

# Spatial Pattern of Affordability and Overhang in Selangor

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**Abstract.** The provision of affordable housing is being developed rapidly whilst the mismatch between demand and supply in the residential market was reported as a crisis causing an increased in the overhang of residential accommodation. To date, no detailed analysis in the form of a spatial pattern for affordable housing has been studied to illustrate the crisis. Thus, this paper aims to analyse patterns for affordable house prices by using a spatial model in Selangor state with further analysis of overhang units in the Selangor district. Secondary data were obtained from various sources and the spatial model was formed and generated to examine the spatial patterns within the study area, which is in Selangor. Although previous research has found that the median household income group intended to purchase a type of landed house, for example terraced houses, the offered prices in the property market were not affordable to this particular group. Further analysis of residential overhang found that Gombak district has a high density of land use zoned for housing supply whilst facing the increased overhang. The findings of this research may guide the stakeholders on proper planning for near future of the affordable housing development with suitable type of residential to meet the residential market segmentation and demand.

## 1. Introduction

The allocation of national housing in Malaysia has experienced a few changing phases, aligned with the changing factors of economic development restructuring, urbanization, population augmentation, and migration, after the era of independence [1], [2]. Today, the allocation of national housing focused more on the supplies of the affordable houses, which is relevant to the higher demands in urban community. To support the allocation, many affordable housing programmes and schemes were launched since the year 2012 to facilitate the housing purchase predominantly by the Bottom 40 (B40) and Middle 40 (M40) household income groups. Various types of houses and price ranges were offered to fulfil the affordable housing demand, but the affordability index keeps on increasing every year [3]. Meanwhile,



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the National Property Information Centre (NAPIC) Malaysia reported that there was an overhang of residential units in the market and the number of units was increasing from the year 2016 until 2019. This situation was seen as a mismatch between the supply and demand for affordable housing in Malaysia by the Malaysia National Bank (BNM) [4] and the Real Estate and Housing Developers' Association (REHDA) [5]. Therefore, spatial studies are important to analyse the housing market needs in Malaysia based on location and local development. This is because factors of location and house were still being regard as the key factors of attraction for future housing [6]. For that reason, further research is being conducted to identify this crisis in the form of spatial models for the sake of a better housing supply in the future.

This crisis research focused the Selangor state as the study area because of its high population [7] thus creates an increasing demand within the residential property market [2], [8]. In addition, the overhang units in Selangor has been recorded as the third highest in Malaysia, behind the Johore and Penang state in the year 2018 [9] and the number of median multiple affordability houses for Selangor has been increasing from year 2012-2016 (see Table 1) [3], [10], [11]. Thus, it supports the argument that further research of the affordable demand and supply, affordability and overhang should be carried out in this state. In order to explore more on the crisis of housing supply and demand, two objectives have been formed which are (1) to explore the affordability pattern in the type of residential in Selangor using the spatial model and (2) to explore the total residential pattern of the overhang in Selangor by using the spatial model. To obtain the research objectives, the secondary data was gathered from various sources such as Department of Statistics Malaysia (DoSM), National Property and Information Centre (NAPIC), and PLANMalaysia. Later, the formation of a spatial model was developed using ArcGIS to analyse the affordable house prices. It is hoped that the findings obtained from this research will assist the stakeholders to be more alert with the changing trends and demands in the type of residential for affordable housing development in Selangor in near future.

## **2. Affordable Housing and Overhang**

In general, public-private partnership in delivering the national housing demand and needs were employed in many construction projects, which includes the efforts to complete the national housing project. The involvement of the private sector since ages ago has been known to greatly contribute towards the success of the mission to provide the housing supply, together with the support given by the government [12]. However, the developers should fulfil the local authority policy, rules and regulation in the housing development. According to the REHDA Institute (RI), Malaysia has been solely known to appoint the quota of compulsory affordable housing to the private sector beyond the board interstate [13]. Despite the policy being imposed by the local authority, a gap still exists in meeting the demands for affordable housing.

For further understand the affordable housing demand and supply, this paper is designed to explore what are the affordability approach being applied? Yet, the affordable housing terminology was discussed by several researchers based on their expertise and perspectives [3], [13]–[16]. For instance, the Khazanah Research Institute (KRI) has conducted an affordable housing research in Malaysia and used a definition of an affordable house by considering the “median multiple” approach that was developed by the Demographia International Housing Affordability Survey which has been recommended by the World Bank and the United Nations. This proposes that a house is considered to be affordable if the household can finance it with less than three times of its annual income (price to income ratio 3) [3], [17]. Median multiple affordability was also classified into four levels in comparing market price with median affordability (see Table 2). By using the median multiple approach, a house priced less than RM260,000 was considered affordable in Selangor in the year 2016. Meanwhile, RI considered the financial perspective by using the housing cost burden (HCB) approach based on the rule of thumb by which housing expenditure of less than 30% of household income is deemed affordable [13]. According to the HCB definition and calculation, the house price of RM422,000 was affordable in Selangor state in 2016 (see Table 3). Although a range of prices was claimed to be affordable through

the “median multiple” and HCB approaches, there was an overhang of residential units particularly for houses priced between RM50,000 - RM500,000 and above in year 2016 (see Figure 1 and 2).

According to the Valuation and Property Services Department (JPPH), overhang can be defined as completed unsold units in nine months after launching and after issuance of the certificate of fitness by the local authorities. In the year of 2016, the lowest number of overhang residential properties were priced between RM200,001-RM300,000 whilst the highest residential unit overhang was for the house prices of RM500,001 and above [18]. This trend became even worse in 2017 and 2018 where the overhang units for house prices of RM500,001 and above increased (see Figure 1). This showed that the supply house price of RM500,000 and above have been the focal point of the developers for the housing development. Meanwhile, NAPIC reported that the sales performance of houses priced between RM400,000 and RM500,000 at launch was only 28.9%, a situation which will disrupt the property business in the long run.

