Research in Management of Technology and Business Vol. 2 No. 1 (2021) 1412–1426


**RMTB**

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/rmtb
e-ISSN : 2773-5044

# Locational Analysis of Crimes and Its Impact Toward the Housing Prices

**Chu Yi Ching[1] & Burhaida Burhan[1]***

[1]Department of Real Estate Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA

*Corresponding Author

DOI: https://doi.org/10.30880/rmtb.2021.02.01.101
Received 1 March 2021; Accepted 30 Aprill 2021; Available online 1 June 2021

**Abstract**: Residential property is a basic need in people's life and it is very important for humans to have a shelter. In general, crime plays a main role in the health of a city's housing market. Areas that have low crime rates would enjoy higher property values simply because the buyers are willing to spend for security that they desired. On behalf of that, the objectives of this research are to analyze how the location impacts the crimes and to study the relationship between the location of crime and housing prices. The objectives of this study are achieved by analyzing the transaction data of residential properties provided by the Valuation and Property Services Department (JPPH) and the data of crime rates from Ibu Pejabat Polis Daerah (IPD) Batu Pahat. Hence, the research is focusing on Batu Pahat, Johor. The methodology used in this study is quantitative technique. The findings of this study revealed that the location that is near to the Central Business District (CBD) will increase the crime rates within the area and the regression analysis shows that there is a positive relationship between the location of crime and the housing price.

**Keywords**: Crime rates, Housing crimes, Housing prices, Locational analysis.

## 1. Introduction

In general, residential property is vital to human beings for the purpose of satisfying the psychological and economic needs. However, crime plays a main role in the health of a country's housing market. According to Emmanuel and Lizam (2017), property crimes are capable of causing the neighborhood decline.

Primarily, increases in crime will directly affect the community's perception of safety in a neighborhood. It is not surprising because the property will sell at a discounted rate where a murder has been committed due to the psychological distress experienced by the nearby residents. This can be supported by Streimikiene (2015) where living in an insecure area will directly reduce the housing comfort and the property prices. Crime has a negative pricing effect on residential property

*Corresponding author: burhaida@uthm.edu.my

(McIlhatton, McGreal, Taltayul and Adair, 2016). Lynch and Rasmussen (2001) revealed that a 1% increase in violent crimes reduces the property prices by 0.05%.

Hence, it may discourage the community from buying a house in the crime area and this will directly lower the property value within that area as all home-buyers are willing to purchase a property that is free from criminal activities in order to secure themselves. It is noted that neighborhood attributes and environment are the main characteristics that makes the property values totally difference from one neighborhood to another (Islam, 2012). Thus, this study is aimed to determine whether the crimes will give impact to the housing price in the surrounding area.

### 1.1 Research Background

There are several factors that can give a huge impact towards the property prices. Undoubtedly, crime is of course one of the main factors that can affect the housing values. This can be supported by Fadaei-Tehrani and Green (2002), where criminal activity can give a huge impact towards the losses of property values. According to the Muhammad Amin, Mohammad Rahim and Geshina Ayu (2014), there are total 314, 675 cases of crime have been reported within the year 2004 till 2013 in Malaysia. The study found out that the highest recorded crime cases is Selangor (91,962 cases) followed by Kuala Lumpur and Johor.

Linden and Rockoff (2008) illustrate that the property price is negatively falling down which is close to the offenders' location. Undoubtedly, home-buyers are willing to pay a premium in order to live in a physically safe environment to avoid crime. In fact, crime is one of the significant factors that will lead the home-buyers to consider when they are thinking of purchasing a property. Meanwhile, crime not only gave impact to the residents' financially but emotionally as well especially in the highest crime rates area. This finding was supported by Gibbons (2004) where fear of offence and direct costs that are related with dwelling crimes have dynamic effects which will affect the home buyers' decision. Hence, it is hoped that this research will be a step to give better results in identifying the housing prices due to the criminal activity, through analyses of locational impacts of the crime, and correlation methods done between crime locations and housing prices.

The study is focusing on the location of Batu Pahat, Johor, Malaysia. Batu Pahat or known as Bandar Penggaram is a town and the capital of Batu Pahat District, Johor. It lies south-east of Muar, south-west of Kluang, north-west of Pontian and south of Segamat. There are two important aspects in this study, which are the location of the crimes and its impact towards the housing prices. The study will investigate whether the location of the crimes will cause any impacts to the property prices nearby. In Malaysia, crimes can be classified into 5 types which are the total crime, violent crime, property crime, theft and burglary (Baharom and Habibullah, 2009). Thus, types of the crime chosen for this research are the total crime, violent crime, property crime, theft and burglary. Hence, this study will be carried out based on the data from the beginning of the year 2012 till the end of the year 2016.

## 2. Literature Review

According to Kauko (2003), the price of a property can be determined through the locational attributes. The price of a property has involved the value of the housing configuration characteristics (Lee and Li, 2009). According to Knaap (1998), there are two types of price models based on the standard economic theory in the interrelated markets which are the housing price and land price. Li (2013) illustrates that property price is referred to as disposable income, housing sales, real interest rate, vacancy rate and property investment.

According to the Board of Valuers, Appraisers and Estate Agents, Malaysia (2011) in Malaysian Valuation Standards Fourth Edition 2011, property is determined as a legal concept which includes all the interests, rights and benefits that related to the ownership. According to the Street, Drainage and Building Act 1974 (Act 133), residential property also known as dwelling property is used for the purpose of human habitation. According to the Guide on Land and Property Development published by Royal Malaysian Customs department in 2016, residential property is referred to as a building that is occupied as a residence or is capable to be occupied as a residence.

In general, housing is essential to offer the residents a suitable place to sleep where they are free of risks and hazards. Housing is important to give a sense of personal security and personal space for the residents (Streimikiene, 2015). Hence, house is not only protecting the family members that live in it from the physical aspect, but it also protects in social, psychological and spiritual side.

