The Geographic Analysis of Problematic Auctioned Residential Properties

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Abstract

Of late, there has been a significant increase in the number of residential properties in Malaysia remaining unsold after repeated sales by auction. This growth in the incidence of what can be termed as problematic auctioned properties gave impetus to a study recently undertaken to investigate the phenomenon. The aim of the study was to gain meaningful insight into the phenomenon by exploring patterns in the spatial distribution of the problematic auctioned properties. The study utilized a dataset of 29,704 residential properties offered for auction over the period of 2005 to 2009 in Selangor and Kuala Lumpur, the two most developed states of Malaysia. With the help of a GIS, spatial patterns were explored and were found to exist in ways that allowed certain interpretations to be made toward understanding what had happened and why. We found certain localities to be more prone to the incidences of problematic properties and, in this paper, offered some explanations why. As the next step forward, we suggest that a model for predicting the incidence of problematic properties be developed.

Keywords : GIS, Property Auction, Residential Property, Spatial Patterns

1.0 Introduction

Recent development in the Malaysian property market has made the auction means of property disposal a subject of interest to investigate. Of late, there has been a significant growth in the number of residential properties on auction. In an economy where auction constitutes a detraction from the property and acts as a means by which to recover the amount in loan, there is the concern that this state of affairs does not reflect well on the state of the residential market, particularly in view of its possible effect on the lending institutions. While supply indicators are well-monitored by public institutions such as the National Property Information Centre, in short NAPIC, auction data appears to have escaped the scrutiny so far. Where there is an established literature concerning the comparison of revenues from auction formats to revenues from private negotiations (Dotzour, *et al.*, 1998; Mayer, 1998; and Allen & Swisher, 2000), less attention has been focused on analysing the spatiality of auction with a view to examining the spatial nature of the auction phenomenon. Even less is an exploratory study that seeks to investigate the geographic patterns

relating to the incidences of auction data. A study of this nature is normally useful to be undertaken as a preliminary step to modeling runs.

A geographic analysis is always useful because it provides insights that the textual information alone is not able to offer. Given that the geographic analysis has proven useful in the past in the detection of causes and effects (Daud & Parker, 1998) a similar motivation has become the primary driver in this study to investigate possible interpretations that can be gleaned from looking at the spatial or geographic distribution of the auctioned residential properties.

According to the auction theory, the preference of auctions over negotiated transactions makes realised property prices higher under the former. Bulow and Klemper (1996) for example, argue that auctions will be preferable to private treaty. Stevenson *et al* (2010) claim that in many parts of the world, auction often represents the preferred method of sales for agents at the higher end of the market. Stevenson *et al.* (2010) also suggest that the heterogeneous nature of the properties generally sold at auctions and their high value may result in premiums over guide prices due to enhanced valuation uncertainty.

The objective of this study is to empirically analyse the auction properties in terms of their geographic distributions. Working on the data on auctioned residential properties, we investigate the patterns of the distribution to seek possible explanations for the way those properties are spatially distributed. Data for the study comes from 29,704 residential properties that were offered at auction during the period of 2005 to 2009 in Selangor and Federal Territories of Kuala Lumpur, the two most developed states of Malaysia. The dataset includes all auctions of landed and non-landed properties including flats, apartments, terraced houses, semi-detached and detached properties. The database was constructed from data advertised in local news media over the years under investigation. Thus this study deals with pre-auction period. In this paper, no attempt is made to investigate performance of auctioned properties since, for many properties, the completion of sales is not investigated and the data is thus not available in this respect.

The attributes captured of the 29,704 properties include the auction date, address of property, type of property, land area, tenure and reserve price. Also, each property was tracked through time to see if it appears again later on for the second and consecutive auctions for being unsold. This establishes the number of times each property has gone ‘under the hammer’ and yet remains unsold up to the cut-off point of time in the data collection. The geographic position of the property was then recorded and captured in GIS database.

In terms of the financial significance of the auction properties included in this study, they were worth a total of RM2.849 billion at their original market value, but this reduced to RM2.425 billion in reserve price, representing a discount of 14.9%. Profiling the auctioned properties by house type and price range, we obtained results as in Table 1.

Table 1: Counts on auctioned properties by housing type and price brackets

	Landed			**Highrise**	**Overall**
	Terraced	***Semi-detached***	***Detached***		
0 – 50,000	248 (4.8%)	0	1 (0.4%)	7,500 (31.2%)	7,749 (26.1%)
50,000 – 100,000	1,755 (33.8%)	37 (15.5%)	15 (5.6%)	11,750 (49.0%)	13,557 (45.6%)
100,000 – 150,000	1,510 (29.1%)	49 (20.6%)	29 (10.9%)	2,955 (12.3%)	4,543 (15.3%)
150,000 – 200,000	733 (14.1%)	46 (19.3%)	48 (18.0%)	1,041 (4.3%)	1,868 (6.3%)
200,000 and above	951 (18.3%)	106 (44.5%)	174 (65.2%)	756 (3.1%)	1,987 (6.7%)
Total	**5,197**	**238**	**267**	**24,002**	**29,704**

It can be seen that overall, more than 60% of the auctioned properties come from lower priced properties below RM100,000. Interestingly, a substantial proportion (45.6%) comes from those properties within RM50,000 and RM100,000. A majority of the auctioned properties come from the terraced type in the price range of RM50,000 – RM150,000 while in semi-detached and detached types at RM200,000 and above.