This also proves that the residential property market was mismatched by offering house prices which are only affordable by the Top 20 (T20) household income group (see Figure 3) in Selangor. Hashim [14] claimed that developers are targeting high-end property within the residential market simply to increase their profits. This situation perceived that the current affordable housing business model has not fully met the demand for M40 target segment where there were higher demands needed by this group.

**Table 1:** Selangor Residential Median Multiple Affordability [3], [11], [19]

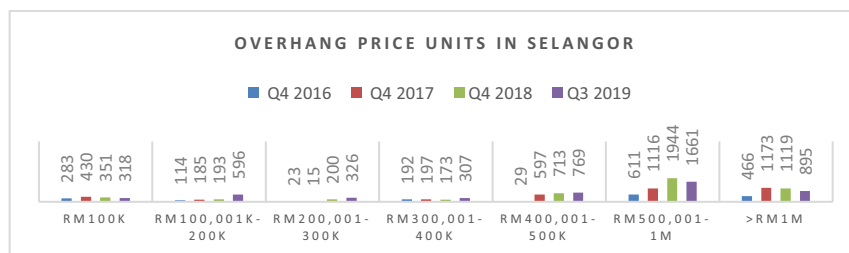
Year	2012	2014	2016
Median Multiple	3.6	4.0	4.7
Affordability	Moderately Unaffordable	Moderately Unaffordable	Seriously Unaffordable

**Table 2:** Median Multiple affordability [17]

Median Multiple			
≤ 3.0	3.1-4.0	4.1-5.0	≥ 5.1
Affordable	Moderately unaffordable	Seriously unaffordable	Severely unaffordable

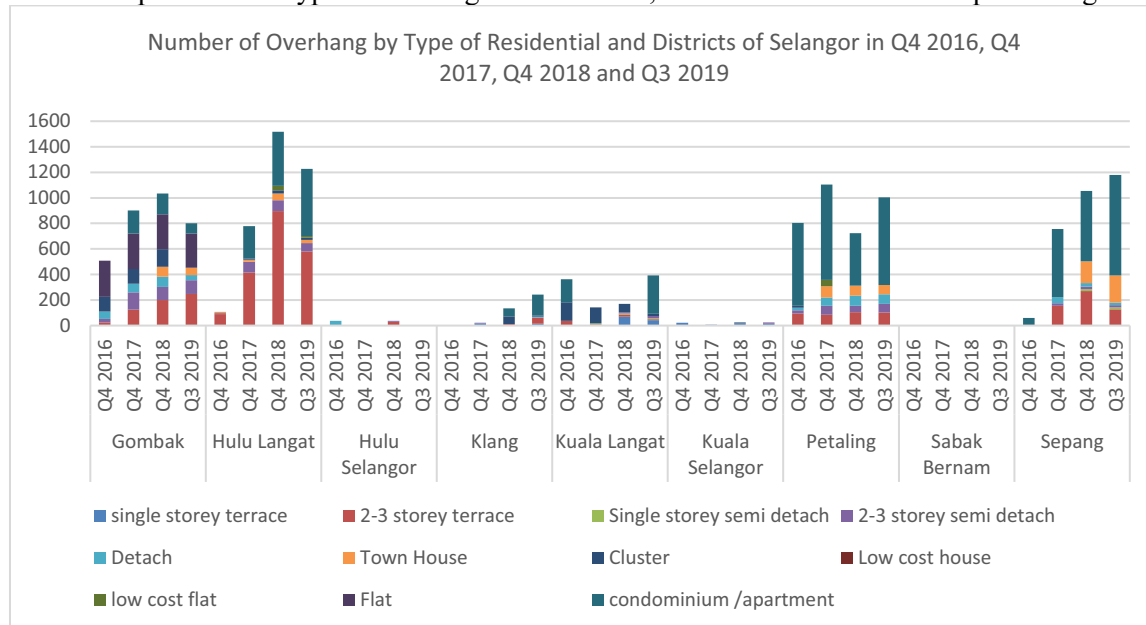
**Table 3:** Housing Affordability approach [13]

Median Income		Median Multiple 3 (MM3) Approach		Housing Cost Burden (HCB) Approach		
States	Median Monthly Household Income (RM)	Median Annual Income (RM)	MM 3 Approach House Price (RM)	Nett Median Monthly Household Income (RM)	30% of Nett Median Monthly Household Income (RM)	HCB House Price (RM)
Selangor	7225	86700	260,000	5988	1796	422,000



**Figure 1:** Number of overhang residential units by house price in Selangor in year Q4 2016, Q4 2017, Q4 2018 and Q3 2019 [18], [20]–[22].

The unsold completed units (overhang) for half year 2019 in the Malaysian residential market in total has increased to 32,810 units worth RM19.76 billion [23]. In Selangor alone, the residential overhang units increased from the year 2016 to Q3 2019 with 4,872 units in total, worth RM3,792.11 million [22]. The greatest residential overhang in Selangor was for type of condominium/apartment and the residential prices for all types of housing worth RM500,000 and above were also experiencing overhang.

