



**PLANNING MALAYSIA:**  
*Journal of the Malaysian Institute of Planners*  
**VOLUME 18 ISSUE 3 (2020), Page 190 – 201**

## **SPATIAL PATTERN OF RESIDENTIAL BURGLARY. THE CASE STUDY: KUCHING, SARAWAK**

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### **Abstract**

Residents in Malaysia are mostly concentrated in urban areas. However, people do feel worried about residential burglary despite living in urban areas. Although burglary cases have recorded a decline, the fears of crime are still high among the people in Kuching, Sarawak. The objective of this study is to identify the spatial pattern of residential burglary in Kuching, Sarawak. This study is using Global Moran's I method as it can evaluate the spatial autocorrelation of residential burglary in the global context. The spatial data consists of Kuching district boundary, road data, police station boundary and police sector boundary, while non-spatial data includes residential burglary from 2015-2017, time, addresses of the crime occurrences, latitude and longitude. The result revealed that the strong global spatial patterns were found for residential burglary in Kuching, Sarawak between 2015 and 2017. However, there was no global spatial pattern found for residential burglary in 2016.

**Keywords:** Spatial Pattern, Urban Property, Global Moran's I, Kuching

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## **INTRODUCTION**

One of the most worrying issues around the world is increasing crime rate. At the world level, burglary was reported highest in Oceania which is 84% followed by Europe 72% while America recorded 59%, Africa 55%, and the lowest burglary levels are found in Asia with 40% (UNHABITAT, 2007). A residential area is one of the most targeted areas by offenders for criminal activities such as theft, robbery, burglary day and night. This situation increases the fear of crime among the people especially those living in urban areas. Today, in Malaysia, crime cases in residential areas have created a fear of crime among society (Mohammad Abdul & Aishath, 2008). Based on previous studies related to the Safe City in Malaysia, most researchers focused on the people's perceptions about the effectiveness and expert views on the safe city using SPSS, hence the effectiveness of the safe city was also measured based on crime statistics or trends without emphasizing spatial elements (Ainur dan Jalaludin, 2010; Mohd Fareed and Mohd Yusof, 2013; Rohana, 2013).

Therefore, to understand the phenomenon of crime in spaces, spatial information technology such as the Geographical Information System (GIS) has been adopted in the Safe City programme to identify the spatial pattern of crime (Department of Town and Country Planning, 2019). GIS can also integrate the extensive amount of spatial and non-spatial data (Tarmiji Masron et.al, 2015). According to property crime trends in 2015-2017, statistics show burglary cases in Kuching, contributed 848 cases or 20.2% during that period (Crime Investigation Department of Kuching, 2018). Thus, what is the spatial pattern of residential burglary in Kuching, Sarawak? This study can reveal the spatial pattern of residential burglary in Kuching, Sarawak by using GIS as the system has the ability in handling spatial data in a geographical environment. GIS is considered as one of the approaches for decision-making and problem solving as well as in urban planning (Tarmiji Masron and Ruslan, 2004; Thangavelu et.al, 2013; Patel et.al, 2014).

## **LITERATURE REVIEW**

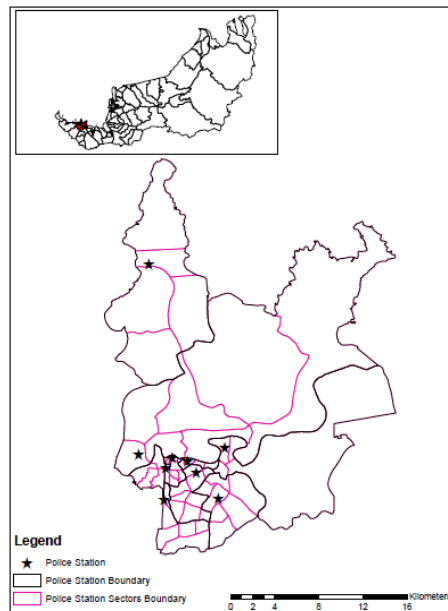
Kouziokas, (2017) has conducted a criminal investigation by using GIS to identify high crime concentration in urban areas and assess the level of urban security. Hot spot analysis has been used for detecting areas with a high risk of crime. Rasul and Ibrahim, (2016) has identified the pattern of burglary as a measure to reduce the burglary in South Yorkshire by using GIS. The result of Global Moran's I show that the distribution of burglary is clustered. Kernel Density Estimation analysis has successfully detected areas with high crime compactness. Besides, the rate of burglary is also influenced by unemployment. Wang and Liu, (2017) examined the burglary hotspot and near-repeat phenomenon in the large city located in Southeastern China using the method of