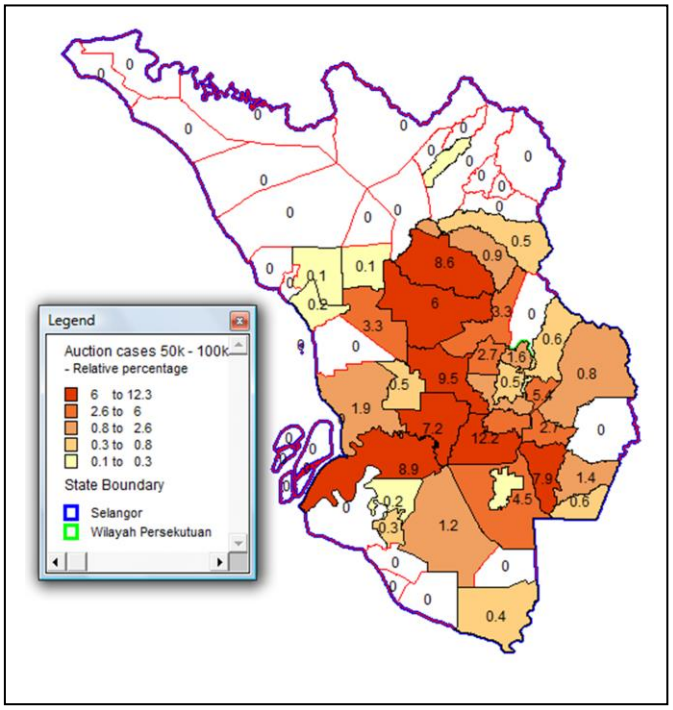


Figure 1: Relative percentages for 50k to 100k

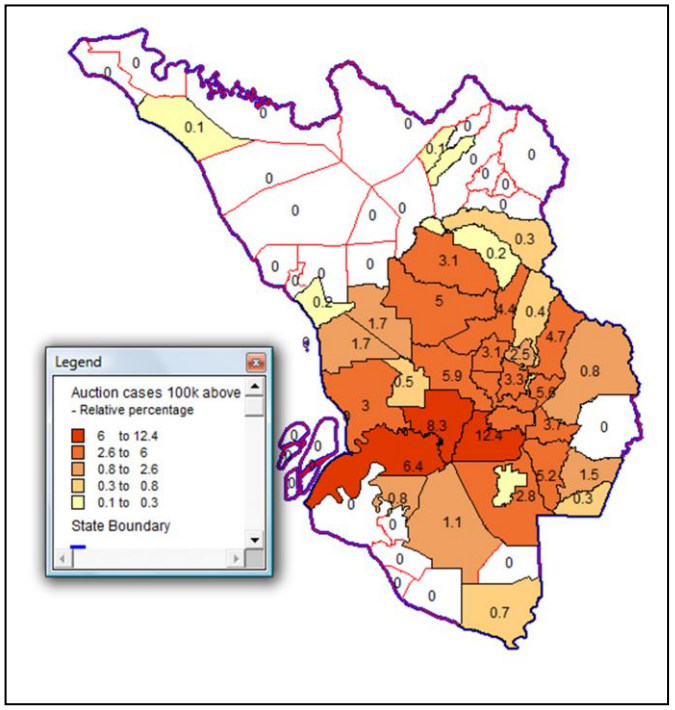


Figure 2: Relative percentages for 100k above

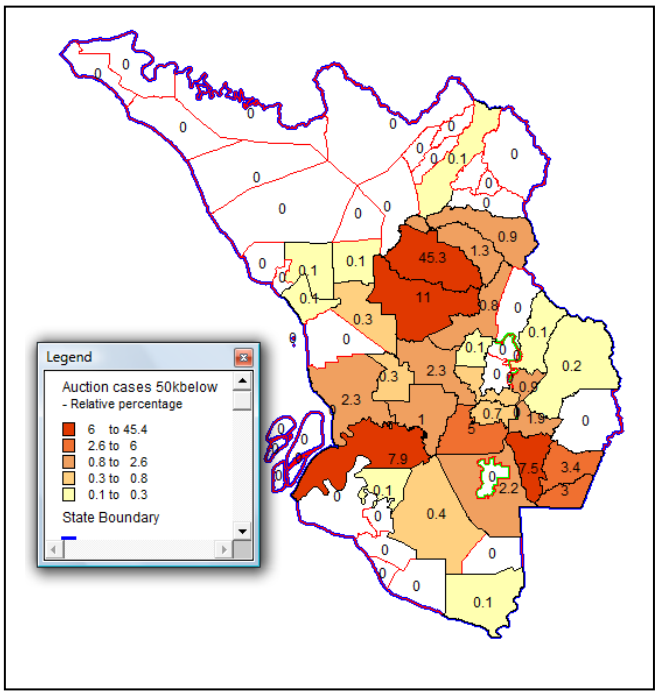


Figure 3 : Relative percentages for 50k below

Figures 1 – 3 above show the differing locational patterns that obtain when analysed at different market price levels. They show that auctioned properties are more omnipresent in RM50,000 - RM100,000 price category.

Ordinarily, auction refers to a public sale in which goods or properties are sold to the highest bidder whereby sale of property through auction is a way of disposing of an asset in an open market at the highest possible market rate (The Oxford English Dictionary). It is pertinent to note that Malaysia is similar to Singapore (Ong *et al.*, 2005) and the US (Mayer, 1998) whereby auctions refer to cases that are headed for foreclosure and bankruptcy procedure. This is different from the English open-outcry auctions which become a popular choice of sale mechanism particularly at the premium end of the market (Stevenson *et al*, 2010). As such, auction cases in Malaysia, although covering the whole spectrum of property prices, refer mainly to the lower end of the market as evident in Table 1. Given that this is the situation, we would expect to observe that auctioned properties achieve lower sales prices than the market prices that have been recorded earlier.

Thus, auction is generally considered as a method of last resort for property disposal. There is a negative stigma associated with auction properties in that such properties are invariably associated with distress properties, i.e. those that are subject to foreclosure and mortgage sales (Asabere & Huffman, 1992). In terms of the significance of the auction properties, they make up approximately 10.32% of the total residential transactions in any particular year in the area investigated.

