Assessing the Suitability of Affordable Housing Based on Demand Criteria

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Assessing the Suitability of Affordable Housing Based on Demand Criteria

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Abstract. Affordable housing has become essential to provide housing with affordable prices, but most of the locations of affordable housing are often not suitable with the people's demand. To assess the suitability of affordable housing, several initiatives has been developed, to match the demand and location of the affordable housing, but most the models lacks of spatial element, other model focusing on the goal related to site suitability to cities, and people's preferences of housing. This study aims to integrating spatial information and analysis to assessing the suitability level of affordable housing in Malaysia. This assessment model consists of 3 main indicators; suitability house according to neighbourhood context, demographic factor and commute distance. The method use in this study is using multi-Criteria Analysis, using weighted scoring techniques. The results show that most of the affordable housing score more than 60% average, with the highest score are 84% and the lowest score are 57.9%. this shows that the suitability level of affordable housing in the study area is good. These indicators can be used for further investigation of other affordable housing, and also in finding the suitable site for affordable housing in the future.

1. Introduction

Affordable housing has become an important aspect for government in providing a housing for all it's people, especially in urban area [1]. A comfortable house is a one of important part in order to find a happiness and productive life [1]. However, the affordability of individuals basically depending on 2 main aspects: the individual income and also the prices of the house [2]. This also happen in Malaysia, and to help Malaysian to buy the house, Malaysian government has provided and develop many affordable housings, especially in Klang Valley area. National Affordable Housing Policy (DRMM), Malaysian Government has established an agency and introduced a program to enable category of B40

and M40 to earn a house. These initiatives including development of 1Malaysia People's Housing Programme (PR1MA), Federal Territory Affordable Housing Policy (RUMAWIP), Rumah Mesra Rakyat (RMR), and Civil Servant Housing Programme (PPAM). Besides that, there are also another initiative by state government to provide affordable housing such as Rumah Selangorku, Rumah Mampu Milik Johor, and PR1MA Pahang [1].

Through DRMM that established by Department of Housing under Ministry of Housing and Local Government of Malaysia, it can help citizen to earn their own houses. However, aside of housing price, the other demand criteria to own affordable housing was less emphasis, especially the location of affordable housing. Previous study stated that current practices are less emphasis about the relationship between affordable housing with the other factors such as location suitability, relation with safety and security, public facilities, public transportation and many more. Even though, this factor is one of the important in order for homebuyers to earn house. Besides that, the studies that carried out by other researchers such as [2].

To handle these issues, this study aims to enhance current indicators to assess suitability level of affordable housing in aspect of demand criteria around Selangor by using spatial information and analysis. The scope of study focused on the indicators to assess from several aspects, and use the affordable housing scattered in Selangor State, Malaysia.

2. Affordable Housing and Suitability

To assess the suitability locations of affordable housing, it is important to have better understanding on the definition of affordable housing, and also suitability. Affordable housing is an approach used to explain socioeconomic and development environments in a country, and the main aims is to confirms if housing provided for families can be afforded by each income – earner cluster. Income – earner cluster classify as low, middle, or high income – earner cluster [3]. Affordable Housing can also be defined in multiple terms which are a measure of expenditure on housing to an income of the household. The terms of Affordable housing refers to any housing that meets some form of affordability criterion, which could be income level of the family, size of the dwelling unit or affordability in terms of EMI size or ratio of house price to annual income is accepted by government [4]. Affordable housing also can be defined as a housing that is intended to meet the needs of households whose incomes are not sufficient to allow them to access appropriate housing in the market without assistance [5].

Beside the affordability of housing prices, another aspect needs to be focus is the suitability of these affordable housing. To define housing suitability, demand criteria become one of the important aspects. Affordability of housing will determine the issue and supply, and where the availability complement market demand [6]. The demand factors involve many significant variables including the attribute of house price, household income, housing choice in the housing market, and limitation of affordable housing [7]. The affordability of the house have significant relationship with demographic factors, where different demographic background shows a different level of housing affordability including marital status, number of households, monthly income, and education level have a strong relationship with affordability housing price [8]. Besides that, the other factors such as location, accessibility, house type, cost of owning over renting, and service of facilities become one of the preferences to choose a suitable house [2]. Through the framework developed by the Housing Education and Research Association mentioned three main factors; type of households, social class, and value of housing. Another factors from [9] said it is important to give more attention on surrounding and neighbourhood as it divided into four characteristics as a preference to choose a suitable house which are physical environment, social environment, location and public facilities and location and transportation.