Near Repeat Matrix to identify high-risk areas of burglary for the period of 1 January 2013 until December 30, 2013. The results showed that the near-repeat phenomenon's contributions of hot spots. The burglary hotspot area is constantly changing in space and time. Chen et.al, (2013) examined space-time analysis of burglary in Beijing by using Nearest Neighbor Index (NNI) and Kernel Density Estimation. The results of the study showed the spatial pattern of burglary was influenced by urbanization. The hot spot of burglary was detected in the Eastern region and decreasing to the western part. This is because the Eastern area is close to the central business district of Beijing city.

Mohd Norarshad and Tarmiji Masron, (2016) have identified drug hot spot in the Northeast District in Penang, Malaysia by using Getis Ord  $G_i^*$ . In 2013, 7 sectors were detected as hot spot areas including the police station of Jelutong, Jalan Pantai, Kampung Baru dan Lebu Pantai while in 2014, 3 sectors were classified as hot spots such as Lebu Pantai and Kampung Baru. Drug abuse cases were recorded higher in the densely populated city area. Norita Jubit et.al, (2019) have identified the hot spots of property crime in Kuching, Sarawak by using Getis Ord  $G_i^*$ . There were two categories of data in this study which include non-spatial data (property crime cases from 2015-2017, address of incidents) and spatial data (map of Kuching, Sarawak, road data, police station boundary, and police station sectors boundary). This study also revealed that hot spots of property crime do exist in certain police station sector boundaries especially concentrated in the central business district and high-density population area. Tarmiji Masron et. al, (2020) found that GIS can also examine the spatial distribution of university students and Covid-19 pandemic.

## **METHODOLOGY AND STUDY AREA**

Kuching is the most populated city in the state of Sarawak in Malaysia. The population was recorded at about 617, 887 people in 2010. Besides that, Kuching has the highest property crime rate in Sarawak. In 2015-2017, Kuching recorded 4,123 cases (81.3%) of property crime while violent crime was about 18.6%. This study has included 9 police station boundaries (57 sector boundaries) such as (1) Santubong, (2) Gita, (3) Satok, (4) Sentral, (5) Sungai Maong, (6) Padungan, (7) Tabuan Jaya, (8) Bintawa and (9) Sekama as shown in Figure 1. There are two types of data used in this study; (i) spatial data and (ii) non-spatial data that were obtained from the Crime Investigation Department of Kuching and the heads of the police station under IPD Kuching administration. The spatial data consists of Kuching district boundary data, road data, police station boundary, and police sector boundary, while non-spatial data includes residential burglary cases (2015-2017) by nine police stations, addresses of crime occurrences, time, latitude, and longitude. The burglary cases have taken place directly from the Police Reporting System (PRS).