As a sale mechanism, auction offers a number of advantages such as:

- The seller determines the date and time of the sale
- Timely auction allows the seller to reduce holding costs
- An auction environment arouses the competitive spirit among the prospective bidders
- Setting a specific date and time of sales creates a sense of urgency and forces the prospective buyers to the point of decision
- The seller can set terms and conditions of the auction and avoid lengthy negotiations of price and terms associated with traditional sale
- An advertisement program is tailored to the seller's property, which will attract the largest possible number of potential buyers. This insures a true market value for the property as determined by the market forces
- Auction allows the price to increase freely. This often leads to a higher sale price than would have been obtained by traditional sale
- Historically, when the market is on an upswing, public auctions have been known to establish the highest price. When the market is declining, an auction will capture the current market price before value drops

- The competitive bidding format creates confidence among buyers when they see other bidders willing to pay similar amount for the property
- The above refers to sales through private auction. The disposal by financial institutions to recover their loans is subject to various legal requirements as stipulated under various laws in Malaysia, such as the National Land Code (1965), etc.

2.0 Literature Review

A number of factors affect the value or marketability of a residential property including location, site, building, cost and depreciation factors (Friedman, 1978). In terms of saleability, a property's appeal depends on the market view of the extent to which its attributes reflect its worth when put up for sale. An inadequacy in respect of the above attributes or any of them could render the property difficult to dispose. In public auction, a residential property is often difficult to dispose when characterised by inadequacy in any of the above aspects such as poor location, poor neighbourhood and poor building conditions in a way that militates against its successful disposal even after going through multiple auctions and the concomitant price reductions after each time.

In the current study, a problematic property is defined as the residential property that has remained unsold after the third auction or after a discount of more than 19% from the starting Market Value. This definition follows the findings from Focus Group Meeting held in April 2008.

It has been observed that the key inadequacies that have been identified as closely associated with being problematic at public auction sales include location (with respect to distances from Kuala Lumpur and other major cities), accessibility (in terms of access to highways/main roads, road conditions, public transportation facilities), building conditions (physically and psychologically), neighbourhood issues (level of crimes, proneness to natural calamities, poorly managed or planned developments, negative stigma of immigrant communities) and legal issues affecting the ownership (Bumi restriction, Malay Reserve title, charges and caveats against title).

3.0 The Study Area

The study area comprises the two states of Selangor and the Federal Territories (FT) in Peninsular Malaysia. These two states represent region of fastest growth with the highest population concentration in the country. The latest statistics show FT as having

421,574 units in housing stock and Selangor 1,327,962 units. The existence of Kuala Lumpur within the study region make the latter home to some of the most densely populated areas in the country. However, not all the areas are of high density as the population is quite thinly spread in some localities. Thus the study region presents a spectrum of areas in terms of the population densities that are spread across 63 different mukims. These densities range from 0.05 to 132 persons per hectare (pph). With Kuala Lumpur acting as the hub, the population density generally follows a falling trend with distance away from the city centre (Figure 4). More particularly, areas of high population density are Kuala Lumpur, the mukims immediately adjoining it (Batu, Sungai Buloh, Damansara, Petaling, Kajang, Cheras, Ampang and Hulu Kelang, and the mukims along the south-west corridor towards Klang (Kapar, Klang, Teluk Panglima Garang).

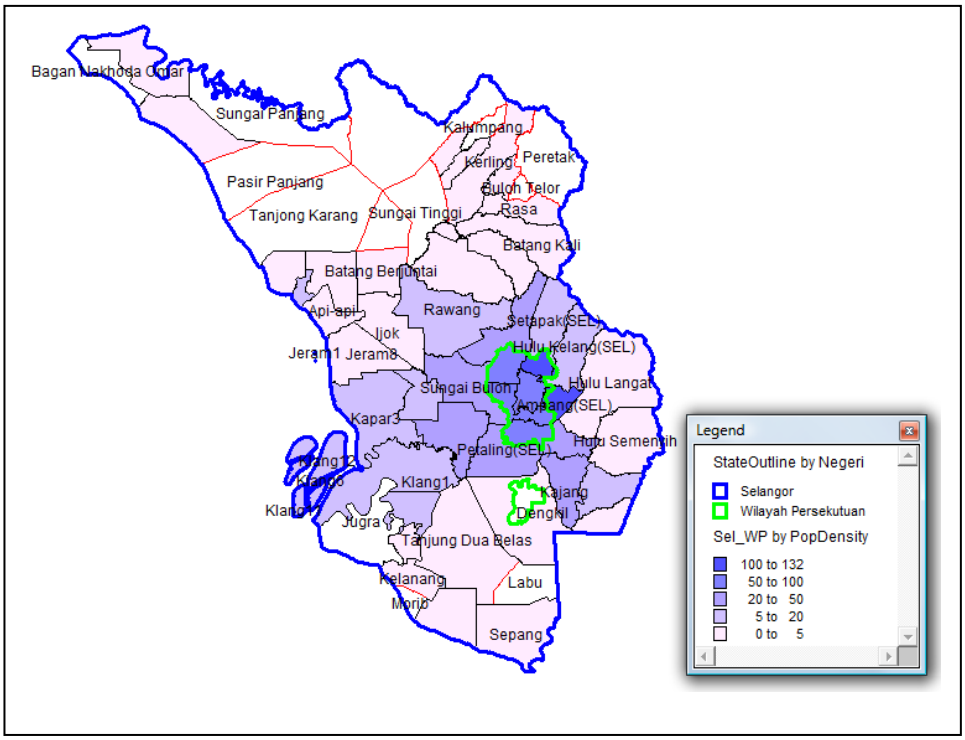


Figure 4: Population densities of the study area

4.0 The Geographic Distribution of the Auction Data

In general, a parallel appears to exist between the number of auction cases and the population density of the mukims within which the cases situate, as borne by the map in Figure 5. This parallel, however, seems to break down in the case of Serendah (demarcated in black) which, despite being only at 4.43 pph, has produced the highest count on auctioned residential properties of all the mukims. With 4,184 cases, Serendah holds 14.1% of the total auction cases in the study area and vastly overshadows

Petaling(SEL) which holds a lower 10.9% (3.228 cases) of the total despite being almost ten times more densely populated, at 41.1 pph. This observation points to Serendah being an 'outlier' mukim that merits further investigation. Elewhere, the mukims within Kuala Lumpur have a disproportionately low count of auction properties despite their high population densities. This could be attributable to the fact that the residential property market is generally healthy except in some areas that have been identified.