Based on previous study or model that have been developed by government of Malaysia and various researcher, there are 30 sub–indicators have been listed. However, not all indicators and sub-indicators are suitable to be stored and analysed using spatial information [10]. From the previous

study, the optimum indicators that should be included to analyse the suitability level of affordable housing can be divided into 4 main indicators, as shown in figure 1 [10].

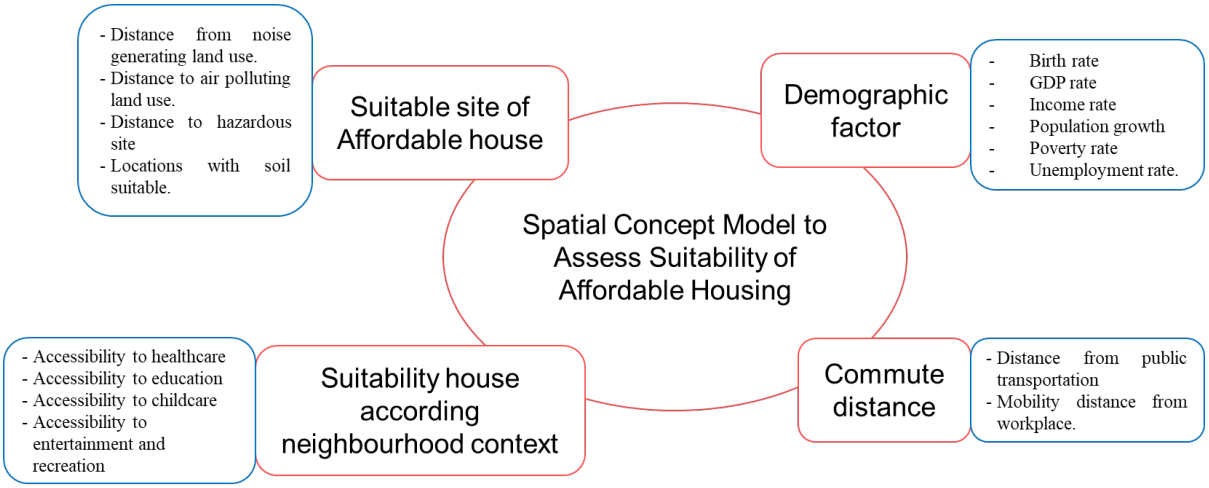


Figure 1. The indicators and sub-indicators to assess the suitability level of affordable housing in Malaysia based on demand criteria [10].

3. Research Methods

To assess the suitability of affordable housing in Malaysia, this study used Multi-Criteria Analysis (MCA). This being done via determining the indicators using weighted criteria, that evaluates a set of choices against a set of weighted factors. In this study, it consists of 3 main phases, (1) identifying the suitability indicators for affordable housing based on demand criteria from previous studies, (2) enhance the indicators and sub-indicators for assessment from previous studies, and (3) assessment of the suitability of affordable housing based on demand criteria. Figure 2 shows the phases in this study.

