory of Kevin Lynch - district, path, edge, node and landmark. The research will be conducted based on a study on the city's history and background and extract all the information regarding the site. Google map is used to explore and study the city layout plan and then draw at a standardized scale of Colonial City. A survey among the local people will be conducted later to receive more accurate facts and information about the site (Altman, 1975). All the detailed information regarding the authority will be obtained from Majlis Perbandaran Sungai Petani to support the information collected from other sources. Thus, everything will be analyzed based on Kevin Lynch's theory as follow.

3.1 Paths

The research is conducted to observe the size, width and length and how it impacts the city in terms of the importance of accessibility and connectivity for the people. Also, to determine the aesthetic value on the path that somehow can resemble and experience the city's identity (Sanusi, 2015). A primary circulation for the people to move and access is usually at the main road, which usually has a bigger and wider road. Going down through the hierarchy is the secondary road (access to parking and building). Therefore, the study regarding the road ratio and hierarchy can be determined.

3.2 Edges

The edges are identified based on three types which are legal, physical, and social. Legal edges act as the boundary or buffer between two phases or a break that separates the continuity of an area, landscape, or other physical features. Physical edges also the boundary usually coming from the building align. Social edges are usually the pedestrian walkway which is accessible by the pedestrians. The size determines all the edges, length and how the edges affect the city from the most dominant edges to the weakest edges (Simpson, et al., 2020).

3.3 Districts

The district can be identified based on the identity and character (Sanusi, 2015) through existing building and typologies, background, and history. Based on the study, the supporting components that exist in the district include commercial, open and green spaces, education and also the government sector. The main district can be identified based on the dominant area covered and activities happening based on the urban element. Thus, the district's hierarchical order can be identified from the primary district into the lowest district.

3.4 Nodes

Nodes can be identified through their functions as the meeting point for the people and becoming the focus or epitome of a district and a symbol of the city (Lynch, K., 1960). Nodes are identified through the interview session with the local people and observation. Therefore, based on the interview session, researchers can identify the hierarchical order, which nodes become the most dominant depends on the activities happening. The ratio can be determined through the node size.

3.5 Landmark

A visible object in the city and becoming a point of reference usually relate to the scale, aesthetic, and attraction and it appears to impact the site. By interview session, researchers can determine the most dominant landmark, which has the highest point of attraction, some will have history. The ratio can be determined based on the size, area and height of the landmark and also the impact on the public, either local or tourist.

3.6 Interview Session through Phone Calls and Internet

As one author is local person making it possible to create the phone call interview session among the local people. To collect the data and information, the local people know well and aware of the city, such as the history and the specific place related to the urban context and study.

Also, the online platform is used to find more information regarding the city. Google Map and Google Earth are used to explore and enhance the city's visuality from the top view, which gives more convenient exposure during the research. The online platform also is used to identified journal or research paper for the researchers as a reference for the study.

The phone call and Internet methods are used due to the Malaysian Government's restriction movement order during the pandemic Covid-19, to avoid any social contact with other people.

4 Results of Analysis & Discussion

All the gathered information for Bandar Sungai Petani has been extracted and transcribed into a few mental maps, associated with the five urban elements based on Kevin Lynch's theories.

4.1 Paths

People can access the site through six entrances. The main entrance to the site is from Jalan Badlishah (approximately 26 m wide). People can also access the site through the secondary accesses which are Jalan Kampung Baru (approximately 15m wide), Jalan Kolam Air (approximately 13m wide) and Jalan Pengkalan (approximately 15m wide). There are also tertiary entrances available to the Jalan Sungai Layar (approximately 5m wide). People from the shophouses along Jalan Masjid 1 can also access the site through the entrance that connects to Jalan Masjid.

Jalan Badlishah serves as the main arterial road connected to Jalan Lencongan Barat to North-South Expy Highway (toll road) with Jalan Ibrahim the secondary arterial road and Jalan Kampung Baru as the tertiary arterial road. Four collector roads can be identified. Jalan Sungai Layar and Jalan Pengkalan serve as the main collector road, Jalan Kolam Air serves as the secondary collector road, and Jalan Patani serves as the tertiary local road. For local roads, eleven local roads

can be identified at the site. The main local roads are Jalan Bank, Jalan Petri, Jalan Merbok. In contrast, the secondary local roads are Jalan Padang, Jalan Dewa, Jalan Masjid and tertiary, K167 Jalan Patani, Jalan MPSP Kedah, Jalan Jerai, Jalan Che Mat Deli, Jalan Masjid 1, Jalan Kuala Ketil.