When analysed with respect to the segments within the residential properties, the highrise properties contribute overwhelmingly to the auction phenomenon with their total of 24,002 cases as compared to 5,702 for the landed segment thereby outnumbering the latter by almost 4 to 1.

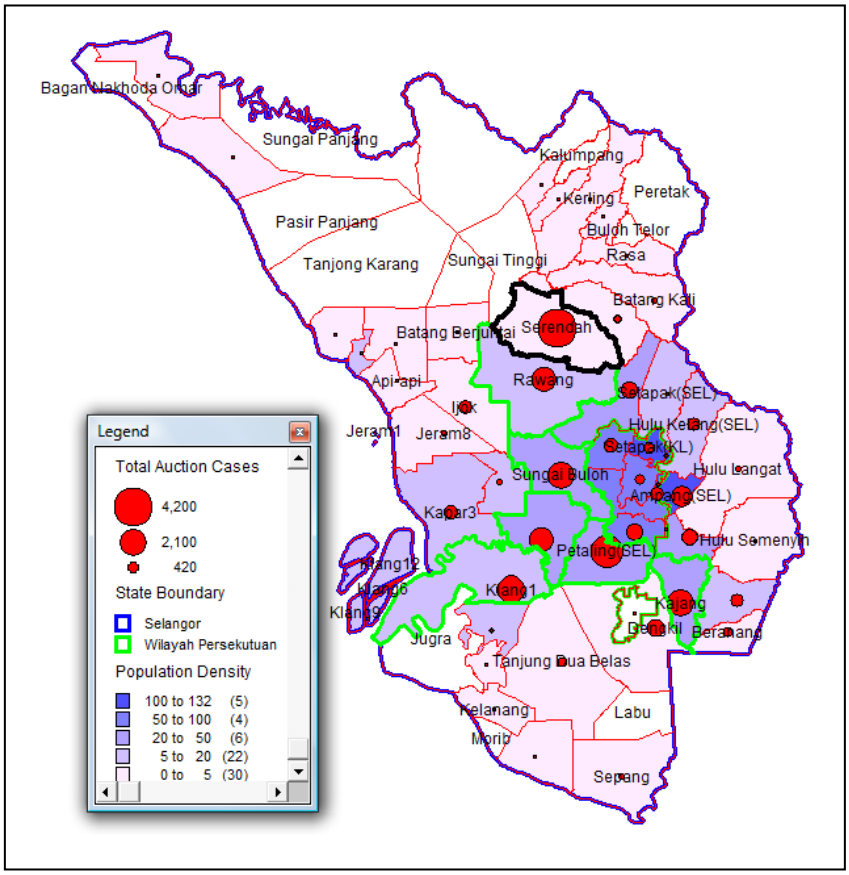


Figure 5: Distribution of all auction cases

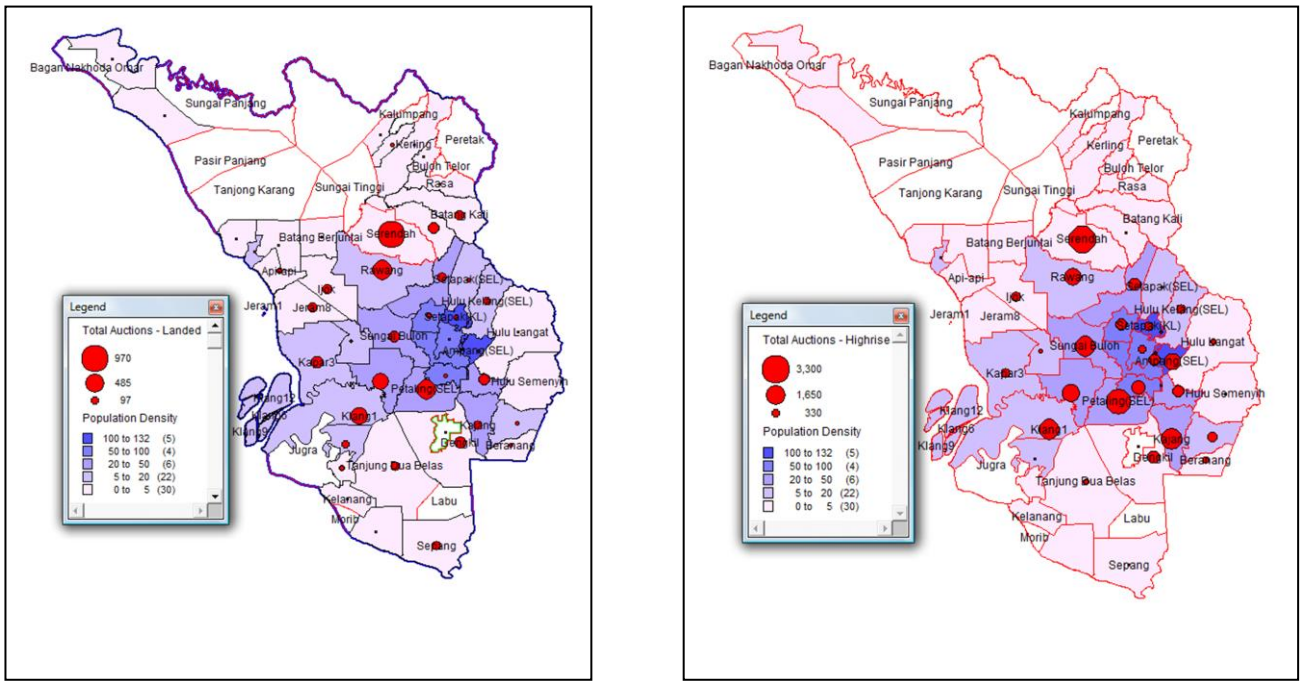
Table 2 shows the statistics that relate to auction cases recorded for the mukims at the upper spectrum of the auction problem. The mukims, more particularly demarcated by green borders in Figure 5, cover a region roughly triangular in shape but exclude those within the Kuala Lumpur city centre. Within the affected region, Klang, Kajang and Sungai Buloh come after Serendah and

Petaling (SEL) in terms of their shares of contribution to auctioned properties counts. The numbers in parentheses show the rankings with respect to the total auction cases recorded.