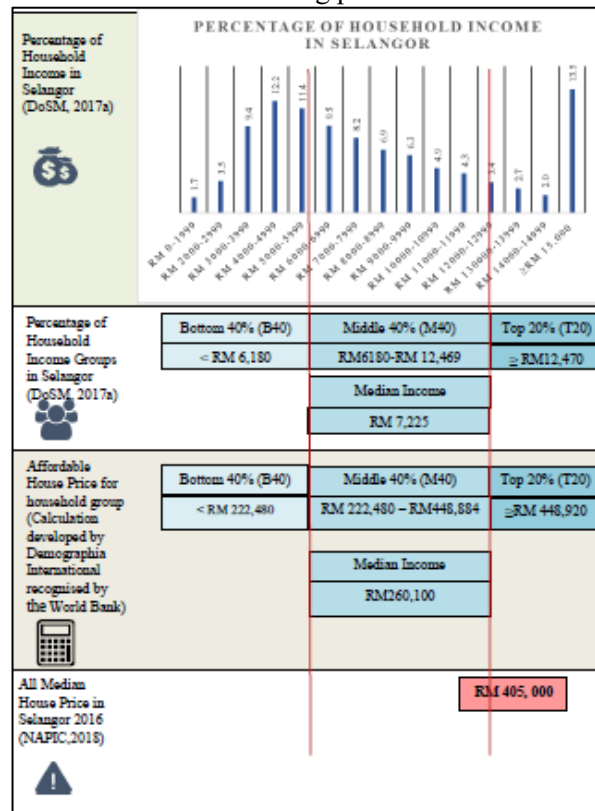


**Figure 2:** Number of overhang residential units by Selangor districts and type in year Q4 2016, Q4 2017, Q4 2018 and Q3 2019 [18], [20]–[22].

### 2.1. Housing Preferences

Supply can be referred as the production and availability of the real estate product [24]. In the situation of housing demands in Malaysia, Bank Negara estimated about 200,000 units annually will be required to match the estimated growth in household during year 2016 and 2020 [4]. Despite the supply shortage [4], [13], total overhang was also increased. In the mismatched crisis of demand – supply, it was found that the supply side was producing unaffordable house price and not meeting the demand of the M40 household income group. The M40 household income group as the prospective house purchasers were known to have more choices of properties offered in the market for them, but the factor of financial limitations to finance the house have influenced them to buy the properties based on the financial burden that matched their household income capability. In targeting the M40, the supply side should keep up with the financial burden of the group. Therefore, the factor of housing price is crucial in making choices of which house to buy. The research conducted has found out that the demand to purchase housing in Malaysia is significantly related with house price [8], [25]. However, the challenge of offering the affordable housing price is to identify the right prices at the target location [26]. This was a result of local economic development which is different from one place to another, due to the differences in local employment opportunities and resources. The ‘one-size-fits all’ idea should not be considered as the household income ranges by district and state are difference [27]. However, Yap [16], found that the price range for affordable housing from an interviewee’s perspective was between RM150,000-RM300,000. Whereas Ling [28] also conducted a questionnaire survey and found that most of respondents preferred a house price of RM500,000 and below. Although previous research has found many ranges in illustrating the compatibility of affordable house prices, this study uses the median household income to determine the affordable house price by using the median affordability house price within the local districts of Selangor for the year 2016.

Since household income makes a standard contribution to the purchase of a house at the right price at a desired location, harmonizing affordable housing supply as a priority should be a target. Samad *et al.* [15] emphasized that the supply side should fit the citizen need based on the location, price and target group as a contribution to solve the affordable housing problem.



**Figure 3:** Percentage of household income in Selangor and suitable affordable house price for B40, M40 and T20 income groups for year 2016 [10], [29].

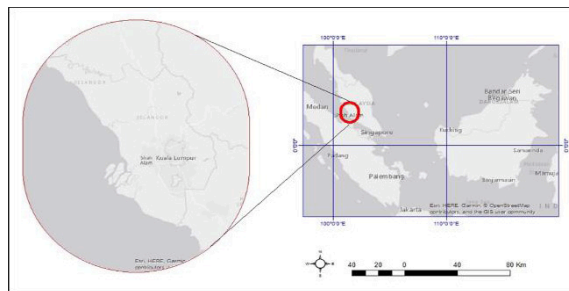
In addition, this study considers the types of house and area in highlighting its aim. This is because, the previous studies by Zainon *et al.* [25] and Ling [28] have discussed the type of housing preferences within the scope of their study. Based on their research, the house purchaser prefers to purchase and move to a landed house. Zainon *et al.* [25] found that the terraced house is the most preferred type of housing among the respondents. Previous research also found out that the location factor was often discussed when purchasing houses. According to Ling [28], urban youngsters prefer to live in an urban area whilst Zainon *et al.* [25] found that the respondents in the Klang Valley area prefer to live near to the city as compared to the city centre.

Although previous studies have discussed the housing preferences and affordable housing, yet no studies have been conducted using spatial patterns to analyse the affordability of housing and overhang. In this study, the type of houses, price, income and location were the factors considered in understanding the overhang crisis.

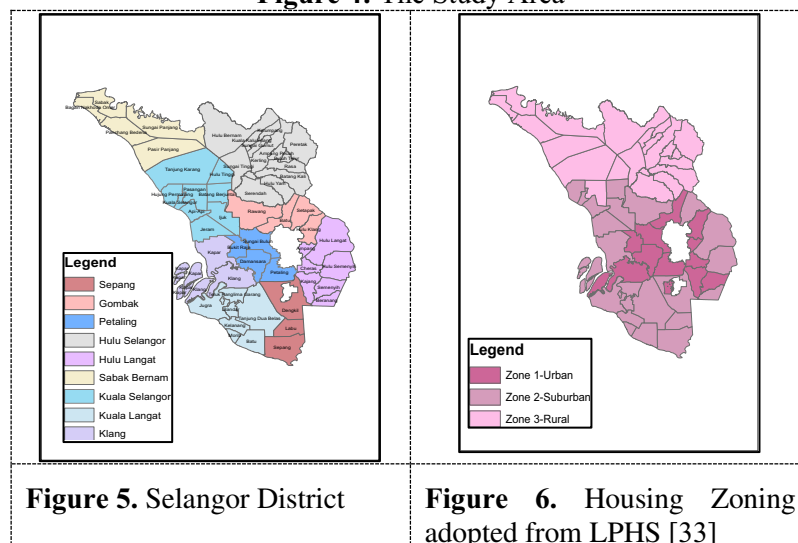
### 2.2. Study Area

Selangor state is situated in the west of the Peninsular Malaysia which adjacent to two Malaysian Federal Territories, the Kuala Lumpur Federal Territory and Putrajaya Federal Territory. Selangor is located near the border of Perak to the north and Negeri Sembilan to the South with Pahang on the East of the Peninsular Malaysia (see figure 4). Selangor consists of 54 subdivisions (*mukim*) for nine districts,