There are two cul-de-sacs in total at the site which the main one is at the entrance of KTM Station, and another is at a parking area near KTM Station. The cul-de-sacs also serve as a parking area for visitors and taxi drivers. The road beside Sultan Abdul Hamid Sports Complex is the only end road used to access the court behind the sports complex and for parking purposes. Several pedestrian walkways are mainly located at the primary arterial roads and primary collector roads.

A bicycle pathway can be seen on the bridge for both traffic circulation at Jalan Kampung Baru (Figure 4) with a width of about 1.2m. There is one river at the site (Sungai Petani) which is a continuity of the Merbok River with a width of approximately 35m wide and the length of the river in the perimeter of the site is about 510m. One two-sided platforms railway at the site is the Keretapi Tanah Melayu's West Coast Line. The railway is served by the KTM ETS and the KTM Komuter Northern Sector services.

Table 1: Comparison of paths based on number, width, length and percentage.

Path	Number	Width	Percentage	Length	Percentage
Arterial Roads	3	22m	19.2%	1000m	13.3%
Collector Roads	4	12m	14.0%	500m	8.9%
Local Roads	11	12m	38.4%	250m	12.2%
End Roads / Cul-de-sacs	3	12m	10.5%	100m	1.33%
Bicycle Pathway	2	1.2m	0.7%	500m	4.4%
Pedestrian Walks	12	1.2m	4.2%	1000m	53.2%
River	1	35m	10.2%	510m	2.3%
Railway	1	10m	2.9%	100m	4.4%