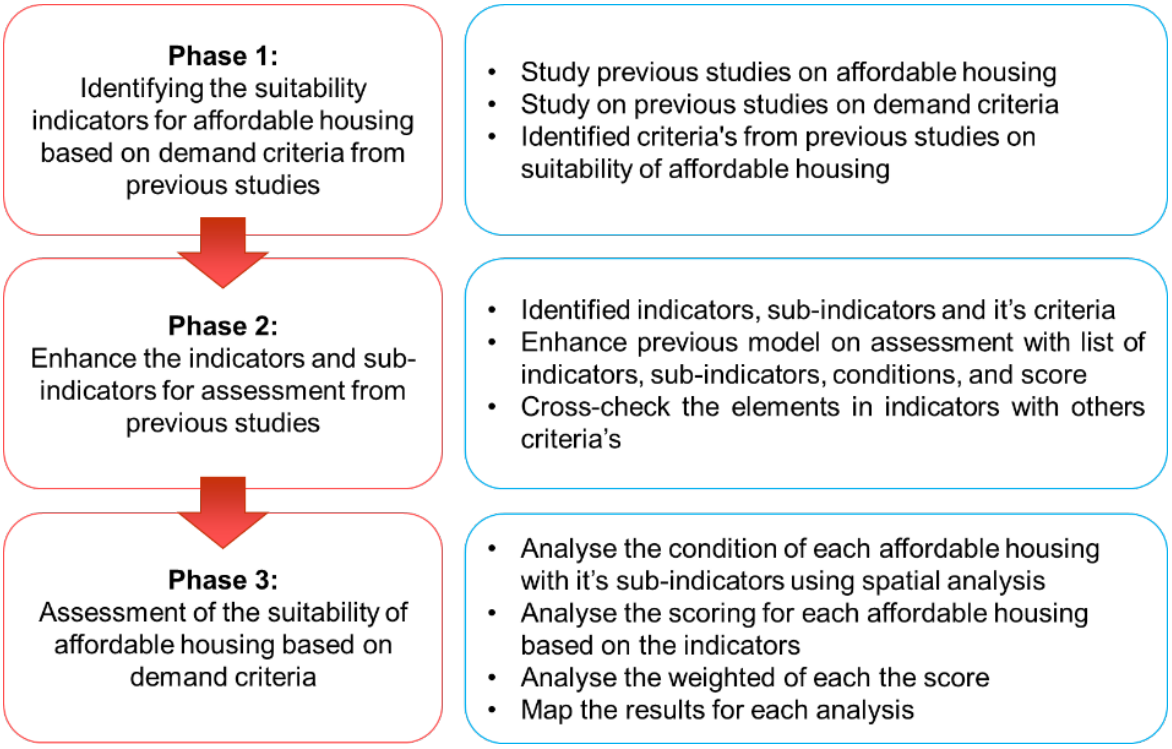


Figure 2. Methodology phases in this study.

The first phase is identifying the suitability indicators for affordable housing based on demand criteria from previous studies. In this phase, this study identified and compare the previous issues, limitation, and criteria that has been developed for housing suitability, and make synthesis and listed of main indicators and sub-indicators that related to affordable housing. From this phase, this study has listed 6 indicators from previous studies, and 7 main issues related to suitability of housing.

The second phase is enhancing the current indicators and sub-indicators for assessment from previous studies, to focus on the suitability assessment for affordable housing. In this phase, the indicators, sub-indicators from previous studies have been compare and synthesis, and from the synthesis, this study come out with 3 main indicators, and 15 sub-indicators that can be used to assess the suitability of affordable housing in Malaysia. These indicators and sub-indicators as shown in table 1 to table 3.

Table 1. Sub-indicators, accessibility and score for suitability house according to neighbourhood context indicator.

Indicator	Sub - Indicator		Accessibility	Score
Suitability house according to neighbourhood context.	Healthcare	Hospital	0 – 25 km	4
			26 km – 50 km	3
			51 km – 100 km	2
			>100 km	1
		Clinic	0 – 800 m	2
			>800 m	1
	Education	Primary School	0 – 0.4 km	3
			0.4 km – 0.8 km	2
			>0.8 km	1
		High School	0 – 0.8 km	3
			0.8 km – 1.6 km	2

			>1.6 km	1
	Entertainment and Recreation	Shopping mall	0 – 5 km	2
			>5 km	1
		Playground	0 – 400 m	3
			401 m – 800 m	2
			>800 m	1
		Park	0 – 1000 m	2
			>1000 m	1

Table 2. Sub-indicators, accessibility and score for demographic factor indicator