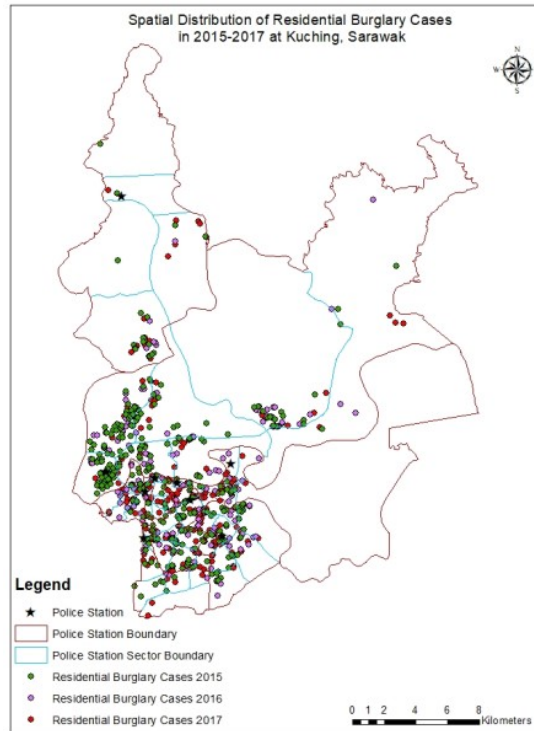
**Figure 1: Map of Study Area**

### **ANALYSIS OF SPATIAL PATTERN**

The method used to identify the spatial pattern of residential burglary in Kuching Sarawak is Global Moran's I. Global Moran's I is used for this study as it can evaluate spatial patterns of urban burglary in the global context. Three indicators were used to determine the residential burglary patterns namely Moran Index value, z-score value, and the p-value. Positive spatial autocorrelation occurs when Moran's I is closed to +1. This means the values cluster together and have similar elevation values close to each other, while the unrelated values, will create scattered patterns of negative spatial autocorrelation (Lederer, 2012). For random patterns, there is no resulting pattern that shows no spatial autocorrelation (Abdulhafedh, 2017). For the Global Moran's I statistics, the null hypothesis states that the attribute being analyzed is randomly distributed among the features in the study area (ESRI, 2019).

### **RESULT AND DISCUSSION**

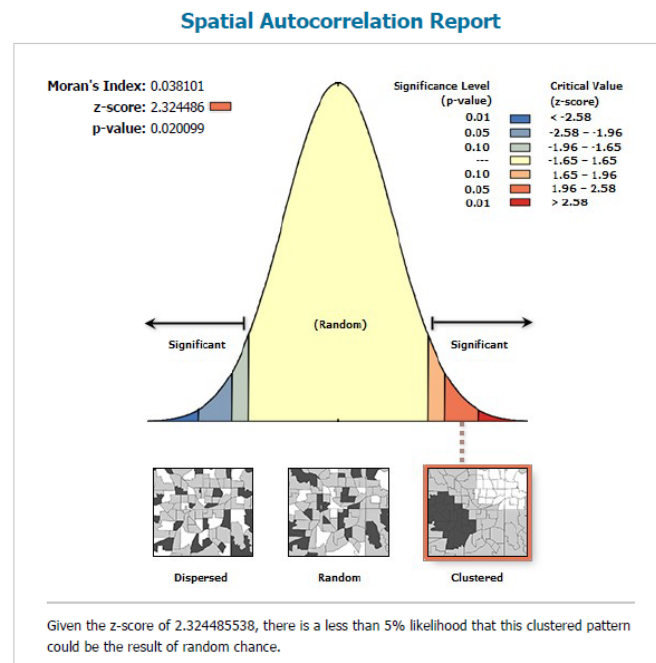
Figure 2 shows the spatial distribution of residential burglary in Kuching, Sarawak from 2015-2017. The statistics report shows that the residential burglary decreased in 3 years from 2015-2017 of 53 cases or 15.6%.



**Figure 2:** Spatial Distribution of Residential Burglary Cases in 2015-2017 at Kuching, Sarawak

According to statistics, the residential burglary in Kuching from 2015-2017 showed a decrease by 99 cases or 58.9% in Gita. However, in Sekama the residential burglary cases recorded decreased by 8 cases or 14.5% from 2015-2016 in Sekama and increased again by 10 cases or 21.1% in 2017. In Tabuan Jaya, burglary cases increased by 8 cases or 17.3% from 2015-2016 while in 2017, the number of cases was static. The burglary cases of Sungai Maong increased by 6 cases or 35.2% in 2015-2017. The residential burglary cases in Santubong increased by 4 cases or 23.5% from 2015 to 2016 and then reduced by 1 case in 2017. The number of burglary cases in Satok increased by 25 cases from 2015-2016 and dropped by 10 cases in 2017. The statistical reports also showed that burglary cases in Sentral decreased by 6 cases (2015-2016) and then increased by 6 cases or 85.7% in 2017. The crime statistics showed that the incidents of residential burglary in Padungan decreased by 3 cases or 33.3% from 2015-2016. However, the burglary was reported to have increased by 1 case in 2017. Bintawa recorded an increased residential burglary cases from 2015-2017 with 14 cases. In 2015-2017 there were only two police stations recorded an increase of burglary cases namely Sungai Maong and Bintawa. This study also