2.1 Factors Affecting Property Price

There are many factors which will give the obvious effect towards the housing price. Knaap (1998) illustrates that the housing price and the land price will increase when the metropolitan planning merely serves to preserve and enhance the neighborhood amenities. According to Lee and Li (2009), the neighborhood environmental characteristics, spatial and locational attributes, and the housing configuration are the factors that influence the price of a residential property. Tita, Petras and Greenbaum (2006) also note that the housing price for sale is also impacted by the tract level community attributes such as the population density, income, demographic composition, and the crime.

There is a strong relationship between the population density and property prices. According to Lee (2016), the higher density referred to more residential units in the same amount of land. Meanwhile, this higher density could reduce property prices because of the increasing traffic congestion, reduce open spaces and generate more infrastructure costs. The higher the income of the household, the higher the probability that the household will purchase a property (Barrios, Colom and Molés, 2013). Higher income enhances the housing sales and property investment (Li, 2013).

In general, market price of a property is determined by the accessibility, environment, social, neighborhood, and the physical attributes (Kauko, 2003). Hence, there are many previous studies indicating that the dwelling price or housing value is decreasing associated with the crime rates. According to Mariadas, Selvanathan and Hong (2016), housing prices are being affected by the population, construction cost, housing speculation and also the inflation rate.

According to Adair, McGreal, Smyth, Cooper and Ryley (2000), accessibility is referred to as the distance between home and work. Transport accessibility can be measured through the distance from property to the new transport infrastructure. His findings found out that accessibility is an important factor in influencing the housing price especially in lower-income areas. Accessibility to commercial or shopping outlets, schools, and recreational facilities will influence the housing values in particular areas (Ijasan, Oloke, Adeyemo and Gbadamosi, 2012).

According to Iman, Hamidi and Liew (2009), the impact of environmental disamenities such as water and noise pollution could reflect the property values. It is noted that properties that have been affected by the pollution show a lower price level compared to those unaffected.

Manufacturing factories which employed the foreign employees for the production line may increase the crime rates in the neighborhood area. Increasing foreign workers are reflected as a threat to the community since it is associated with the increasing crime rates and at the same time will affect the property values in the neighborhood area (Devadason, 2012). Andersen (2008) notes that social problems and poor safety where people who behave badly, domestic disturbance and noise from the neighbors will result in the housing price in the neighborhood area being affected.

Aluko (2011) illustrates that neighborhood factor is vital especially for the residents to make housing purchase decisions due to its spatial linkage and externalities of the neighborhood effects imposed. According to Musa and Zahari (2015), neighborhood characteristics are important in determining the residential property value as they are essential for market analysis.

Poor neighborhood circumstances such as the social problems and poor safety where people behave badly, domestic disturbances and noise from neighbors will lead the residents to move away (Andersen, 2008). His findings supported by Streimikiene (2015) that living in an insecure area will reduce the housing comfort and at the same time will give a huge impact towards the housing values. The characteristics of the house and the neighborhood in which the property is located revealed the property values (Musa, Yusoff and Zahari, 2009). According to Iman et al. (2009), neighborhood factors in terms of the environmental conditions and population attributes are the main factors which will give a huge impact to the property values. According to Ihlanfeldt and Mayock (2010), robbery and aggravated assault crimes exert a meaningful influence upon the neighborhood property values.

Physical characteristics make one residential property totally different from another residential property. Meanwhile, physical attributes of a property also contribute to differences in housing price. Property structure which included the number and size of rooms and toilets, construction materials, age of building, architectural design and landscaping significantly gave impact to the property value (Musa, Yusoff and Zahari, 2009). This finding was supported by Opoku and Abdul-Muhmin (2010) where the number and size of bedrooms and bathrooms are the main components of a property in influencing the property values. According to Kauko (2003), physical features can be categorized as land area, location, lot size and types of residential property.

2.2 Effects of Crime

Crime can be referred to as the attitude condemned by the community (Eide, 1994). According to Taylor (1995), crime is associated with the property values, neighborhood satisfaction, and also the desire of the residents to move. There are several factors leading to crime such as poverty, family stress, inequality, unemployment, absence of educational and vocational opportunities (Yirmibesoglu and Ergun, 2007). According to Shah Habibullah and Baharom (2009), crime not only can lead to property loss, lives and misery, it can result in severe mental anguish to the community too.

Crimes are dominated by psychological, sociological, and economic approaches. In general, crime is a rational behavior where people make a choice in deciding to spend their valuable time for the purpose of benefits and costs of using their time in various kinds of ways such as working legally, working illegally, or not working at all (Fadaei-Tehrani and Green, 2002). Crime has potentially deleterious effects on growth, through reduced productivity and shortened planning horizons (Soares, 2015).

According to Shah Habibullah and Baharom (2009), there are 15 kinds of crime in Malaysia, which is total crime, violent, murder, attempted murder, armed robbery, robbery, rape, assault, property, daylight burglary, night burglary, lorry-van theft, car theft, motorcycle theft, and larceny. In Malaysia, crimes can be classified into five types which are the total crime, violent crime, property crime, theft and burglary (Baharom and Habibullah, 2009). Figure 2.3 illustrates the trend of crime in Malaysia meanwhile Figure 2.4 represents the trend of growth rate of crime in Malaysia from 1973 till 2003. In general, crime can be divided into three categories, which are homicides, violent crime other than homicides, and property crime (Pope and Pope, 2012).

Property crime is an armed robbery, robbery (cars, businesses, homes), pick pocketing, and snatch thievery (Yirmibesoglu and Ergun, 2007). According to Shah Habibullah and Baharom (2009), property crime is referred to as total crime, daylight burglary, night burglary, lorry-van theft, car theft, motorcycle theft, and larceny. Property crimes are those offences committed on properties without force in taking or stealing property (Ghani, 2017). According to Olajide and Lizam (2016), property

crime can also be known as residential neighborhood crime demonstrates various offences targeted at the residential neighborhood. Such crimes include burglary, theft, street incivilities, vandalism, and robbery to violent crime.