Indicator	Sub - Indicator	Condition	Score
Demographic factor	Birth rate	15.0 – 15.5	4
		14.4 – 14.9	3
		13.8 – 14.3	2
		13.2 – 13.7	1
	GDP rate (%)	5.9 - 6.4	4
		5.3 – 5.8	3
		4.7 – 5.2	2
		4.1 – 4.6	1
	Income rate (%)	8.2 – 8.7	3
		7.6 – 8.1	2
		7.0 – 7.5	1
	Population growth (million)	> 7.0	2
		< 7.0	1
	Unemployment rate (%)	2.0- 2.5	3
		2.6 – 3.1	2
		3.2 – 3.7	1

Table 3. Sub-indicators, accessibility and score for commute distance indicators

Indicator	Sub - Indicator		Accessibility	Score
Commute distance	Distance from public transportation	Train Station	0 – 400m	3
			401 m – 800 m	2
			> 800 m	1
		Bus Terminal	0 – 400 m	3
			401 m – 800 m	2
			> 800 m	1
	Mobility distance from the workplace.		< 5km	4
			5 km – 9.9 km	3
			10 km – 14.9 km	2
			> 15 km	1

The third phase is assessing of the suitability of affordable housing based on demand criteria. In this phase, spatial analysis has been done to each affordable housing, and the score based on the indicators and sub-indicators has been insert into the affordable housing. Next this study analyses the weighted for each score, and combine the scoring for affordable housing for all the indicators as shown in table 4. And from the results, mapping was produced to show the locations of each affordable housing, the score for each indicator, and overall score for all the indicators. To sum the total score, Figure 2 shows the formula used to calculate the total score with weightage.

Table 4. the weight for each indicator used in this study.

Indicator	Sub - indicator	Source	Weightage
Suitability house according to neighbourhood context	• Accessibility to healthcare • Accessibility to education • Accessibility to entertainment and recreation	[11], [12], [13], [2].	0.4
Demographic factor	• Birth rate • GDP rate • Income rate • Population growth • Unemployment rate.	[14], [12],[15]	0.3
Commute distance	• Distance from public transportation • Mobility distance from workplace.	[15], [11], [13]	0.3

Total score with weightage =

$$\frac{Total\ score\ each\ indicator}{Total\ \max\ score\ each\ indicator} \text{ x weightage each indicator}$$

Figure 3. Calculation for total score with weightage.

4. Results and Discussion

The results from this study are according to the total score with weightage based on formula in figure 3. The results are based on the suitability of affordable housing in neighbourhood context, demographic factors, and commute distance. Table 5 shows the results of total score for each indicator, and sub-indicators in this study.

Table 5. Results of total score for each indicator and sub-indicators.

AH name	Score										TS	%
	NC			DF					CD			
	Ed	Hc	RE	BR	GR	IR	PG	UG	PT	MD		
PPR Desa Rejang	4	6	5	2	1	3	2	3	4	3	33	73.3
PPR Gombak Setia	6	6	7	2	1	3	2	3	6	2	38	84.4
PPR Wangsa Sari	6	6	5	2	1	3	2	3	5	2	35	77.8
Rumawip Gombak	4	6	5	2	1	3	2	3	4	2	32	71.1
Residensi Jalan Jubilee	6	6	4	2	1	3	2	3	4	3	34	75.6
PPAM Metropolitan Kepong	2	6	4	2	1	3	2	3	2	2	27	60
PPR Sri Aman	4	6	4	2	1	3	2	3	2	2	29	64.4
PPR Taman Wahyu	2	6	5	2	1	3	2	3	4	2	30	66.7
PPR Kerinchi	6	6	6	2	1	3	2	3	5	3	37	82.2
PPR Sri Pantai	3	6	7	2	1	3	2	3	5	3	35	77.8
PPR Kampung	6	6	7	2	1	3	2	3	5	2	37	82.2

Muhibbah												
Residensi Bukit Jalil	5	5	5	2	1	3	2	3	6	1	33	73.3
PPAM Bukit Jalil	3	5	6	2	1	3	2	3	4	1	30	66.7
PPR Raya Permai	2	6	4	2	1	3	2	3	6	1	30	66.7
PRIMA Alam Damai	3	6	6	2	1	3	2	3	4	1	31	68.9
Total Score											491	
Total Max Score	**6**	**6**	**7**	**4**	**4**	**3**	**2**	**3**	**6**	**4**	**45**	