Table 2: Auction counts for mukims at the top end of the property auction problem

Mukim	**Overall**		**Landed**		**Highrise**	
	Total Cases	%	Total Cases	%	Total Cases	%
Serendah	4,184 *(1)*	14.1	964 *(1)*	16.9	3,220 *(1)*	13.4
Petaling(SEL)	3,228 *(2)*	10.9	563 *(2)*	9.9	2,665 *(2)*	11.1
Klang	2,346 *(3)*	7.9	456 *(4)*	8.0	1,890 *(4)*	7.9
Kajang	2,073 *(4)*	7.0	123 *(16)*	2.2	1,950 *(3)*	8.1
Sungai Buloh	2,054 *(5)*	6.9	188 *(9)*	3.3	1,866 *(5)*	7.8
Rawang	1,978 *(6)*	6.7	551 *(3)*	9.7	1,427 *(7)*	5.9
Damansara	1,888 *(7)*	6.4	401 *(5)*	7.0	1,487 *(6)*	6.2

However, the pattern varies slightly when analysed at property segment level. Within the landed and highrise segments, Serendah and Petaling(SEL) continue to dominate as the mukims with the highest auction counts, while the positions of Klang and Sungai Buloh are in lower and thus better positions. Of particular interest is Kajang which shows a 7.0% contribution overall but only a 2.2% contribution in the landed segment. This suggests that, relative to other mukims, Kajang's auction problem weighs more heavily in the highrise segment as is also Sungai Buloh. By similar argument, auction cases in Rawang and Damansara are relatively more prevalent in the landed segment rather than the highrise segment.



Landed Highrise

Figure 6: Comparison of auction cases on landed and highrise properties

5.0 The Problematic Properties

As defined earlier, a problematic property is one that has remained unsold after the third auction. With this definition, not every property that has gone through three unsuccessful auctions actually end up being problematic since some would find buyers by the third auction or, more significantly, that others have not actually reached the threshold number to be considered problematic. Given that the possibilities could lead to different analysis implications, it is nonetheless instructive to perform a simple description of the data as part of the exploratory analysis. The next step is thus to interrogate the auction data with a view to gleaning patterns to help in improved understanding of the context of the problematic properties.

Table 3 reveals that problematic properties comprise 33.8% (about one-third) of overall auction cases. Going by the property segment, however, the percentage on problematic properties is lower for landed properties at 23.7% and higher for the highrise segment at 36.2%. It is thus conceivable that a highrise property has, on average, a higher chance of becoming problematic compared to its landed 'counterpart'.

Table 3: Percentages for problematic properties

Type	**% Problematic**	**% Non-problematic**
All	33.8	66.2
Landed	23.7	76.3
Highrise	36.2	63.8

Across the mukims, the percentage composition of problematic properties varies rather significantly from the minimal 2.6% to the maximal 66.7%). We present below in Table 4, the mukims at the top end of the problematic scenario.

Table 4: The most problematic mukims by problematic properties composition

Mukim	**Overall**		**Landed**		**Highrise**	
	% Problematic	**Frequency of problematic**	**% Problematic**	**Frequency of problematic**	**% Problematic**	**Frequency of problematic**
Ampang Pecah	66.7 (1)	2	66.7 (1)	2	0	0
Kuala Kalumpang	60.0 (2)	6	60.0 (2)	6	0	0
Semenyih	58.5 (3)	321	43.3 (4)	13	59.3 (2)	308
Serendah	53.8 (4)	2,253	39.8 (9)	384	58.0 (3)	1,869
Cheras(KL)	52.2 (5)	12	42.9 (6)	3	56.2 (4)	9
Rawang	49.2 (6)	973	38.3 (10)	211	53.4 (6)	762

At 2,253 problematic cases, Serendah has by far the highest number of problematic properties; the next highest at only 973 was Rawang, which was followed by Klang and Kajang at 933 and 874 respectively. In terms of the percentage problematic, however, Serendah is eclipsed by three other mukims that are much lesser in number of problematic cases; for Ampang Pecah and Kalumpang in particular, the sample is too small for a reliable interpretation of the problematic percentage. Nonetheless, as Figure 7 shows the percentage of problematic auction properties is generally larger in outer areas. If this can be taken as indication, it is reasonable to surmise that the incidence of problematic properties tends to be more likely further away from the city centre. This is

rather intuitive because as we move away from the city centre, the population base becomes thinner and thus is the demand. So, it is the lack of demand coupled with property's own factors that make auction properties more in outlying areas.

Serendah and the surrounding areas is a phenomenon for which the problem is well-known in the country's economy. The phenomenon is related to a shift in the government decision on the location of Kuala Lumpur International Airport in the early 1990's, which triggered the sudden supply of housing in anticipation of the new housing needs following the new employment opportunities, only to find that the airport did not materialised there, resulting in the collapse of the housing sector. This had left the condition turning sour on the housing sector. Thus, an analysis of the unsold auction phenomenon would be more meaningful by treating this area separate from the rest of the analysis.