2.3 Impacts of Crime Toward the Housing Property

According to Hellman and Naroff (1979), the problem of crime rate can influence the property values and thus property tax revenue. This is because the proportion of society is willing to spend for the purpose to combat the crime costs in which the property tax revenue will increase due to the costs of managed the crime. Gibbons (2004) also describe that afraid of offence and direct costs that related with dwelling crimes have dynamic effects which will drive the home-buyers' decision. His findings also supported by Buonanno et al. (2013) where fear of crimes such as breaking and entering, robbery, and theft will lead to the direct and indirect costs to the community and at the same time inflict the impact on dwelling values, value of the property stolen or damaged, anxiety and lack of safety on the residents.

Linden and Rockoff (2008) illustrate that the dwelling prices is negatively close to the offenders' location. His study explains that the sold for property prices near to the offenders with the distance of 0.05 miles decline largely for about $145,000 on average before the arrival of the offenders, however there is an obvious decline afterward with the sold for about $125,000 as shown in Figure 1 below. Hence, Figure 2 clearly shows the different duration (before and after the offenders' arrival) on the prices of the dwellings based on the distance from the offenders' location.

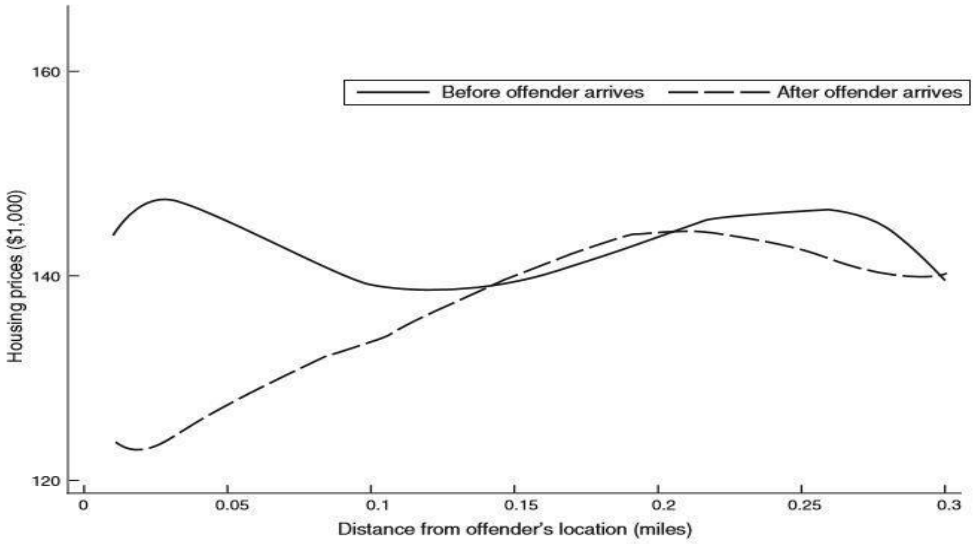


**Figure 1: Housing price gradient of distance from offender (Sales during year before and after arrival) (Linden and Rockoff, 2008)**

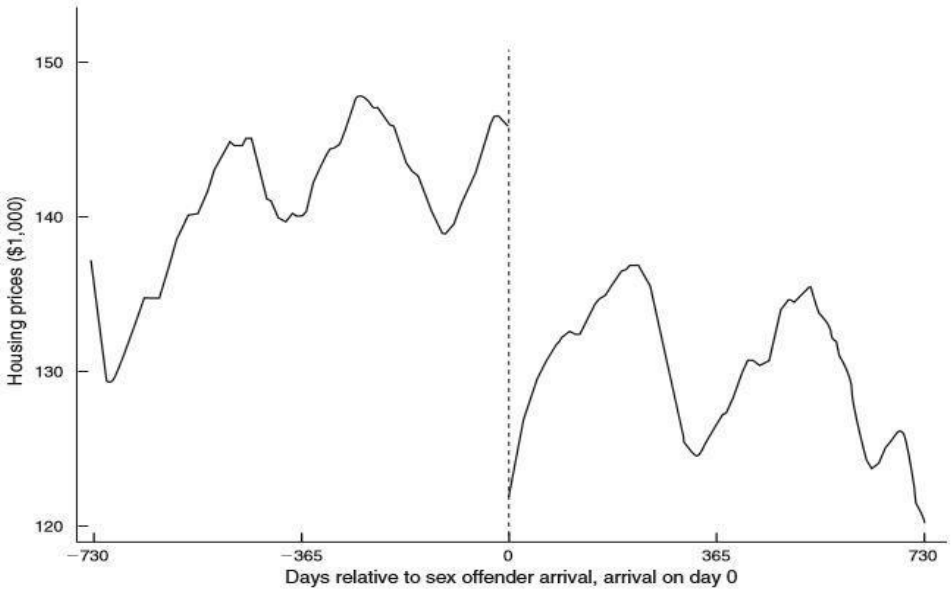


**Figure 2: Housing price trends before and after offenders' arrivals (Parcels within a tenth of a mile of offender location) (Linden and Rockoff, 2008)**

2.4 Geographical Information System (GIS)

According to Chang (2012), Geographic Information System (GIS) was developed by Tomlinson in the early 1960s. GIS are systems which deal with geographical information and mainly focused on map processing, databases, and spatial analysis (Maguire, 1991). According to King (1991), GIS is used for displaying the spatial analysis at the system design scale through the GIS database as shown in Figure 3 below. DeMers (2009) also demonstrates that GIS is used for the processing of spatial data into information and used to make particular decisions about some portion of the earth.

