ISSN 2354-9114 (online), ISSN 0024-9521 (print)
Indonesian Journal of GeographyVol 56, No 1 (2024): 127-137
DOI: 10.22146/ijg.56539 website: https://jurnal.ugm.ac.id/ijg

INDONESIAN JOURNAL OF GEOGRAPHY

RESEARCH ARTICLE

Mapping the Impact: Property Crime Trends in Kuching, Sarawak, During and After the COVID-19 Period (2020-2022)

Azizul Ahmad[1], Muhammad Haziq Kelana[1], Ryoji Soda[2], Norita Jubit[3], Asykal Syakinah Mohd Ali[1], Luqman Haqim Bismelah[1], & Tarmiji Masron[1]*

[1]Centre for Spatially Integrated Digital Humanities (CSIDH), Faculty of Social Sciences & Humanities, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, MALAYSIA.
[2]Graduate School of Literature and Human Sciences, Osaka Metropolitan University, 3-3-138, Sugimoto, Sumiyoshi-ku, Osaka 5588585, JAPAN.
[3]Borneo Institute for Indigenous Studies (BorIIS), Universiti Malaysia Sabah (UMS), 88400 Kota Kinabalu, Sabah, MALAYSIA.

Submit : 2023-10-24
Received: 2024-01-25
Publish: 2024-04-30

Keywords: Burglary Crime; COVID-19; Crime Hot Spot Mapping; Property Crime; Spatial Analysis

Correspondent email: mtarmiji@unimas.my

Abstract This study aims to explore how COVID-19 and the Movement Control Order (MCO) have influenced the trend of property crimes in Kuching, Sarawak spanning from 2020 until 2022. The lockdown imposed by the government had impacted daily activities in Malaysia, including those in Kuching, Sarawak. The methodology employed in this research involves descriptive analysis and spatial analysis, specifically using the Hot Spot Getis GI* technique, with the support of ArcGIS software. It examines relationships between crime and geography. The trend of property crime cases dropped from 1,144 cases (2020) to 813 cases in 2021 and ended with 683 cases in the year 2022. The value of GiZScore from the lowest of 2.066694 to the highest of 13.365677 is from the year 2021. Property crime in Kuching's urban center was targeted even during MCO beginning March 2020 to November 1, 2021. This indicates a notable decrease in property crime trends during the COVID-19 (2020-2021) pandemic period due to the MCO and lockdown which continue to impact into the subsequent endemic era of 2022. This demonstrates the efficiency of the Royal Malaysia Police, particularly in the context of Kuching, Sarawak.

1. Introduction

COVID-19 and the Movement Control Order (MCO) have had a worldwide impact, affecting people, not only in Malaysia but notably in region like Kuching, Sarawak. It not only affects our economy but also has repercussions on our mental well-being and lifestyle as we transition beyond the pandemic's endemic phase. A study by Paramasivan et al., (2022) explored the impact of COVID-19 lockdown restrictions on property crimes such as burglary, theft, and robbery during the first and second waves of the pandemic in 2020 and 2021. Stay-at-home orders during COVID-19 led to a significant decrease in property crime globally, but with varying effects depending on the type of crime and location. Studies show that property crimes are frequently reduced more than violent crimes in high-income nations. Early studies of prominent American cities during COVID-19 epidemic, for example, found a decrease in residential burglaries during stay-at-home orders. However, another study found that there was an increasing tendency of domestic violence, while another found no significant difference in the event of attacks (Nivette et al., 2021).

The frequency and severity of property crime in each location can be an important indicator of criminal activity there. Understanding property crime patterns is key to creating customized and effective prevention methods (Borg & Svensson, 2022; Cheng et al., 2023). Kuching, which is in Sarawak, Malaysia has changed a lot, especially socially, economically, and in terms of where people live and who lives there. The developments have considerably affected the surge in crime and the consequential change in crime patterns in the urban area (Abdullah et al., 2021; Onyeneke & Karam, 2022). Many factors, like crime and changes in the economy, have caused more burglaries in Kuching, Sarawak. The incidence of residential burglaries concentrates in Kuching, Sarawak (Du et al., 2019; Jubit et al., 2020b, 2020a; Jubit & Masron, 2022; Masron et al., 2021).