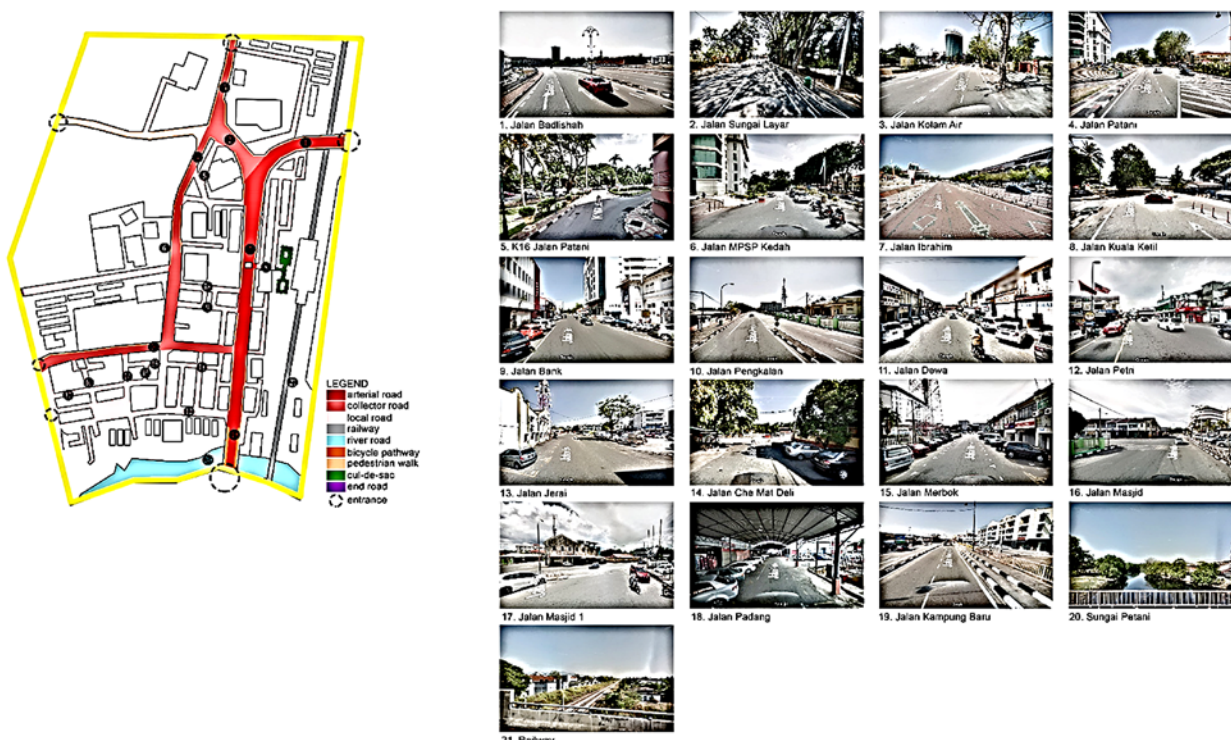


Figure 4: Paths plan of the study area

The roads are designed with a proper hierarchy that created gridiron formation. Jalan Badlishah is the most important vehicular road and followed by Jalan Kampung Baru whereas the least important road is Jalan Padang. However, the pedestrian pathways are only available on certain routes and so are the bicycle lanes which only available on the bridge along Jalan Kampung Baru crossing Sungai Petani. The railway at the site plays an important path as it serves for the Keretapi Tanah Melayu's West Coast Line since the colonial era and helps shape Bandar Sungai Petani's urbanization into an important trading centre in Kedah. Jalan Badlishah is well-identified leading towards the northern part of Bandar Sungai Petani to the highway exit.

In contrast, Jalan Kampung Baru is well-identified leading toward the southern part of Bandar Sungai Petani, across the Sungai Petani. Jalan Ibrahim is well designed with Dataran Zero serves as nodes. Few landmarks can be seen along the paths.

4.2 Edges

There are two edges identified in the study area that set as boundaries for the site. From the map in Figure 5, Petani River or Sungai Petani which is the continuity of Merbok River can be seen to set the contrast between the study area and the neighbouring area thus makes it the main edge at our study are. Sungai Petani has approximately 35m in width and 510 m long within the boundary. The secondary edge can also be seen crossing our site, the KTM's West Coast Line Railway Road with 10m width and 1km length within the site study boundary.

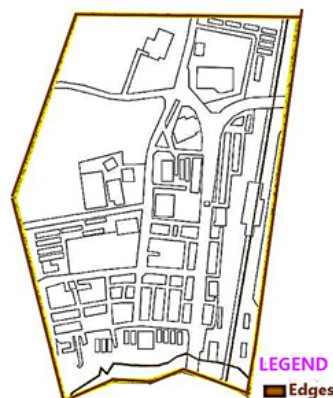


Figure 5: Edges of the study area

Table 2: Comparison of edges based on number, width, length and percentage.

Edge	Number	Width	Percentage	Length	Percentage
Main Edge	1	35m	77.8%	510m	33.8%
Secondary Edge	1	10m	22.2%	1000m	66.2%

Bandar Sungai Petani is located in the heart of Sungai Petani and near to Merbok River. Petani River is the Merbok River's continuity, which acts as a natural edge separating the site with the southern part of Sungai Petani and the railway along the eastern part acts as the artificial edge. The edges are continuous and well-formed. Petani River can be concluded as the most dominant edge compared to the railway as the river divide the site (Taman Pekan Baru) from the neighbouring site (Taman Patani Jaya).

4.3 District

There are a few districts that can be identified through observation. There are four types of dominant district on-site: the Commercial, Government Sector, Education and Recreational. The biggest district on-site is the Commercial area covering 206,769 m². From Figure 6, the blue zone represents the commercial area. This commercial area has shophouses with two-storey height and some other shophouses from 3 to 5 storey height with a storey height 3m.

There is two main business area separated along with Jalan Ibrahim. Most building forms are the old style shophouses and the element of the colonial. Most buildings function as the business centre where goods and services are provided.

Next, the green zone represents the recreational area covering 112,263 m². This place is known as Taman Jubli Perak Sungai Petani. The place where people gather, enjoy the environment and do exercise and other recreational activities. This area is just an open space with green and nice landscape. Sometimes this place also used for the carnival or exhibition.

Next, the red zone represents the educational area which covers 44,919.07 m². There is one secondary school located in this area, Sekolah Menengah Kebangsaan Khir Johari built in 1969, considered one of the oldest schools in Sungai Petani.



Figure 6: District diagram in studied areas

The yellow zone represents the government sector area which covers 40,827.04 m². This area is filled with government building. Sungai Petani's community will come here for a specific purpose such as paying tax, business rental and others. The government sector includes Police Station, City Council (7 storeys), Land Office (4 storeys). City Council also provides amenities such as hockey turf and football field that can be rent by the people.

The domain district covers Bandar Sungai Petani is the business area supporting the economic growth in Bandar Sungai Petani. This place is located along the main road of Jalan Ibrahim where the place mostly local people use the road to go to other locations in Sungai Petani.