*Notes:
NC: Suitable house according neighborhood context
DR: Demographic Factor
CD: Commute Distance
Ed: Education
Hc: Healthcare
RE: Recreational and Entertainment
BR: Birth rate
GR: Growth rate
IR: Income rate
PG: Population growth
UG: Unemployment rate
PT: Distance from public transport
MD: Mobility distance

From the results, for indicator of suitability house according to neighbourhood context, the highest suitability level is 100%. The affordable housing that shows 100% suitability level is PPR Gombak Setia, and PPR Kampung Muhibbah. It shows that the location of affordable housing is near to education location, healthcare location and recreational and entertainment location while the lowest suitability level is 63.16%. The affordable house that shows the lowest score is PPR Raya Permai and PPAM Metropolitan Kepong.

For demographic factor's indicator, it differs from other indicators. This is because of the indicator are also includes Kuala Lumpur area which is inside the study area. Thus, the suitability level of a demographic factor of each affordable house is same which are 68.75%.

For commute distance indicator, the highest suitability level is 80%. The affordable housing that shows 80% suitability level is PPR Gombak Setia, PPR Kerinchi, and PPR Sri Pantai. It shows that the commute distance of affordable housing is short. The lowest suitability level is 40%. The affordable house that shows the lowest score is PPAM Metropolitan Kepong, and PPR Sri Aman

The total score for all the indicators that have been highlighted to assess the suitability level of affordable housing in an aspect of demand criteria, it shows that PPR Gombak Setia, PPR Kerinchi and PPR Kampung Muhibbah has the highest suitability level of affordable housing in an aspect of demand criteria with 84.6%, 82.5% and 81.6% value. For the lowest scores are PPAM Metropolitan Kepong and PPR Sri Aman with suitability level 57.9% and 62.1%. Figure 4 shows the graph of percentage for total score of all the affordable housing in this study. Figure 5 shows the location for each affordable housing, and its percentage score of suitability based on demand criteria.