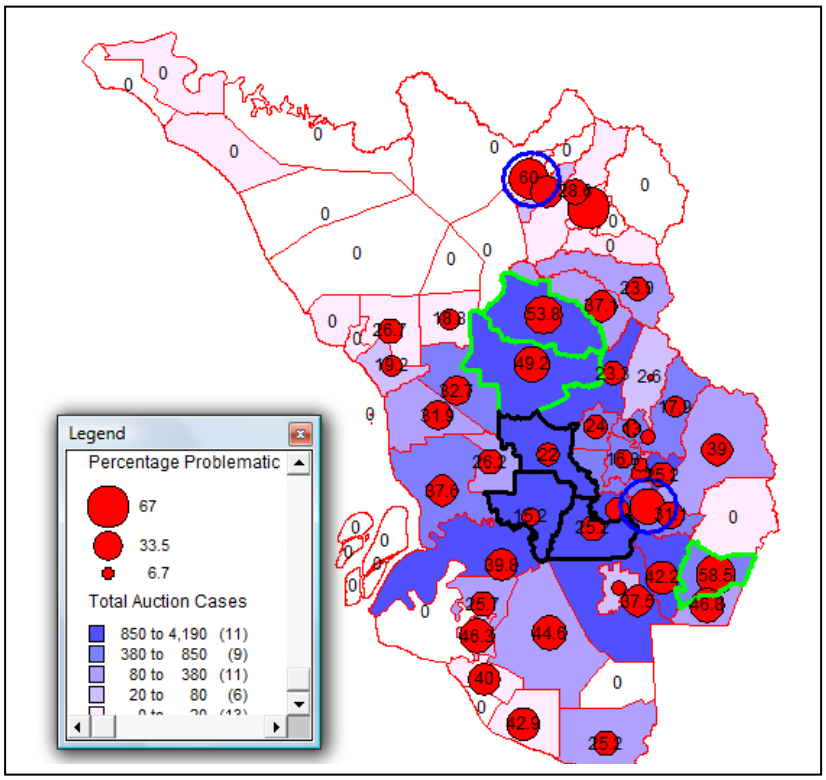


Figure 7: Problematic auctioned properties as a percentage of total auction cases

In Figure 7 the percentage of problematic properties data is juxtaposed on data representing the total number of auction cases data for each mukim. It shows the geographic distribution of the auction cases in terms of the proportion that is problematic which lies in the range of 6.7% to 66.7%. As a postulation, a mukim would signal a negative auction condition if it produces a high percentage of problematic properties on its high number of auction cases. Semenyih, Serendah and Rawang fall under this category

(marked in bold yellow on the map). This tends to suggest structural economic problem of sort or another in these mukims. Elsewhere, Petaling (SEL), Damansara and Sungai Buloh (outlined in black) have high auction counts but with lower proportions in problematic properties of between 15.2% and 25.2%. On the other extreme, mukims such as Ampang Pechah dan Kalumpang record very high proportions in problematic properties (> 60%) but on small number of auction cases. It is reasonable to surmise that the latter cases can be distinguished from the earlier cases in that the problematic phenomenon is highly localised and has more to do with the individual properties involved than the structural problem.

It is also possible to generate some kind of an index to compare the mukims in terms of the extent of their problematic properties relative to their auction cases. Given any mukim, the proportion of the mukim's contribution to problematic properties relative to the proportion of its contribution to auction cases can be calculated into an index as follow:

$$\text{Index}_{\text{Mukim A}} = \frac{\text{\% contribution to overall problematic properties X 100}}{\text{\% contribution to overall auction properties}}$$

The mukims can then be compared based on the indices. A mukim with a higher index number shows that the mukim's problematic situation is relatively higher than one with a lower number and vice versa. The results are as presented in Figure 8 while table 5 presents the mukims at the top end on extent of problem relative to auction cases.