namely Klang, Kuala Langat, Kuala Selangor, Sabak Bernam, Hulu Langat, Hulu Selangor, Petaling, Gombak, and Sepang. (see figure 5). The Selangor Housing and Property Board (LPHS) as one of local authority has classified three housing zoning in that state namely the urban, suburban and rural (see figure 6). Selangor covers an area of 795,736.59 hectares [30] and recorded the highest percentage of the population in 2016 with 19.9% of the 31.7 million Malaysian population. The percentage of M40 household income group in Selangor was also the highest in Malaysia with 26.4%. The average household income was 4.1 person [31], [32]. The population was projected to increase up to 7.3 million in year 2020 and Selangor state was a major contributor to Malaysia's gross domestic product (GDP) with 22.7% (value almost RM252 million) in the year 2016 [10]. Since Selangor makes the highest contribution to Malaysia's GDP, the population and migration has been increasing in this state thus creating more demand for housing.



**Figure 4:** The Study Area



**Figure 5.** Selangor District

**Figure 6.** Housing Zoning adopted from LPHS [33]

### 2.3. Study Area Housing Provision

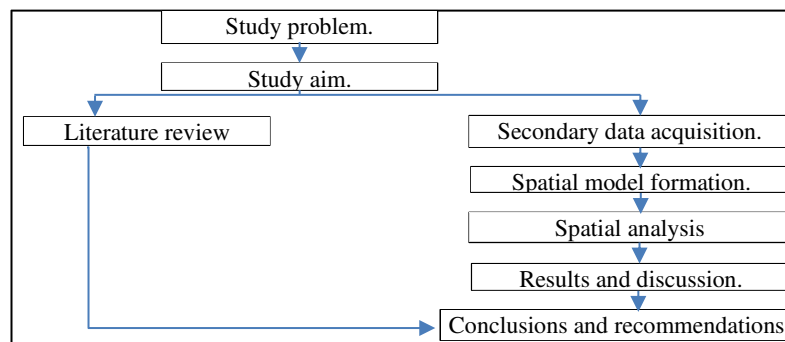
The Selangor Housing and Property Board (LPHS) is the authority issuing the circular for the affordable housing programme namely the “*Rumah Selangorku*” in Selangor since 2013. The Selangor housing provision rebranded the existing housing provision to “*Rumah Selangorku*” formerly known as low-cost houses, low-cost medium house, medium house and affordable home [34]. LPHS was authorised to monitor each housing development to comply with the circular requirements. LPHS divided the housing development in Selangor state into three zones (see Figure 6) and sets the selling price of housing units for each housing land development within the price range of RM42,000 to RM250,000. The eligible Selangor citizens can apply to purchase “*Rumah Selangorku*” houses through the LPHS authority. Although the affordable price range was set for each acre of development area in Selangor, there is still a gap for the property market to cater for demand from the median income group.

**Table 4:** Socio-economic data [32] with median multiple affordability house price by district of household income using the median multiple approach.

No.	Selangor District	Percentage Population of Household	Percentage by household income group			Median income (RM)	Median multiple affordability house price (RM)	Area (sq.k m)	Area Percentage distribution (%)	Population density (per sq.km)
			T20	M40	B40					
1	Klang	15.1	12.2	14.9	11.1	6724	242064	627	7.9	1,581
2	Kuala Langat	3.5	1.1	3	5.1	5293	190548	858	10.8	304
3	Kuala Selangor	3.9	2	2.7	5.9	4979	179244	1,178	14.9	205
4	Sabak Bernam	1.5	0.3	0.9	2.9	4060	146160	997	12.6	122
5	Hulu Langat	20.3	20.6	23	17.5	7851	282636	829	10.5	1,598
6	Hulu Selangor	4.7	1	3.9	7.4	5421	195156	1,746	22.0	131
7	Petaling	34.5	44.3	33.4	30.7	7904	284544	487	6.1	4,283
8	Gombak	15.1	14.2	13.9	11.1	7903	284508	653	8.2	1,204
9	Sepang	3.7	4.3	4.4	2.6	8174	294264	556	7.0	445

### 3. Research Methodology

In order to achieve the research objectives, secondary data was obtained from various sources such as from the Department of Statistics (DoSM), NAPIC, PLANMalaysia and The Selangor Housing and Property Board (LPHS). All of the data collected in the form of .pdf file except the maps from the PLANMalaysia and Selangor Town and Country Planning Department were in the format of shape file (see table 4). The data in the format of .pdf was keyed in the attribute table of the ArcGIS software and spatial model was form using the map provided by PLANMalaysia shape file data. Then, the spatial analysis was conducted to see the scattering patterns of the land use to analyse the residential supply in Selangor. The summary of this article's research methodology are as follows (figure 7):

**Figure 7:** Research Framework

#### 3.1. Data Sources and Limitation

Data was obtained from various sources, but the secondary data was limited to the published findings by responsible agencies related to the research topic. For an instance, to measure the affordability for year 2018 required the data of household income from the DoSM, which will only be published in the next two years (2020). Even the data for this research is limited, others available data for this study was from 2017 to 2019. Nevertheless, the data affordability by type of houses for the year 2016 has been contributed to this study since the data was complete, both from the DoSM and NAPIC. To measure the affordability by type of houses in Selangor, this study was conducted by calculating the median house price for every type of house along with the annual median household income using the median multiple approach for every district of Selangor in year 2016. Whilst the overhang data from NAPIC was limited

to the number of overhang units based on every district in Selangor for the year 2016 until 2019. The analysis of the data set was depicted in the spatial pattern *as per* the detailed discussion below.