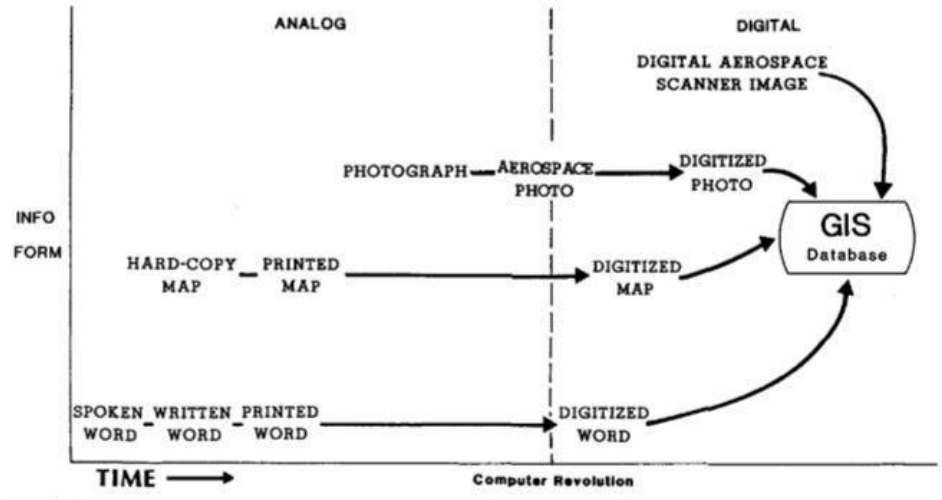


**Figure 3: Forms of geographical information through time and their integration in a GIS database (King, 1991)**

DeMers (2005) points out that GIS is used by real estate companies for the purpose to isolate available property on the basis of buyer criteria such as proximity to schools, type of neighborhood, or access to highways. Meanwhile, GIS is used to enhance the professionalism in public housing

management (Sheng Han and Ming Yu, 2001). At the same time, police departments need the aid of the GIS in order to compile particular information for the purpose of characterizing the movements and operational settings of suspected serial killers. GIS is associated with business because of its capabilities internal software, and it can also improve the quality of products, and provide a new chance in industry (DeMers, 2009).

The real world has a lot of spatial data. This means that with the aid of the Geographical Information System (GIS), the manipulation, modeling, and the analysis actually can be carried out effectively and efficiently. Indeed, GIS has many applications in the real estate field. For instance, the distance between two locations or even more can be easily calculated through the GIS. Besides, the GIS can also produce maps which can figure out the real property market in certain areas. This statement can be supported by Donlon (2007) in which the main product of a GIS actually is a map. The map that was produced by using the GIS application can tell a story and at the same time such an application will enable the residents to think twice before they make their decision to purchase a property. Thus, they can identify exactly where the prone crime areas are too by referring to the map that is produced via the GIS application.

In the real estate market, the value of a property usually is determined by its location. Undoubtedly, the GIS application is very important on this matter to illustrate the actual location by producing a map. Besides, the spatial analysis of the property data via the GIS can enhance the researcher's understanding of locational influences on the property value. Basically, criminal activities would result in significant visual impacts to the residents and the housing prices. Hence, it will lower the demand on the housing market in that area and the housing values in the surrounding area, as the potential buyers will take into consideration the neighborhood factor or the circumstances during purchase of a property also the problem of resell.

## 3. Research Methodology

### 3.1 Research Design

The data collected was analyzed by using the Geographical Information System (GIS) and the Statistical Package for the Social Sciences (SPSS) software. It is an essential step to accomplish the objectives of the research. The first objective of the research is to analyze how does the location impact the crimes. The second objective is to study the relationship between the location of crime and housing prices. Hence, the chapter is concentrated on the Nearest Neighbour Analysis and Multiple Regression Analysis (MRA). The visual concept on how the location impacts the crime rates and at the same time they can understand more details about the relationship between the location of crime and housing price.

The methodology that is used in this study is quantitative techniques. It will require secondary data such as polygon data from the Batu Pahat Municipal Council, transaction data of housing prices provided by the Valuation and Property Services Department (JPPH) Batu Pahat and also the crime rates data from the Ibu Pejabat Polis Daerah (IPD) Batu Pahat in order to evaluate the effects of crime rates on property prices in the research area.

Data collected from the Batu Pahat Municipal Council, JPPH and Ibu Pejabat Polis Daerah (IPD) Batu Pahat will be analyzed using GIS application. The results will be presented in the form of maps. In this study, researchers are focusing on the secondary data analysis. According to Johnston (2017), secondary data analysis refers to the analysis of data that are gathered by someone else for another key purpose. Mapping of location of study area is done through the application of Google Map. Hence, secondary data is the main source to be concluded and summarized for the data analysis.

### 3.2 Property Crime and Geographical Information Systems (GIS)

The application of Geographical Information Systems (GIS) allows the visual representation of both the housing prices and the crime rates throughout the study area. Besides, through the spatial data analysis, the spatial distribution patterns can be identified by utilizing the optimized hotspot analysis. Hence, the benefit from this approach is the visual determination of areas with housing prices and the crime rates.

Once the housing transaction data and the crime index were collected, and the data of the distance to the prone crime area via the GIS were calculated, then it was analyzed by using the Statistical Package for the Social Sciences (SPSS). According to Norusois (1990), SPSS is a computer program that is used for analyzing data. In fact, the Multiple Regression Analysis (MRA) will be adopted in this research via the SPSS software in order to achieve the objective 2. The analysis will be able to identify significant relationships between variables that are denoted. Hence, the data obtained from the analysis will be presented in the form of tables.

## 4. Results and Discussion

### 4.1 Nearest Neighbourhood Analysis

The researcher has used the MMQGIS plugin to create hub distances to visualize the nearest neighbors. According to Minn (2017), MMQGIS is a set of python plugins for manipulating the vector map layers in Quantum GIS. In general, the researcher wants to achieve the first objective by using the Nearest Neighbor Analysis. First of all, the researcher has imported the housing lots in Batu Pahat to the GIS software. At the same time, the researcher has added the crime data as shown in Figure 4. From Figure 5, the Mukim and Central Business District (CBD) layers have been added into the GIS software. From the figure, the researcher can easily identify that the prone crime area is nearest to the CBD areas, which is located in the Minyak Beku Mukim, Peserai Mukim and Simpang Kanan Mukim. The MMQGIS plugin to create the hub distance as shown in Figure 5 and Figure 6 in order to visualize the nearest neighbors Mukim for each location where the crime areas happened.