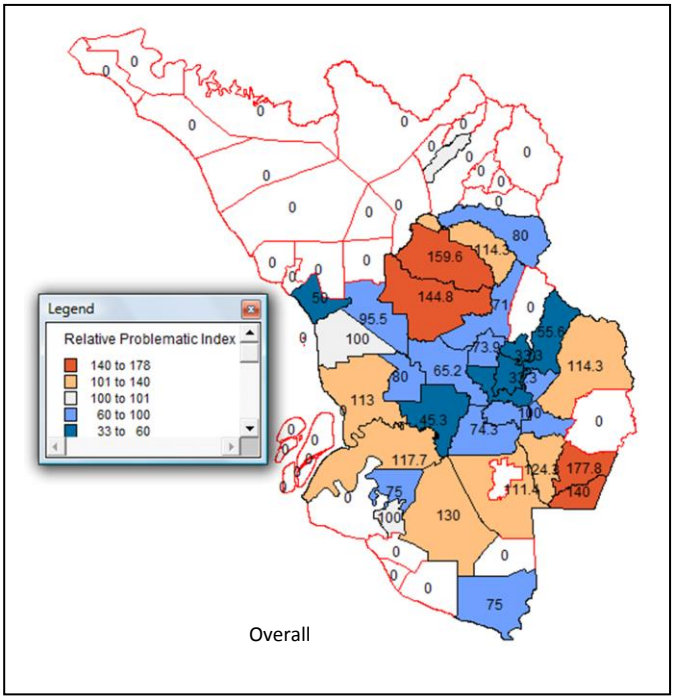


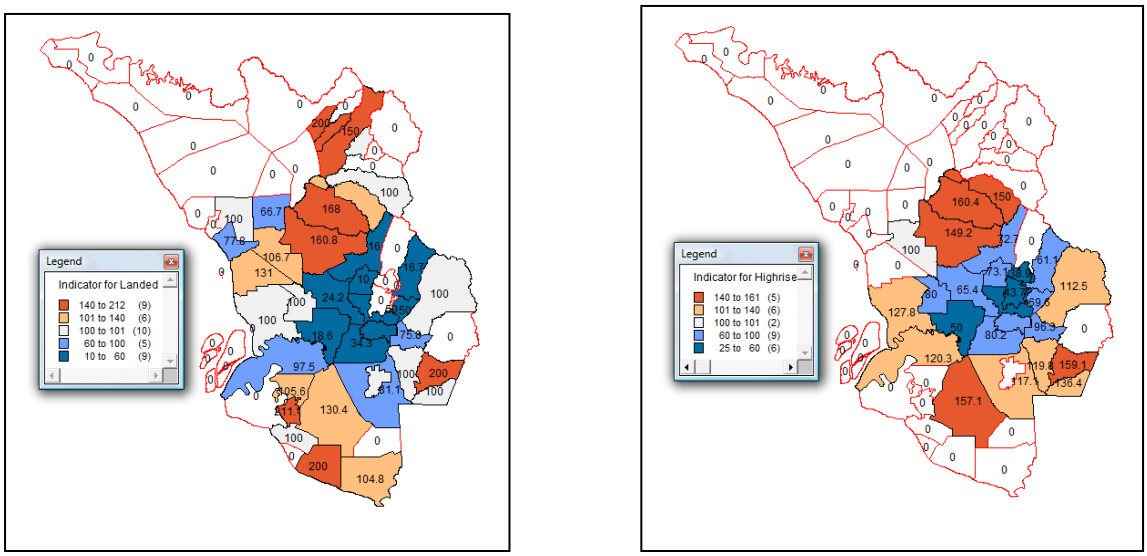
Figure 8: Index of problematic properties overall

It is evident from the table that Semenyih (177.8) on average has the highest relative percentage difference in terms of the problematic when compared to auction cases. This is followed by Serendah (159.6), Rawang (144.8) and Beranang (140.0). Interestingly, these are areas located away from the Kuala Lumpur city centre. On the other hand, mukims like Petaling, Damansara and Hulu Kelang are lower, as depicted in the map below. Again, it appears that areas further from the city centre are generally more problematic.

Table 5: The mukims at the top end on extent of problem relative to auction cases

Mukim	PercentProblema	PctOfTotCases	PercentDifferenc
Dengkil	3.9	3.5	111.4
Kapar3	2.6	2.3	113.0
Hulu Langat	0.8	0.7	114.3
Hulu Yam	0.8	0.7	114.3
Klang1	9.3	7.9	117.7
Kajang	8.7	7.0	124.3
Tanjung Dua Belas	1.3	1.0	130.0
Beranang	1.4	1.0	140.0
Rawang	9.7	6.7	144.8
Serendah	22.5	14.1	159.6
Semenyih	3.2	1.8	177.8

Could there be value in differentiating landed properties from non-landed in a way that a market segmentation based on these property types is justifiable? It is quite likely that that is the case. Even in property market report, the two types of properties are treated differently. There is evidence to show that the two types of properties display two different demand patterns. We shall now expand our analysis of unsold auctions to look into the two types and then compare the two.



Landed Highrise

Figure 9: A comparison of landed and highrise problematic properties

It is clear from the above that there are distinct differences in the distribution between the two segments. A number of points can be made about the observation. At the most extreme, some mukims are marked as higher than average in terms of their problematic for landed properties but yet have no problematic properties at all in highrise, particularly in outlying areas (marked in green circles). In some areas, there are no problematic highrise properties but there are problematic landed, only of milder form (marked in black). Yet there are mukims that do not have problematic landed but have problematic highrise (circled red); these mukims are close to city centres.

Given the indicator, the landed segment problematic properties generally appear more severe compared to the landed. Nonetheless, landed properties seem to have the most extreme indices compared to the highrise.

6.0 The Extreme Problematic Properties

We next turn to looking at extreme problematic properties. By extreme problematic properties, we mean those that have remained unsold after the tenth auction.

For landed properties, 21 cases fall under the extreme properties category. Their details and locations are as in Table 6 and Figure 10.

Table 6: Extreme landed problematic properties

Mukim	BldgScheme	HouseType	AuctionFreq
Bukit Raja	Bkt Bandaraya, SectU11, S Alam	Terrace House	11
Hulu Yam	Bdr Bkt Beruntung, Rawang	Terrace House	11
Kapar	Tmn Jaya, Kapar	Terrace House	11
Kerling	Lembah Beringin	Terrace House	11
Petaling(SEL)	Saujana Puchong, Puchong	Terrace House	11
Serendah	Bdr Sg Buaya, Rawang	Terrace House	11
Serendah	Bdr Sg Buaya, Rawang	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	11
Serendah	Bdr Bkt Beruntung, Rawang	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	11
Batang Kali	Tmn Rasa Utama, Rasa	Terrace House	11
Serendah	Bkt Sentosa 3, Rawang	Terrace House	12
Serendah	Bkt Sentosa 3, Rawang	Terrace House	13
Serendah	Bdr Sg Buaya, Rawang	Terrace House	13
Batang Kali	Tmn Rasa Utama, Rasa	Terrace House	13
Batu(LANGAT)	Tmn Mutiara, Tanjung Sepat	Terrace House	14
Kapar	Tmn Intan, Kapar	Terrace House	16
Tanjung Dua Belas	Tmn Periang, Banting	Terrace House	26

All are terraced houses. All but six of these properties lie within Rawang area.