*3.1.1. Median House Price and Residential Overhang Data.* Median House Prices for nine residential types were obtained from the National Property Information Centre (NAPIC) for year 2016. Meanwhile, the data on the number of residential overhang units were collected for 2016 until quarter 3 (Q3) 2019 by the districts in Selangor.

*3.1.2. Socio-economic Data.* Various socio-economic data sets including the median household income by district, size of populations, percentage household income by group in the study area was obtained for the year of 2016 from the Department of Statistics of Malaysia (DoSM) (see table 4)

*3.1.3. Spatial Data.* Spatial data for the study area were obtained from the Federal Department of Town and Country Planning (PLANMalaysia) in March 2017. The spatial data provided information on current land-use for housing and the zoning of land use for housing. Current land use for housing depicted the location of most housing location in Selangor for 2017. While zoning land used for housing indicated the incoming planning housing supply in Selangor. To conduct a GIS-based analysis of the spatial distribution of current land use and zoning land use for housing, points and polygons representing nine districts of Selangor from the district's boundary layer were generated based on the district boundaries map provided by Selangor Town and Country Planning Department.

**Table 5:** Data acquisition for spatial model formation.

No.	Sources.	Types of data.	Data format.
1	National Property Information Centre (NAPIC).	Market median house price by residential types.	.pdf file.
2	Federal Department of Town and Country Planning (PLANMalaysia).	Spatial housing current land-use and zoning land-use.	Shape file.
3	Selangor Town and Country Planning Department.	District and <i>mukim</i> boundaries	Shape file.
4	Department of Statistics Malaysia (DoSM).	Selangor state household median income and population by districts	.pdf file.
5	LPHS	Housing Zoning	.pdf file

#### 4. Spatial Pattern Analysis

The spatial pattern can be defined as how a certain population occupies a landscape (in terms of structure, placement, or arrangement of objects on the ground) and the space between objects [35]. The spatial pattern was widely used for crime investigation, health and disease analysis, ecological changes and the property market. However, less research was dedicated to spatial pattern analysis regarding the affordable housing situation [36]. For this study, the spatial pattern of Selangor household settlement at Selangor land for housing was analysed using several methods. In order to study the current housing pattern in Selangor, four types of analysis were adapted using the ArcGIS.

##### 4.1. Point Density

Spatial analysis methods of point density were aimed to analyse the scattering land use pattern for housing developed in Selangor. A spatial point pattern is a spatial pattern that composed of closely arranged, somewhat organized, points [35]. Point density analyses the density of point features around an output raster cell. The current housing land use density and zoning for housing land use density were analysed within Selangor state to measure the highest density for housing purposes in the current and



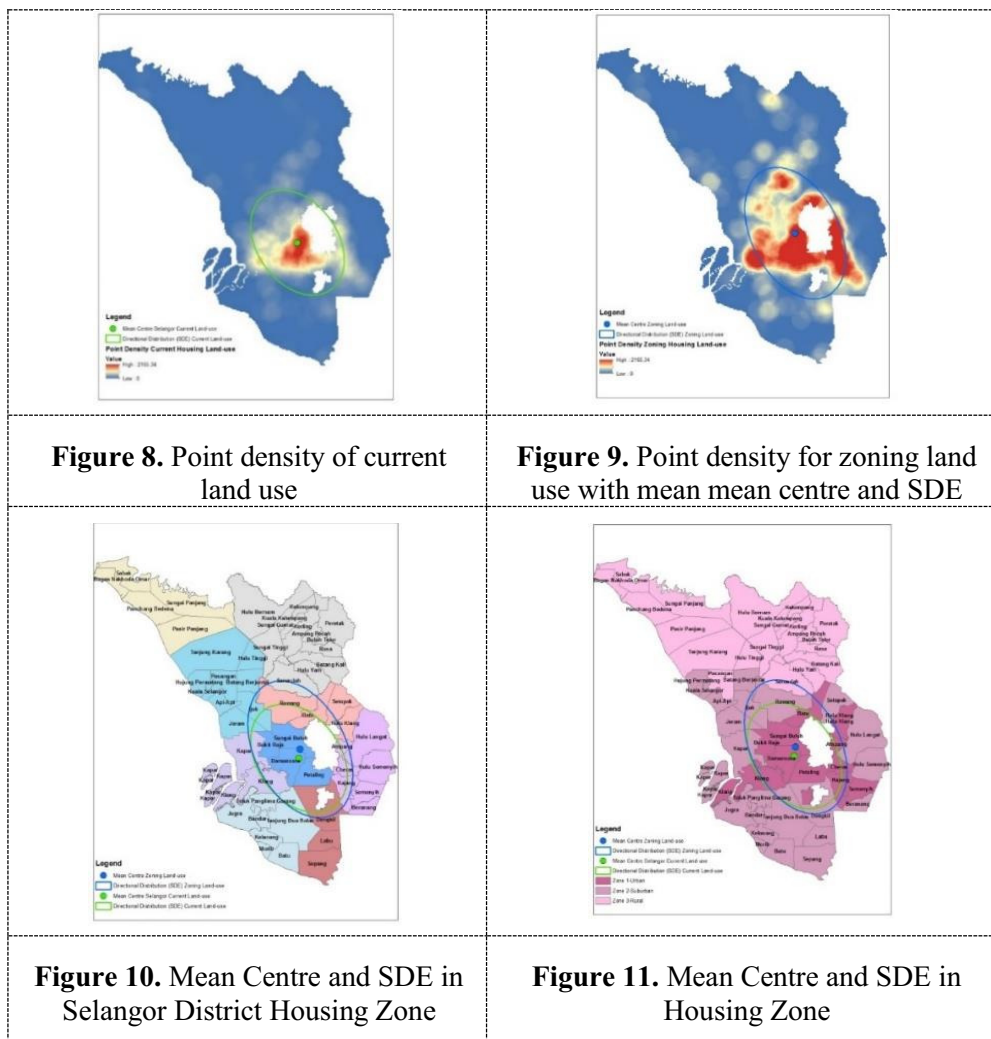
future developments of Selangor. Point density pattern for land use housing zoning indicated the trend of housing supply by location in Selangor for future planning development. Whilst the point density pattern for current housing and land use indicated the trend location of housing supplies.