The next area will be a recreational area. This place acts as a gathering place for the community to relax and have their family and friends' quality time. Next, there is also the government sector area that serves the community. Last, the area followed is the educational area where one secondary school, Sekolah Menengah Kebangsaan Khir Johari is located for the local people to send their children for formal education within the age of 13-18 years old. In overall, the district is a dominant urban element in Bandar Sungai Petani.

4.4 Nodes

Based on research, three nodes can be identified in the layout plan. The most dominant one is Dataran Zero Sungai Petani. This square is well known to be a place of celebration. The pavement road of Jalan Ibrahim usually will be closed if there is any celebration happening. Usually Independent Day (Merdeka) on 31 August every year. This square acts as a place for the public to enjoy the view and majestic Government old building and Clock tower. During the festive season, this place will be crowded with people where after they finish their shopping they will come here to rest before going back home (Figure 7 & 8).

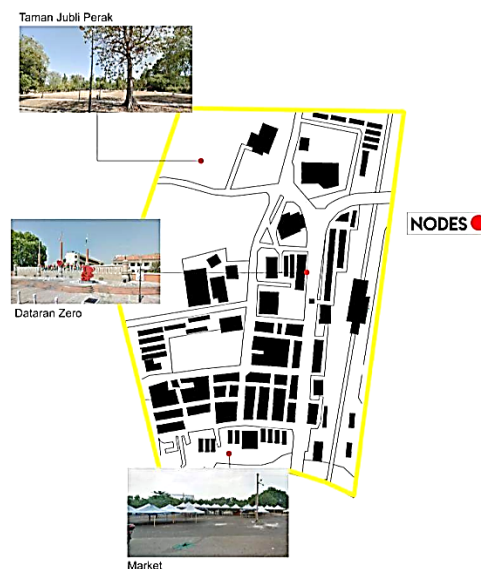


Figure 7: The Nodes Location on Sungai Petani



Figure 8: Dataran Zero (Left) Taman Jubli Perak (Right) (Courtesy of Google Map).

The next one is Taman Jubli Perak Sungai Petani (Figure 9). It is an open green space open with a playground and field suitable for the kids and the public to do recreational activities such as jogging, Zumba etc. Taman Jubli Perak Sungai Petani also has a mini zoo as the place of attraction. Next to the recreational park is Sultan Muzaffar Shah mosque where people will come and drop after or before their doing the activities. The last one is Pasar Tani Sungai Petani or Wet Market.

This market opens every morning to the public to buy their kitchen stock and other home stuff. Business activities occur where the seller needs to pay the rent for the place, and they are going to sell their goods. All Nodes are explained in Table 3.



Figure 9: Pasar Tani (Source: Google Map)

Table 3: Comparison of nodes based on area, percentage, activity type and level of socio-activity.

Node	Area	Percentage	Activity Type	Level of Socio-Activity
Node 1	25,181.58	3.82 %	Recreational	Very Good
Node 2	7,022.23	1.06 %	Events	Good
Node 3	6,802.62	1.03 %	Business & Commercial	Satisfactory

The nodes are only located at a specific area and act as supporting elements for the area next to it. The primary node in the study area is the recreational area. This place is next to a mosque which people can go and relax right after praying. It is also a place where many activities can be done. Next is Dataran Zero, which is located next to Jalan Ibrahim. This node supports the business area during the festive season. The lowest node is the Pasar Tani, where people only gather to get their fresh food stocks which is only happening in the morning.

4.5 Landmark

There are several landmarks on-site (Figure 10). The landmark can be classified into two groups, recognized by the local and tourists (Table 4). The most dominant landmark on-site is the Clock Tower Sungai Petani, built from 1936 to remember King George V and Queen Marry (Harian Metro News Paper), with height of 15.2 meters and took about 26 years to complete it. It is next to Dataran Zero Sungai Petani. The colonial-style designed makes this landmark easy to spot.

The next identified landmark is the HSBC Bank building. It is well recognized as the history behind the building. It is a colonial design building and now function as a bank. It is also identified as a landmark because of the important usage to the community and located in the city centre. Next, Sungai Petani Old Post Office is the only Post Office in the main city centre. However, this landmark is more well-known for the local instead of tourists to give society important service.

The Sultan Muzzafar Mosque is the biggest mosque in Sungai Petani while the oldest mosque in Sungai Petani, Masjid Abdul Rahman. Building form and architecture shown by Sultan Muzzafar Shah is most likely an adaptation of Arabic elements where the arts of engraving and the high minaret can be seen throughout the city, with an area of 4500 m². Masjid Abdul Rahman is on the other side of the city, 2500 m².