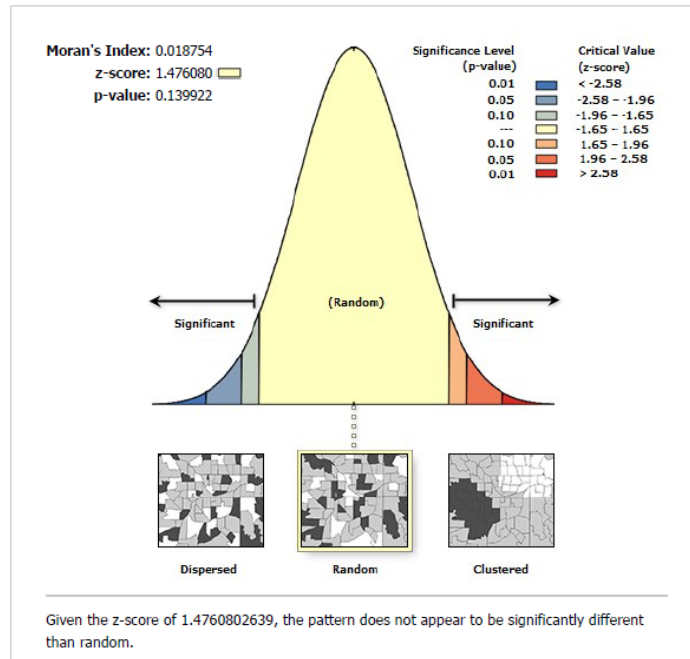
found that Gita had recorded the highest burglary cases within three years (2015-2017).



**Figure 3:** Result of Global Moran's I Analysis for Residential Burglary of Kuching, Sarawak in 2015

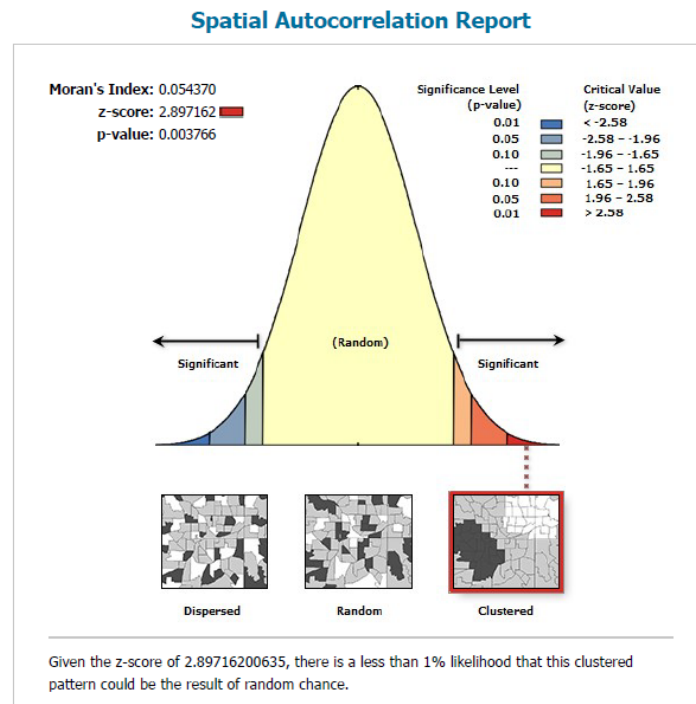
The result of Global Moran's I for residential burglary in 2015 shown in Figure 3. Based on the results, the Moran index value is 0.038101, z-score = 2.324486 with p-value 0.020099 which is <0.05. It is shown that the residential burglary in the study area is clustered. Thus, the null hypothesis is rejected.