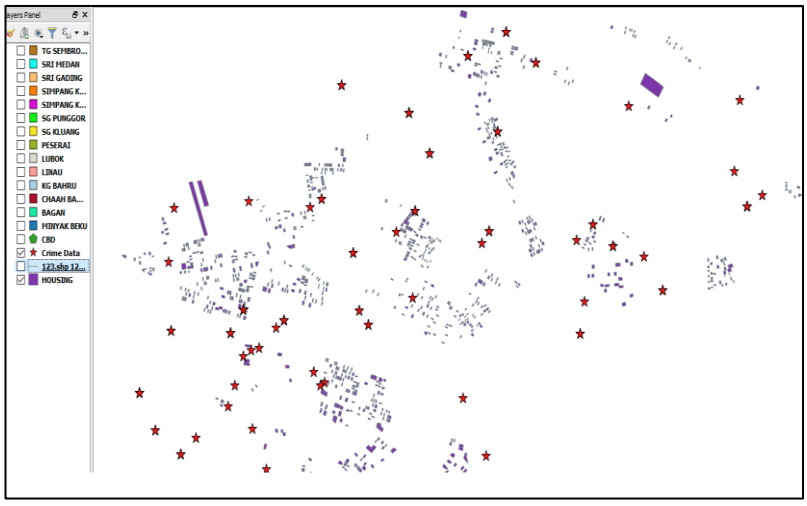


**Figure 4: Crime areas located in Batu Pahat**

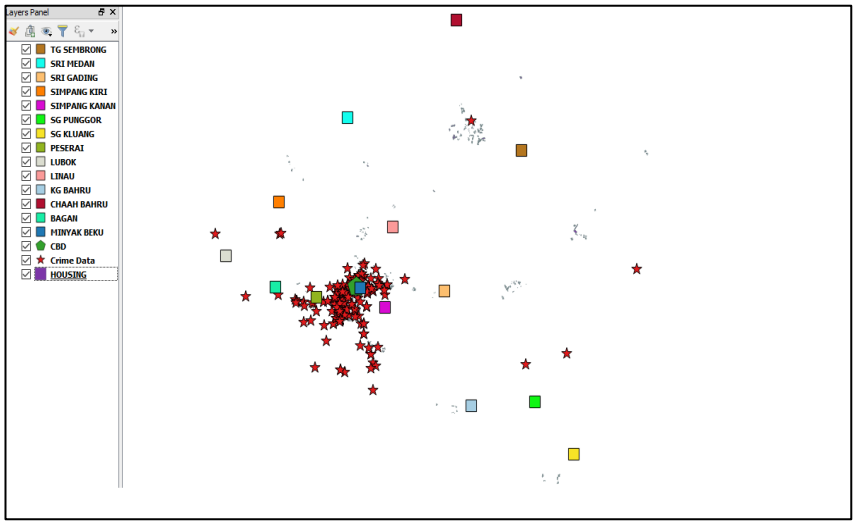


**Figure 5: Crime areas, 14 mukim, central business district (CBD) concentrated in Batu Pahat**

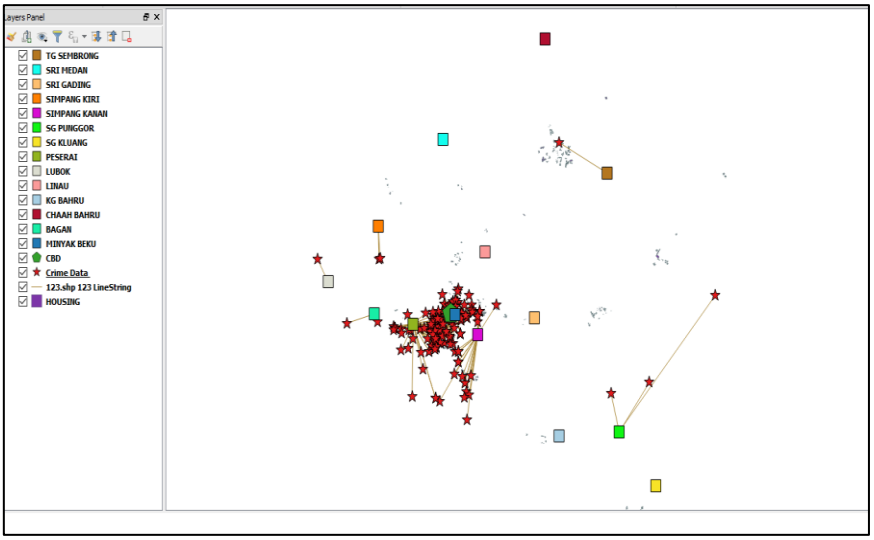


**Figure 6: Distance pattern of crimes joint to the nearest mukim in Batu Pahat**

## 4.2 Multiple Regression Analysis (MRA)

The regression analysis is used to discover a relationship between the values of two or more variables (Ritzema, 1994). For testing whether the relationship is statistically significant or not, at least one is subject to random variation. The research has focused on 1 dependent variable which is the housing price and a few of independent variables which will be discussed based on the tables in this chapter. Hence, the researcher will use the multiple regression analysis to achieve the second objective in this research. According to Regoniel (2012), multiple regression analysis is a powerful statistical test which is used to find the relationship between the dependent variable and two or more independent variables.