4.2. Mean Centre

The results from the point density for housing were then persisting with the mean centre analysis method. The mean centre (MC) is the average location of a set of points [37]. Here, the MCs of the location’s current land-use for housing purposes and zoning land-use for housing purposes were examined. The analysis showed that the mean centre for housing land use was centred in the district of Petaling. This revealed that the density of housing supply was still focused in urban zone which is the Petaling district that has the highest M40 population in Selangor. The results indicated the pattern of housing development in Selangor (see Figure 10)

4.3. Directional Distribution (Standard Deviational Ellipses)

In the next step, the analysis standard deviational ellipse (SDE) was carried out to analyse the comparison of point density trend for current land use of housing and zoning land-use for housing. The standard deviational ellipse (SDE) measures whether a distribution of features displays a directional trend (whether features are farther from a specified point in one direction than in another.)



#### 4.4. Global Moran's *I*

The analysis method of spatial autocorrelation (global Moran's *I*) adopted to assess the affordability by the type of houses spatial pattern such as spatial distribution characteristics and spatial clustering in the nine districts of Selangor. The median house price for nine types of houses was calculated using the median multiple approach and included in the attribute table to generate and analyse the spatial affordability in the spatial model. The data sets for the types of houses involved was terraced houses (T), condominium/apartment (CA), cluster house (CH), detached house (DH), flat (F), low cost flat (LCF), low cost house (LCH), semi-detached house (SD), detached house (DH). The spatial affordability was then classified based on the median multiple approach (see Table 2) and depicted in Figure 16.

Sample calculation:

Median house price for the terraced type in Petaling district from NAPIC sources / annual median income in the Petaling district from DoSM sources = median multiple affordability.

RM 695,000/ RM 94,848= 7.3 (severely unaffordable (see table 2))

Then the value median affordability index for each type of houses in Selangor will be illustrated spatially in figure 16. To determine the phenomenon in the spatial model, whether it is a clustering pattern or not, the Moran's *I* statistical tools are used. The Moran's *I* uses feature values to identify and measure the strength of the spatial pattern [38]. Moran's *I* takes on the values between minus one (-1) and one (+1). A value of zero indicates that the pattern is random. If the value of Moran's *I* is statistically significantly closer to one, there is clustering. While if the value of Moran's *I* is statistically significantly closer to minus one, there is greater dispersion than expected from a random distribution [38]. Spatial analysis by using Global Moran's *I* for this study was only applicable for the nine sample districts, which was very less to apply since the data set is only applicable for the nine districts in Selangor rather by *mukim*. However, the result from the analysis is able to indicate clustered, random or dispersed patterns in analysing the phenomenon of affordability spatial pattern.

## 5. Results and Discussion

Most types of landed houses - terraced, semi-detached and detached - were severely unaffordable for residents in the local districts to own and further spatial analysis found that they were in a clustered pattern (see Table 6 and figure 16). Meanwhile, condominium/apartments were mostly affordable for local residents to purchase except in Petaling, Hulu Langat and Sepang districts. These three districts faced a big overhang number for the condominium/apartment housing type.

The highest current and zoned housing land using point density was in Petaling district where the mean centre was located on the spatial model. This district was the smallest area (sq.km) if compared to other districts in Selangor and the population density (per sq.km) was the highest of all the districts (see Table 4). Although Petaling district has a high density for housing land use, high population and high percentage of M40 household income group, the overhang for condominium/apartments was also high in the year of 2016 and increased in 2017. However, the overhang units in Petaling were declining in 2018 then increased again in year 2019.

Overall, the high point density for the zoning of land use for housing purposes in Selangor surrounded the Kuala Lumpur Federal Territory boundary. Further analysis using the directional distribution ellipses (SDE) for housing land indicated that the housing land use zoning (future planning supply) was greater towards Gombak district. This demonstrated that the pattern of land use for residential and housing supply was directed more to that particular district. Surprisingly, zoning land use for housing was also high in *mukim* Rawang (within the Gombak district) that was classified under zone 2 (suburban) by LPHS. In addition, the number of residential overhang in the Gombak district increased from 507 units in 2016 to 1034 units in 2018 (see Figure 12-15). The units with the highest overhang were flats and cluster houses in Gombak district for 2016 and 2017. In the year 2018, the town house type also showed overhang within the property market in Gombak.

Besides, the overhang of residential units also increased in Hulu Langat and Kuala Langat districts. While in Sepang district which possessed less M40 population in Selangor was also experiencing the

consecutive increase in the number of overhang units from 2016 to 2019 albeit the median household income in this district was higher compared to other districts in Selangor. The mismatch between demand and supply occurred due to low population of M40 in this district.