### Spatial Autocorrelation Report



**Figure 4:** Result of Global Moran's I Analysis for Residential Burglary of Kuching, Sarawak in 2016

The result of Global Moran's I for residential burglary in 2016 shown in Figure 4. This study found the Moran index is 0.018754 with z-score = 1.476080, p-value is 0.139922 which indicated that there is no global spatial pattern is generated because the p-value reaches 0. This result found that the residential burglary in Kuching for 2016 was random pattern.



**Figure 5:** Result of Global Moran's I Analysis for Residential Burglary of Kuching, Sarawak in 2017

The burglary cases in Kuching showed a strong positive spatial autocorrelation in 2017 as shown in Figure 5. Global Moran's I analysis showed that the Moran index was 0.054370 with a z-score of 2.897162 greater than 2.58 with the p-value of 0.003766 indicating a case was clustered. This result showed that the burglary cases in 2017 were concentrated in several sectors. The null hypothesis is rejected as the case of a residential burglary does not occur at random.

## DISCUSSION

This study revealed that the spatial analysis method helps to better understand the increasing issue of theft crime that focuses on the spatial pattern of residential burglary in Kuching, Sarawak. The urban area has undergone a lot of changes including in the aspect of the social dimension, economy, rising residential mobility, and more heterogeneous urban dwellers. This transformation has impacted the rise of crime and the change of crime patterns in urban areas (Song and Liu, 2013). The residential burglary in Kuching, Sarawak tends to be clustered in 2015 and 2017 due to the opportunity of crime. It is clear that there are some potential targeted areas by offenders during the period. Most researchers explained that residential burglary cases occur due to the crime opportunity that



exists in residential areas (Groff & Vigne, 2001; Sanders et.al, 2016). Crime opportunities refer to individual routines and lifestyle activities that either enhance or reduce the risk of burglary cases (Kuo, 2015). Burglary is one of the property crimes that are often associated with the design of physical environments. (UNHABITAT, 2007). According to Cohen and Felson, (1979) three important elements influence crime, are namely (i) suitable target, (ii) motivated offenders, and (iii) the absence of capable guardians to prevent crime (Ratcliffe, 2002).

There are a few reasons why offenders break into houses. The first is to obtain valuable items such as money, jewelleries and other precious items. Next, crime opportunities are concentrated in time and space (Aantjes, 2012) as well as situations that enable them to enter the house especially if the houses that are located at the corner, with poor or no lighting, located near the road, and no occupants are at higher risk of burglary (Gyamfi, 2005). The statistics report showed residential burglary from 2015-2017 in Kuching most likely occurred between 6 am - 8 am but the burglary decreased during night-time between 9 pm to 12 pm (Crime Investigation Department, Kuching, 2018). This indicates that the cases of residential burglary in Kuching are more likely to occur when residents are out for work. Someone who goes to work leaves home without occupants during the day has a higher risk of becoming a victim of burglary (Luo et.al, 2016; Chon, 2016). Hence, from the findings of this study, the residential burglary in Kuching depends on the crime opportunity such as the physical environment and time that enable offenders to break the house.

## **CONCLUSION**

GIS can contribute to the field of crime and helps police in Kuching, Sarawak to prevent crime more effectively as well as enable local authorities to take action to create a safer environment for the people. From this study, the information of property crime in Kuching can be shared with the police and community in the affected area and it is hoped that more research in various fields can be conducted by using the GIS approach.

## **ACKNOWLEDGMENTS**

This study was funded under Special Top-Down Grant (SPTDG) F06 / SpTDG / 1731/2018, Spatial Distribution, and Pattern of Drugs Addict and Crime: Case Study in Kuching and Penang, Universiti Malaysia Sarawak. I wish to thank Bukit Aman, Kuching District headquarters especially the Crime Investigation Department (CID) and the heads of police stations in Kuching for giving cooperation.

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Received: January 2020. Accepted: 13<sup>th</sup> May 2020