For Model 1, the researcher only used the transaction data from the Valuation and Property Services Department (JPPH) such as building size, lot, valuation date, tenure, types of property, mukim, lot area, and number of bedroom as the independent variables with the housing price (dependent variable) in Batu Pahat to identify how well the regression model is without taking into consideration the distance of the location of crimes.

**Table 1: Model summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .747[a] | .559 | .558 | 93520.037 |

a. Predictors: (Constant), Building Size, Valuation Date, Lot, Tenure, Mukim, Lot Area, Types of Property, Number of Bedrooms

The $R^2$ value is known as the coefficient of determination which is the proportion of variance in the dependent variable that can be explained by the independent variables. From Table 1, the $R^2$=0.559 which means that the predictors only explained 55.9% of the variations are in housing prices. At the same time, there is 44.1% of the variability of other variables which are involved in influencing housing prices too. Thus, the researcher will take into consideration that 44.1% of the other variables in the next MRA process.

In model 2, the researcher added the types of crime index as one of the independent variables to determine any increasing or decreasing of $R^2$ towards the housing price. The researcher wants to identify the crime impact on the housing price in Batu Pahat is not similar with the previous results. The types of crime index that have been added are the burglary, murder, van, lorry, and heavy vehicle theft, gang robbery, gang robbery with firearm, badly injured, vehicle theft, rape, snatch, motorcycle theft and the thefts.

**Table 2: Model summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 2 | .796[a] | .633 | .570 | 82084.647 |

a. Predictors: (Constant), Burglary, Types of Property, Murder, Van, Lorry, Heavy Vehicle Theft, Gang Robbery, Gang Robbery with Firearm, Badly Injured, Vehicle Theft, Lot, Building Size, Rape, Snatch, Valuation Date, Mukim, Motorcycle Theft, Tenure, Theft, Lot Area, Number of Bedrooms

Based on Table 2, the $R^2$=0.633 indicates that the crime and transaction data predictor variables have 63.3% of the variations in price. It is clearly shown that there are 36.7% of the other variables that have relationships with the housing price other than the crimes and the transaction data variables. From the table above, there is an increase of 7.4% from Table 1 (55.9%) to Table 2 (63.3%).

From the analysis done, the researcher found out that 6 out of 11 types of crime have positive β values which indicate that 6 types of crime have positive relationships on housing price. In general, the standardized β values are all measured in standard deviation units and therefore it has better insight into the importance of a predictor in the model. In this research, the highest β value for crime is "badly injured" (0.148) while the lowest β value for crime is vehicle theft (0.009). This means that "badly injured" crime has more impact in the model. Thus, the finding result is similar with the previous studies in which different crimes will give different impacts towards the property values (Ralph, 1995).

In the third model, the researcher added a new independent variable which is the distance between the location of crime with the mukim and the distance between the location of crime with the CBD. The researcher has used the nearest neighbor analysis from GIS software to find the distance between the location of crimes with the mukim and also the distance between the location of crimes with the CBD. From the nearest neighbor analysis, the mukim that is near to the crime areas include the Tanjung Sembrong, Minyak Beku, Sungai Punggor, Simpang Kiri, Peserai, Simpang Kanan, Bagan, and Lubok. The purpose of adding the distance of location of crimes as the independent variable is to identify how well does the relationship between the location of crime and the housing price in Batu Pahat. At the same time, the researcher wants to ensure whether the objective of this study can be achieved or rejected by using the MRA to analyze the variables of the distance between the location of crime with the mukim and the distance between the location of crime with the CBD.

**Table 3: Model summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 3 | .813[a] | .660 | .567 | 82347.858 |

a. Predictors: (Constant), Distance to Tanjung Sembrong, Gang Robbery, Van/Lorry/Heavy Vehicle Theft, Burglary, Gang Robbery with Firearm, Badly Injured, Lot Area, Murder, Motorcycle Theft, Distance to Minyak Beku, Snatch, Building Size, Mukim, Rape, Valuation Date, Lot, Vehicle Theft, Distance to Sungai Punggor, Tenure, Theft, Types of Property, Number of Bedrooms, Distance to Simpang Kiri, Distance to Peserai, Distance to Simpang Kanan, Distance to Bagan, Distance to Lubok, Distance to CBD

From Table 3, the value of R = 0.813, which indicates that this model is a good level of prediction of the dependent variable. Besides, the $R^2$=0.660 shows that there is 66% of the variance in the housing prices. And there is an increasing variability of 10.1% from Table 1 (55.9% of the variations in price) to Table 3. Meanwhile, the $R^2$ value has been improved from 55.9% to the 66% which illustrate that the independent variables of the distance between the location of crimes with the mukim and the distance between the location of crimes with the CBD have a significant relationship with the housing prices in Batu Pahat. The result shows that the R square has a big variance which could affect the dependent variable.

Additionally, the researcher wants to identify how well does the relationship of the distance between the location of free crime areas with the mukim will give effect towards the housing prices in Batu Pahat. The mukims that are free of crimes include Sri Medan, Sri Gading, Chaah Bahru, Sungai Kluang, Kampung Bahru and Linau. Hence, the researcher takes into consideration the distance of the free crime areas with the mukim in the MRA in order to identify how the variation between the distance of location prone crime areas and the distance of free crime areas with the relationship of housing prices.

**Table 4: Model summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 4 | .776[a] | .602 | .554 | 83594.505 |

a. Predictors: (Constant), Distance to Sri Medan, Lot, Types of Property, Valuation Date, Tenure, Building Size, Mukim, Distance to Sri Gading, Lot Area, Distance to Chaah Bahru, Number of Bedrooms, Distance to Sungai Kluang, Distance to Kampung Bahru, Distance to Linau

From Table 4, the finding shows the $R^2$=0.602 which means that there is only 60.2% variations in housing prices. This result shows a small decrease if compared to Table 4.8 which has 66% of variation in the housing prices. The small decrease in $R^2$ proved that the distance between the free crime areas with the mukim has less significant relationship with the dependent variable which is the housing prices. This finding shows that the location is very important and will give impact to the housing prices no matter the location is near to the prone crime areas or free crime areas.