Districts near the Kuala Lumpur and Putrajaya Federal Territories recorded the highest overhang in 2016 until 2019. The result showed a clustered pattern of overhang for four consecutive years. Recent survey research by Zainon *et al.* [25] found that the highest demand for terraced houses in Klang Valley was for homeownership. Meanwhile, the spatial analysis in this paper discovered that those living in rural areas of Hulu Selangor could only afford to purchase terraced houses in that district. The chance to purchase houses in the urban area was limited to high-rise residential properties such as the condominium/apartment type. High population and land use density resulted in developers supplying high-rise residential units in urban areas. However, the offer prices were unaffordable to median household incomes in Selangor which caused the overhang of residential units, especially near to urban areas. In solving these issues, the government should be considering the provision of land to the developers catering for affordably priced housing in urban zones thereby ensuring that both parties gain the benefits. Besides, the government could subsidise the infrastructure, particularly the public transportation facilities in the suburban or rural areas, to ensure the demand for purchasing housing in those areas can be met. This will allow the citizen to minimize the cost of transportation to work while they can occupy their own affordably priced house. Indeed Selangor citizens still have the chance to purchase affordable houses in the suburban or rural areas within their income level. However, the accessibility preferences will become another challenge and may also influence the mismatch crisis.

**Table 6:** Global Moran's *I* analysis.

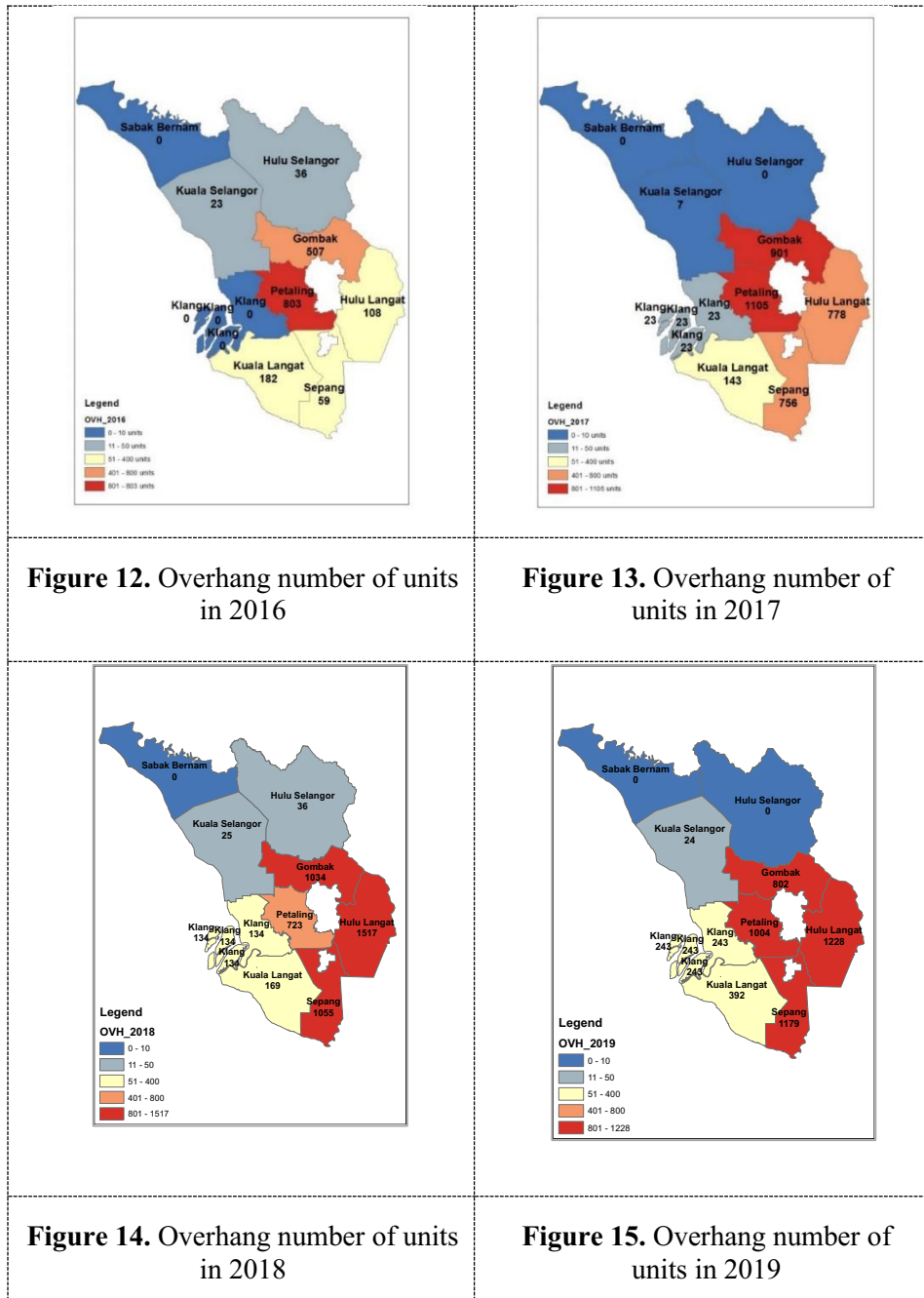
Global Moran's <i>I</i> (input field)	p-value (significance level)	z-score (critical value)	Moran's Index	Pattern
Median household income.	0.049887	1.960929	0.201507	Clustered
Affordability Condominium/apartment.	0.005932	2.751517	0.328083	Clustered
Affordability terraced house.	0.001956	3.096875	0.380732	Clustered
Affordability cluster house.	0.409663	0.824486	0.012577	Random
Affordability detached house.	0.005790	2.759437	0.402798	Clustered
Affordability Semi-detached.	0.057952	1.896061	0.153101	Clustered
Overhang 2016.	0.008872	2.616934	0.297516	Clustered
Overhang 2017.	0.008872	2.616934	0.297516	Clustered
Overhang 2018.	0.087165	1.710548	0.154129	Clustered
Overhang 2019.	0.025804	2.229142	0.2485804	Clustered
Owned dwellings.	0.237836	1.180413	0.060512	Random
Percentage of M40 population.	0.373630	0.889694	0.012271	Random