ESRI Canada Education and Research, (2021) states that application of GIS in crime analysis allows crime analysts to identify high-risk areas for criminal activity and determine the exact locations, types of crime, and the time of day these incidents take place. This information can guide the strategic deployment of resources and inform community members. So, the aim of this research is (i) to analyze property crime in the study area; (ii) to analyze the spatial distribution of high property crime rate in Kuching; and (iii) to analyze the most common property crime to happen day or night within

the month from 2020 until 2022 that has been targeted in Kuching. According to a study by (Jubit et al., 2020b, 2020a; Jubit & Masron, 2022; Masron et al., 2021; Nordin et al., 2022), the city experienced a clustering of residential burglaries between 2015 and 2017 using the Getis-Ord Gi* method in the ArcMap 10.3 application. It suggests that opportunities for crime played a significant role in the occurrence of burglaries during that period. It also shows that festivals and school holidays are the times when property crime is most prevalent in Kuching, Sarawak (Hunter et al., 2021; Ristea & Leitner, 2020). The routine activities theory posits that crime rates increase when individuals are not home, such as during holidays, a notion substantiated by prior research (Roach & Pease, 2011; Yesufu, 2021). The study of criminology aids in understanding criminal mindsets, motivations for committing crimes, and variables that influence criminal behavior. This aids in the efficient distribution of resources for crime control. It not only helps to prevent and regulate crime, but it may also recommend effective strategies for rehabilitating offenders.

Studies have shown that the COVID-19 pandemic has had a significant impact on property crime in urban areas (Paramasivan et al., 2022). Despite this, there appears to be a gap in the existing literature concerning property crime related to COVID-19 in Kuching, Sarawak. Some research, however, has looked at the impact of COVID-19 on crime, including property crime. Research conducted in China, for example, discovered that the COVID-19 epidemic has a considerable impact on criminal behavior, including theft (Jiang et al., 2023). Another study conducted in Malaysia discovered that the adoption of MCO during the pandemic had a significant impact on all levels of society, including an increase in theft in rural flats (S. M. Zakaria et al., 2022). Although the search results do not offer a comprehensive exploration of the issue of COVID-19-related property crime in Kuching, Sarawak, they do indicate that the pandemic has influenced criminal behavior. Consequently, even though the government's implementation of MCO is believed to be the main factor behind the reduction in crime cases, the crime index rate has decreased by approximately 50%, with a few crimes demonstrating a decline (Ibrahim & Abd Rahman, 2021). Further research is essential for a comprehensive understanding of how COVID-19 impacts property crime in Kuching, Sarawak. Therefore, the application of GIS in COVID-19 research is very important in identifying crime hotspots in Kuching. A 50% decrease in crime cases does not mean we need to stop studying property crime since it did not provide location details of the crime that committed by the Abdullah et al., (2021); Jubit et al., (2019), (2020b), (2020a); Jubit el al., (2021); Jubit et al., (2023a); Jubit et al., (2021); Jubit et al., (2022); Jubit & Masron, (2022); Masron et al., (2021); Nordin et al., (2020), (2022).

In another study by Zhang & Che (2023), it was discovered that the strategies employed to combat COVID-19 have changed the operations of urban facilities, potentially leading to fluctuations in related crimes corresponding to pandemic's prevalence. The study's goal was to perform quantitative research to investigate this phenomenon. The COVID-19 pandemic gave a once-in-a-lifetime chance for scholars from