The results of the research analysis answered the first and second objective of this study, which is the first objective is to analyze how does the location impact the crimes while the second objective is to study the relationship between the location of crime and housing prices. The research objective one had been answered through the nearest neighbor analysis. The location which is near to the CBD will become the hotspot area for the crimes to happen. From the nearest neighbor analysis that had been conducted through the GIS software, the Figure 6 has clearly exhibited the distance pattern in which the crime prone areas are concentrated and near to the CBD area.

Additionally, for the research objective two, it was answered through the MRA. The analysis shows that the $R^2$ with 66% involving the distance of the location between the prone crime areas with the mukim and the distance between the prone crime areas with the CBD have significant relationship with the housing prices. This is because the higher the R square, the independent variables will have more impact towards the dependent variable. Thus, the finding results proved that the distance to crime area has a huge effect towards the housing price because the R square is the highest compared to the other three models. And, the objective has met with the previous studies in which the problem of crime rate can influence the property values and thus property tax revenue (Hellman and Naroff, 1979).

## 5. Conclusion

Based on the results of this research, it is noted that the prone crime area is near to CBD. And, at the same time, types of crime and the location will impact on the housing price. Hence, there is a need especially for the security of the housing area to enhance the safety of the residents and the market field of the property. Additionally, the developers shall pay attention to the buildings that are built in crime prone areas. They need to build the security guards house for the residents and such actions will automatically enhance the security of the place and at the same time, the housing price will increase too.

The two objectives in this research are successfully achieved through the Nearest Neighbor Analysis and the Multiple Regression Analysis (MRA). The first objective of the research reveals that

the location is the main criteria that has a relationship with the crimes and the housing prices too. From the findings, the criminal activities frequently occurred near the Central Business District (CBD) via the Nearest Neighbor Analysis. According to Liu, etc. (2014), violent crimes are strongly concentrated in the central city area. The previous studies showed that most of the offences will concentrate surrounding the CBD. Thus, the first objective has been achieved by displaying the hotspot area on the map via the Geographical Information System (GIS) software.

In general, property price is influenced by the demand of the market. Normally, when there is high demand on residential property in certain areas, it will cause the property in that area to increase the housing price. However, there are a few criteria that will lead to the changes in property price such as the distance to the prone crime area. The preference of the house buyer is the main key that will affect the home purchase decision. Hence, different types of house buyer will have different requirements and different considerations towards the residential property.

There are many issues that are related to the location of crime that will give effect to the property price as discussed in the earlier studies. From the regression results conducted by the researcher, the $R^2$ displayed the distance to the prone crime area has positive relationships with the housing price compared to the other models. And the results that are analyzed by the researcher are similar with Linden and Rockoff (2008) in which the property prices are negatively close to the offenders' location.

**Acknowledgement**

The authors would like to thank the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia for its support.

**References**

Adair, A., McGreal, S., Smyth, A., Cooper, J., & Ryley, T. (2000). House Prices and Accessibility: The Testing of Relationships within the Belfast Urban Area. Housing studies, 15(5), 699-716.

Aluko, O. (2011). The Effects of Location and Neighbourhood Attributes on Housing Values in Metropolitan Lagos. Ethiopian Journal of Environmental Studies and Management, 4(2), 69-82.

Andersen, H. S. (2008). Why Do Residents Want to Leave Deprived Neighbourhoods? The Importance of Residents' Subjective Evaluations of Their Neighbourhood and Its Reputation. Journal of Housing and the Built Environment, 23(2), 79-101.

Baharom, A. H., & Habibullah, M. S. (2009). Crime and Income Inequality: The case of Malaysia. J. Pol. & L., 2, 55.

Barrios, V. E., Colom, M. C., & Molés, M. C. (2013). Life Cycle and Housing Decisions: A Comparison By Age Cohorts. Applied Economics, 45(32), 4556-4568.

Buonanno, P., Montolio, D., & Raya-Vílchez, J. M. (2013). Housing Prices and Crime Perception. Empirical Economics, 1-17.

Chang, K. T. (2012). Sixth Edition Introduction to Geographic Information Systems. New York, NY: Ryan Blankenship.

DeMers, M. N. (2005). Fundamentals of Geographic Information Systems. United States, America: John Wiley & Sons, Inc.

DeMers, M. N. (2009). GIS for Dummies. US, America: Wiley Publishing, Inc.

Devadason, E. S. (2012). Socio-Economic Effects of Foreign Workers on the Host Labour Market: The Malaysian Perspective.

Donlon, K. H. (2007). Using GIS to Improve the Services of a Real Estate Company.

Eide, E. R. L. I. N. G. (1994). The Determinants of Crime. In Economics of Crime: Deterrence and the Rational Offender (pp. 7-85). Emerald Group Publishing Limited.

Emmanuel, O. S., & Lizam, M. (2017). A Review of the Impact of Neighbourhood Crime on Residential Property Values. Journal of Engineering and Applied Sciences, 12(5), 1205-1211.