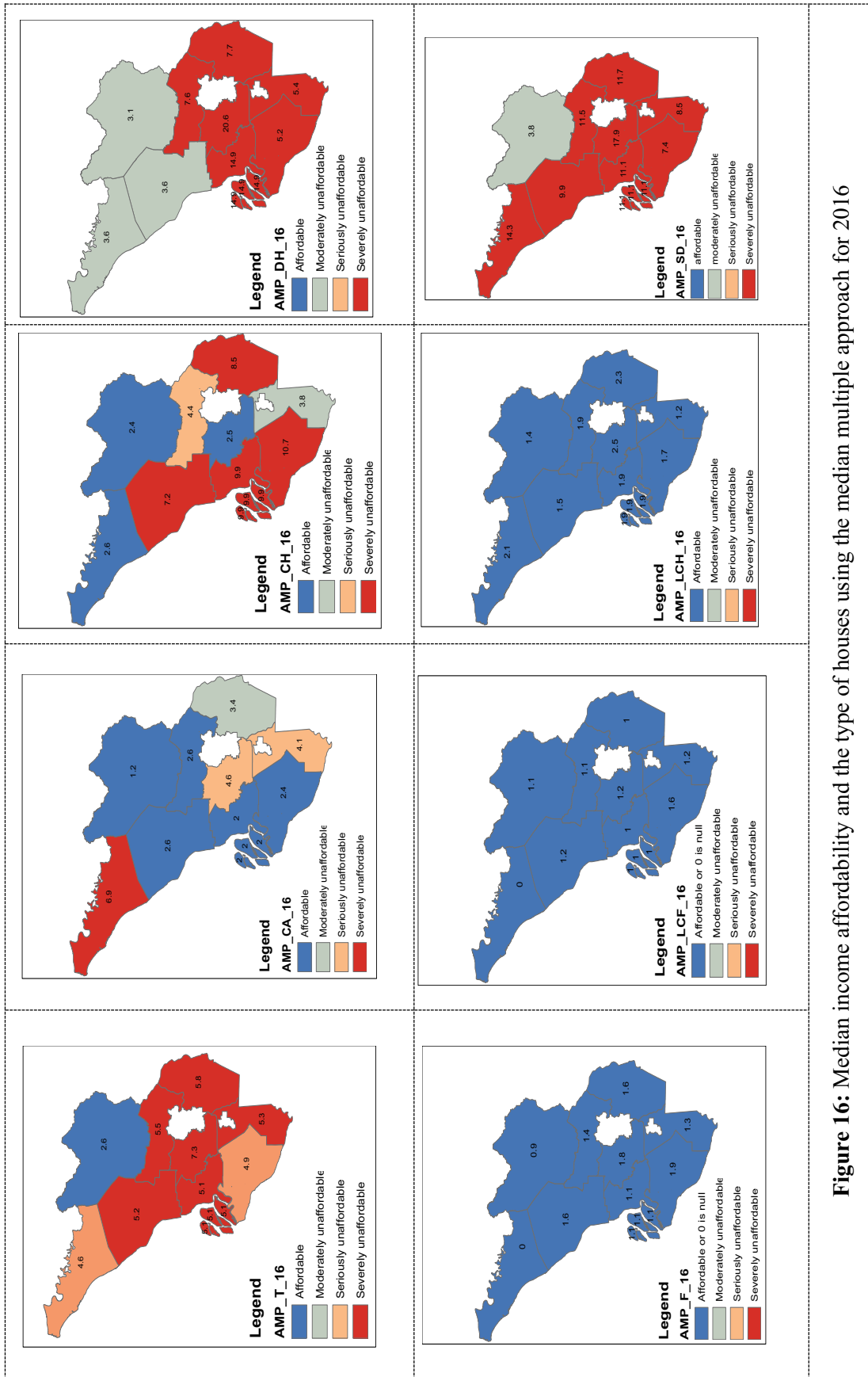
## 6. Conclusion and Recommendation

This study has analysed the spatial pattern of affordability by types of house in year 2016 for Selangor state. Concerning the overhang issues, the findings showed that the overhang of residential units in Selangor was increasing from year 2016 till 2019, which indicated a clustered pattern. Overall, in year 2016 the landed house types were unaffordable to the median income group. Meanwhile, the high rise residential units such as condominium/apartments were affordable in some districts. Besides, this type of house is highly overhung with large numbers of available units, particularly near to the Kuala Lumpur Federal Territory boundary due to the offered prices there being unaffordable to the median household income citizens.

Future planning housing supply location in Gombak district shows an increased overhang for three consecutive years, from 2016 to 2018. The future planning supply at *mukim* Rawang (located at Gombak

district) may overhang due to other factors such as public transportation availability. Thus, proper planning and provision by all stakeholders could reduce the mismatch of demand and supply crisis. This study is limited to the spatial data of house price, location, income and type of houses in examining the affordability and overhang crisis. Other factors and data could be included in the spatial model to generate better analysis. Factors such as public facilities and amenities such as public transportation may be related to issues of affordability and overhang. Thus, a further research and spatial analysis of mobility and accessibility should be carried out for future affordable housing to help in solving the affordability issues in the light of citizen needs.





**Figure 16:** Median income affordability and the type of houses using the median multiple approach for 2016

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