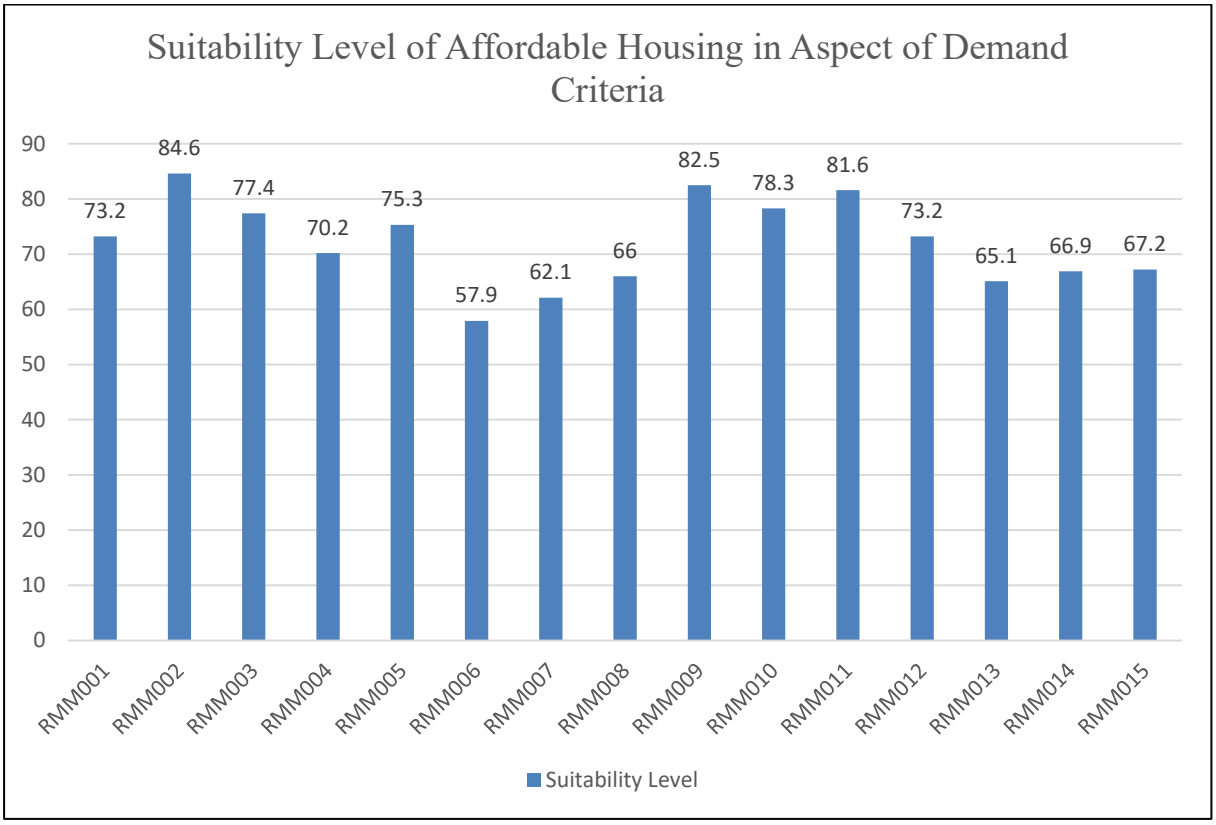
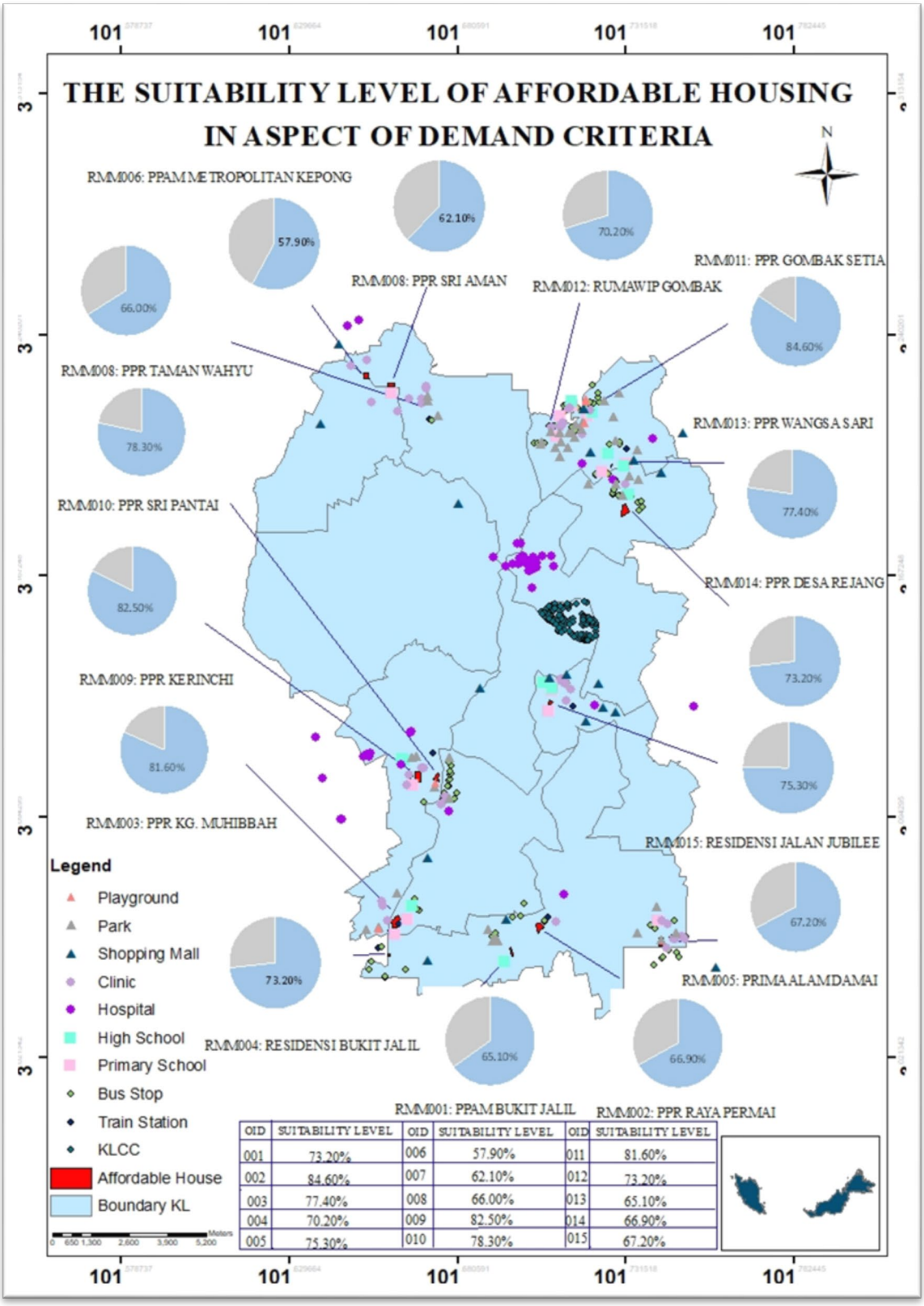