Fadaei-Tehrani, R., & Green, T. M. (2002). Crime and Society. International Journal of Social Economics, 29(10), 781-795.
Ghani, Z. A. (2017). A Comparative Study of Urban Crime Between Malaysia and Nigeria. Journal of Urban Management.
Gibbons, S. (2004). The Costs of Urban Property Crime. The Economic Journal, 114(499).
Hellman, D. A., & Naroff, J. L. (1979). The Impact of Crime on Urban Residential Property Values. Urban Studies, 16(1), 105-112.
Ihlanfeldt, K., & Mayock, T. (2010). Panel Data Estimates of The Effects of Different Types of Crime on Housing Prices. Regional Science and Urban Economics, 40(2), 161-172.
Ijasan, K. C., Oloke, O. C., Adeyemo, O. A., & Gbadamosi, A. F. (2012). Depressionary Effect of Proximity of Residential Properties to Waste Disposal Sites in Nigeria. Ethiopian Journal of Environmental Studies and Management, 5(4), 574-582.
Iman, A. H. B. H., Hamidi, N., & Liew, S. (2009). The Effects of Environmental Disamenities on House Prices. Malaysia Journal of Real Estate, 4, 31-44.
Islam, S. (2012). Impact of Neighbourhood Characteristics on House Prices. ASBBS Proceedings, 19(1), 443.
Johnston, M. P. (2017). Secondary Data Analysis: A Method of Which The Time Has Come. Qualitative and Quantitative Methods in Libraries, 3(3), 619-626.
Kauko, T. (2003). Residential Property Value and Locational Externalities: On The Complementarity and Substitutability Of Approaches. Journal of Property Investment & Finance, 21(3), 250-270.
King, M. (2011, February 1). Online Crime Maps could Drive Down House Prices, Warn Property Analysts. The Guardian, p.1. Retrieved from https://www.theguardian.com/money/2011/feb/01/police-crime-website-house-prices
Knaap, G. (1998). The Determinants of Residential Property Values: Implications For Metropolitan Planning. Journal of Planning Literature, 12(3), 267-282.
Lee, J. S. (2016). Measuring The Value of Apartment Density? The Effect of Residential Density on Housing Prices In Seoul. International Journal of Housing Markets and Analysis, 9(4), 483-501.
Lee, J. S., & Li, M. H. (2009). The Impact of Detention Basin Design on Residential Property Value: Case Studies Using GIS in The Hedonic Price Modeling. Landscape and Urban Planning, 89(1), 7-16.
Li, J. (2013). What Causes China's Property Boom?. Property Management, 31(1), 4-21.
Linden, L., & Rockoff, J. E. (2008). Estimates of The Impact of Crime Risk on Property Values From Megan's Laws. The American Economic Review, 98(3), 1103-1127.
Liu, D., Song, W., & Xiu, C. (2014). Spatial Patterns of Violent Crimes and Neighborhood Characteristics in Changchun, China. SAGE journals, 49 (1), 53-72.
Lynch, A. K., & Rasmussen, D. W. (2001). Measuring The Impact of Crime on House Prices. Applied Economics, 33(15), 1981-1989.
Maguire, D. J. (1991). An Overview and Definition of GIS. Geographical information systems: Principles and applications, 1, 9-20.
Mariadas, P. A., Selvanathan, M., & Hong, T. K. (2016). A Study on Housing Price in Klang Valley, Malaysia. International Business Research, 9(12), 103.
McIlhatton, D., McGreal, W., Taltavul de la Paz, P., & Adair, A. (2016). Impact of Crime on Spatial Analysis of House Prices: Evidence from a UK City. International Journal of Housing Markets and Analysis, 9(4), 627-647.
Minn, M. (2017). MMQGIS. Retrieved from http://michaelminn.com/linux/mmqgis/
Muhammad Amin, B., Mohammad Rahim, K., & Geshina Ayu, M. S. (2014). A Trend Analysis of Violent Crimes in Malaysia. Health, 5(2), 41-56.
Musa, U., & Zahari, W. (2015). Impact of Neighborhood Characteristics on Residential Property Values: A Critical Review of Literature. International Review of Social Sciences (Vol. 3. Issue. 4).
Musa, U., Yusoff, W., & Zahari, W. (2009). The Influence of Housing Components on Prices of Residential Houses: a review of literature, 1-12.
Olajide, S. E., & Lizam, M. (2016). Determining the Impact of Residential Neighbourhood Crime on Housing Investment Using Logistic Regression. Траектория науки, 2(12).
Opoku, R. A., & Abdul-Muhmin, A. G. (2010). Housing Preferences and Attribute Importance Among Low-Income Consumers in Saudi Arabia. Habitat International, 34(2), 219-227.
Pope, D. G., & Pope, J. C. (2012). Crime and Property Values: Evidence from the 1990s Crime Drop. Regional Science and Urban Economics, 42(1), 177-188.
Regoniel, P.A. (2012). Example of a Research using Multiple Regression Analysis. Simply Educate Me. Retrieved from http://simplyeducate.me/2012/11/11/example-of-a-research-using-multiple-regression-analysis/

Ritzema, H.P. (1994). Drainage Principles and Applications, Publication 16, second revised edition. International Institute for Land Reclamation and Improvement (ILRI), Wageningen, The Netherlands, 3(39), pp. 1-47. Retrieved from https://www.waterlog.info/pdf/freqtxt.pdf

Shah Habibullah, M., & Baharom, A. H. (2009). Crime and Economic Conditions in Malaysia. International Journal of Social Economics, 36(11), 1071-1081.

Sheng Han, S., & Ming Yu, S. (2001). EMAPS – A GIS Application In Town Council Management in Singapore. Facilities, 19(11/12), 428-435.

Soares, R. R. (2015). Welfare Costs of Crime and Common Violence. Journal of Economic Studies, 42(1), 117-137.

Streimikiene, D. (2015). Quality of Life and Housing. International Journal of Information and Education Technology, 5(2), 140.

Taylor, R. B. (1995). The Impact of Crime on Communities. The Annals of the American Academy of Political and Social Science, 539(1), 28-45.

The Board of Valuers, Appraisers and Estate Agents, Malaysia. (2011). Malaysian Valuation Standards Fourth Edition 2011. Kuala Lumpur: Board of Valuers, Appraisers and Estate Agents, Malaysia (BOVAEA).

Tita, G. E., Petras, T. L., & Greenbaum, R. T. (2006). Crime and Residential Choice: A Neighborhood Level Analysis of the Impact of Crime on Housing Prices. Journal of Quantitative Criminology, 22(4), 299.

Yirmibesoglu, F., & Ergun, N. (2007). Property and Personal Crime in Istanbul. European Planning Studies, 15(3), 339-355.