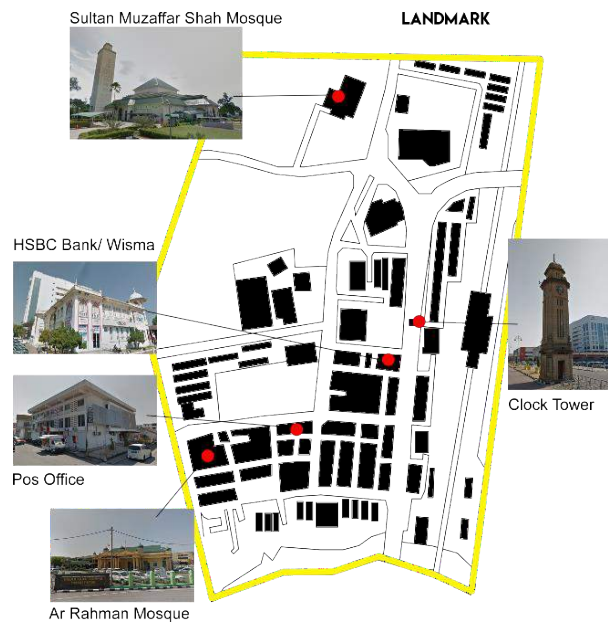


Figure 10: Landmark diagrams in studied areas

Table 4: Comparison of landmarks based on length, width, height and area, volume and level of dominance.

Landmark	Length (m)	Width (m)	Height (m)	Area (m ²)	Volume (m ³)	Level of Dominance
Landmark 1	17.8	10	15.2	20.00	2670	Very Good
Landmark 2	20	37.13	7	1345	5180	Good
Landmark 3	81.23	45	12	3,650.67	43848	Satisfactory
Landmark 4	50	25	8	1473	10000	Weak

Landmark can be found mostly in commercial area. One of the most significant impacts to Bandar Sungai Petani is the clock tower. The landmark can be easily seen by the public and located in the middle of the main road and next to the node, which is Dataran Zero. The same goes for the other landmarks. Most of them are easy to find as in the historical value and the architectural style that represents the religion embrace most by the locals, for instance, the mosque for the Muslims. The functional value also makes the landmark easier to find and be reached out by local and tourist in Sungai Petani. The weakest landmark most probably happened to be the post office building where this landmark is only used locally as it is one of the oldest post offices in Sungai Petani.

5 Conclusion

The site, Bandar Sungai Petani houses governmental sectors, is growing as commercial sectors. The colonial-era can greatly influence the building's facades, and so is urban planning. Bandar Sungai Petani city impacts the colonial urban element. This element develops since the '90s and moves along with the modernization and the growth of generation. The identity and historical features are well preserved by the government and local people. Until today Bandar Sungai Petani is still active in the commercial industry as the dominant area on the study area consists of the business and economic growth industries. The authorities well preserve some elements as it brings the historical component of Sungai Petani. The results shows that Bandar Sungai Petani has all the urban elements context, including the path, edge, districts, nodes, and landmark. All the elements become the supporting component for the development of Bandar Sungai Petani. The city's layout consists of a path that strategically and systematically creates a smooth circulation in the city. The arrangement based on the hierarchical which generate very efficient traffic based on the gridiron layout. The natural river's edge form and the KTM's West Coast Line Railway road set as the

boundaries on-site. The most dominant district on-site is the commercial support by the recreational, Government and educational.

The landmark and nodes on sites are limited, however, both still becoming the supportive elements and easily recognized by the locals and tourists, for instance, the Clock Tower now acts as an identity and iconic building for Sungai Petani. The overall site is very friendly to the community, especially local people. The meeting point for the local is very strategic and separated by leisure (Dataran Zero), relaxing (Taman Jubli Perak) and business (Pasar Tani).

6 Availability of Data and Material

Data can be made available by contacting the corresponding author.

7 Acknowledgment

This study is financially supported by Bridging Grant, Number 304.PPBGN.6316521.

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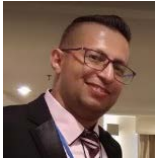
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Note: The origin of this article was reviewed, accepted, and presented at the 5th International Conference on Sustainable Architecture and Urban Design (ICWSAUD 2020) (Virtual Conference), a Joint Conference with the 5th International Conference on Engineering, Innovation, & Technology (ICEIT 2020) held by the School of Housing Building and Planning, Universiti Sains Malaysia, Pinang, Malaysia during 22-23 September 2020.