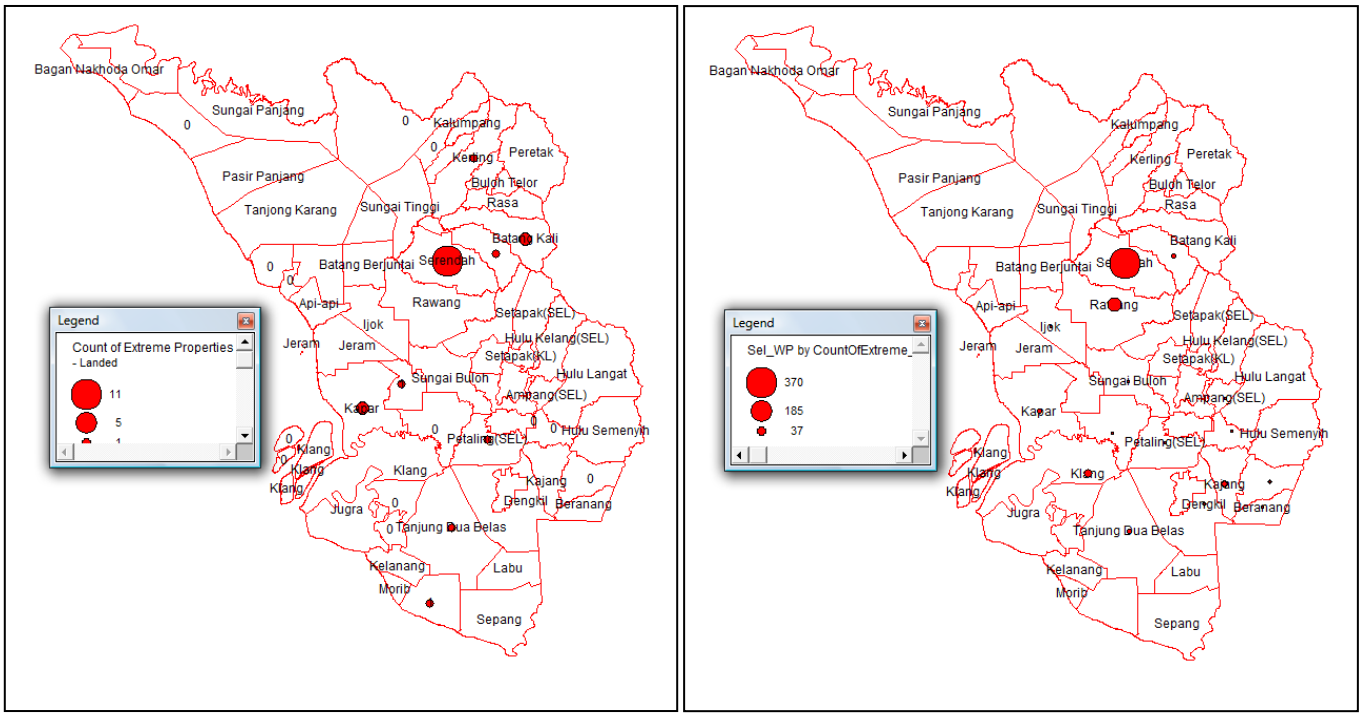


Figure 10: Location and magnitude of extreme landed and highrise properties

Serendah has 11 extreme properties and, consistent with evidence produced before points to structural economic problems in the area. At the most extreme is a terraced property in Tanjung Dua Belas that has remained unsold after 26 auctions. The existence of no less than 60 problematic properties within 9 km from this property portends locational failure as a possible issue. The properties are predominantly terraced and lie within the various housing estates, with original market values pegged at RM55,000 – RM180,000. Owners are a balanced mix of Indians and Malays with very few Chinese. However, for this particular extreme property, no reason can be inferred as to why it has reached that stage of extremity. A similar situation applies in the case of Batu (LANGAT) property whereby its geography does not explain the phenomenal occurrence.

The extreme property in Kapar is surrounded by at least 30 other problematic properties around it. In this locality, a combination of different types of houses (terraced, semi-detached and detached) exists with original market price range of RM64,000 to RM145,000. Of interest is that the ownership pattern to a vast majority of problematic properties in this area appears to be race-biased. On this score, there is potential for a separate investigation to examine what role race has in contributing towards the incidence of problematic housing properties in this area.

In Bukit Raja, the extreme property has 14 properties around it with houses comprised mainly of combination of different types of houses (terraced, semi-detached and detached) with prices ranging from 115,000 to 1,500,000. The Malays make a majority mainly because of the Bumiputra restrictions. It is quite plausible that the Bumi factor is a cause here.

As intimated earlier, Serendah is a case of an exercise in public investment that has unfortunately failed to work out according to plan. It is not unreasonable to associate the proliferation of problematic properties in this area with the general depression of the local economy.

The above analysis shows that it is possible to identify areas that have turned into 'hot spot' from the number of problematic auction properties that they have engendered. Where that is the case, it is conceivable that the underlying reason has more to do with the trend at the location. In other cases, the reason would be less clear and could be due to the individuality of the properties in question. We present in Table 7 the comparative statistics on extremely problematic properties by mukim, arranged in the order of problematic counts.

Table 7: Statistics on extreme properties

Mukim	**No. of problematic properties**	**Extreme as % of Problematic - Overall**	**Extreme as % of Problematic - Landed**	**Extreme as % of Problematic - Highrise**
Serendah	2,253	16.8	2.9	19.7
Rawang	973	9.2	0.0	11.8
Klang	933	3.5	0.0	4.0
Kajang	874	2.2	0.0	2.3
Petaling(SEL)	815	0.9	2.2	0.8
Sungai Buloh	451	0.4	0.0	0.5
Dengkil	393	2.0	0.0	2.3
Ampang(SEL)	341	0.3	0.0	0.3
Semenyih	321	2.5	0.0	2.6
Damansara	287	1.0	0.0	1.1

Thus, the extremes really belong to the two mukims of Serendah and Rawang, with the former being the most outstanding. An investigation into the individual characteristics of the extreme properties lies beyond the scope of this paper.

7.0 Conclusion

This part of the data analysis has aimed to fulfill the preliminary objective of the research, that of exploring the spatial nature of problematic auctioned properties. The geographic approach to the analysis of the data has been useful in the detection of spatially-related phenomena that are otherwise difficult, if not impossible, to perform with textual database. It revealed the existence of spatial patterns within the problematic auction data in a way that has enabled their interpretations. The visualisation of these patterns has contributed to the ability to generate certain opinions and to throw up postulations. The completion of this exploratory stage of the investigation paves the way to the next step of the study, which is to develop a model for forecasting the incidence of problematic properties. The aim of the model will be to generate useful data with which to anticipate situations that can lead to the occurrence of problematic properties, for avoidance purposes. This is the direction in which the study will turn to next.

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