Figure 4. Graph of suitability level of all indicator in this study in an aspect of demand criteria.



OID	SUITABILITY LEVEL	OID	SUITABILITY LEVEL	OID	SUITABILITY LEVEL
001	73.20%	006	57.90%	011	81.60%
002	84.60%	007	62.10%	012	73.20%
003	77.40%	008	66.00%	013	65.10%
004	70.20%	009	82.50%	014	66.90%
005	75.30%	010	78.30%	015	67.20%

Figure 5. Map for affordable housing with its percentage of suitability based on demand criteria.

4.1. Discussion

In this study, there are three indicators highlighted which are suitability house according to neighbourhood context, demographic factor and commute distance. Even though in figure 1 shows there are 4 indicators can be used for suitability study, but in this study only 3 main indicators were most suitable and used for analysis and assessment of suitability of affordable housing.

For first indicators, which is suitability house according to neighbourhood context, there are 3 sub-indicators, which is accessibility to education, accessibility to healthcare facilities (government only), and accessibility to entertainment and recreation. From this study, it shows that most of the affordable housing in this study score more than 60% above, and 2 affordable housing score 100%.

The second indicators are demographic factors, with 5 sub-indicators, including birth rate, GDP rate, income rate, population growth, and unemployment rate. For this analysis, all the affordable housing has the same score, due to data restriction that based on state, and not by focusing area.

The third indicator are the commute distance, that have 2 sub-indicators, which is commute distance from affordable housing to nearest public transportation, and commute distance from the affordable housing to the workplace, in this study we focus to Kuala Lumpur as a city centre. From the analysis, it shows that the suitability level for both sub-indicators reach above 80% especially PPR Gombak Setia PPR Kerinchi, and PPR Sri Pantai.

For an overall indicator to assess the suitability level (%) of affordable housing in an aspect of demand criteria, the highest value resulted in this assessment is 84.4% (PPR Gombak Setia) while the lowest score is 57.9% (PPAM Metropolitan Kepong). It shows that the maximum value of the suitability level in this study is above 80% and the minimum value is under 70%.

This analysis can also being improve with more information and factors related, such as land use information, the facilities, or other related information. If the land use shows the suitable land use usage, for example for residential, or commercial, the calculation will be a little bit different. Besides that, this study not focus on the disaster or other issues. For example, the suitability based on type of geology, or distance to recent disaster area such as flood, or river that can contribute to decrease score to the suitability score. This study can be a base for further study on the suitability assessment for housing, especially affordable housing, or high-rise residential.

5. Conclusion

Affordable housing is important to provide a proper housing to people with low or middle income in the country. One of the most important aspect for affordable housing is the suitability with it's surrounding, or based on demand criteria. This study suggests 3 main indicators and 15 sub-indicators to assess the suitability level of affordable housing. Form this study, most of the affordable housing in the study area score more than 60% of suitability level, but with 1 affordable housing score below than 60%. These indicators can be improved via integrating with other elements such as disaster or land use or land cover information, beside a demographic information that based on the local area. This assessment can also be used to assess the new locations for affordable housing.

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