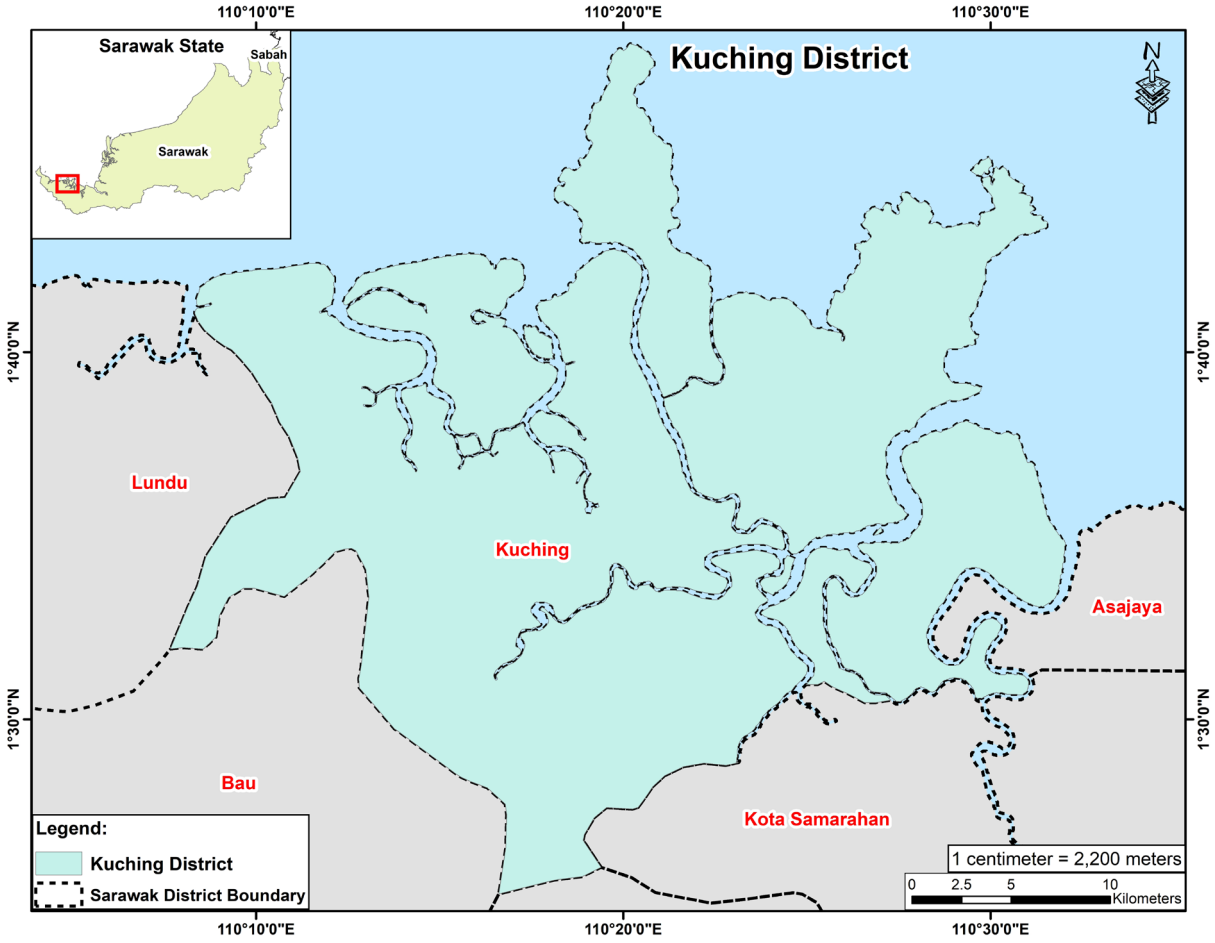

Figure 1: Kuching District Boundary
Source: https://www.diva-gis.org/

diverse countries and regions to investigate the influence of pandemic prevention and control on crime in urban environments. The initial research focus on documenting the time-based variations in crime within distinct locations and discovered that most crimes in numerous countries and cities, a decline in most types of crimes had been observed. After the early stages of the epidemic, people started exploring crime variation in smaller spatial units continuously, following the study on crime variation by cities. Campedelli et al., (2020), (2021), discovered that the reduction in crime in Chicago, USA, differed by neighborhood and crime category following the pandemic. However, investigations in other nations have found that the COVID-19 pandemic has had a substantial impact on urban property crime. Property crimes are often reduced more in high-income countries than violent crimes, according to studies (UNODC, 2020). In conclusion, the COVID-19 pandemic has had a substantial influence on property crime in metropolitan areas, with property crime decreasing more than violent crimes (Zhang & Chen, 2023).

2. Methods

Study Area

Kuching, the capital, and most populous city of Sarawak in East Malaysia is in the northwest part of Borneo (Keng et al., 2021; Omorinoye et al., 2021). This city encompasses 1,862.8 square kilometers within the Kuching district (Sarawak Department of Statistics, 2015) and is positioned at latitude 1.6019N and longitude 110.3244E (Chai et al., 2016). Kuching has experienced rapid population growth and is a prominent tourist destination (Lai S. H et al., 2008). The city, along the Sarawak River on the southwest corner of Borneo Island, had a total population of 325,132 (Omoregie et al., 2016). Kuching holds Sarawak's highest population concentration, with 617,887 residents in 2010, and attained city status in August 1988. The city's economic opportunities have attracted people, making it the focal point of Sarawak's population growth (Zainol et al., 2014). Kuching encompasses 431 square kilometers (166 square miles) and is divided into Kuching North (165,642 residents) and Kuching South (159,490 residents) administrative regions (Thayaparan et al., 2015). Kuching presents an array of attractions that entice visitors from distant locations (Kuok et al., 2022). It is the highest-ranked metropolitan city in Sarawak, ranking seventh among Malaysia's 14 states (Jubit, Masron, et al., 2022). Thanks to its robust economic growth, rising per capita income, and high industrial productivity, Kuching has experienced rapid development compared to other Sarawak districts (The World Bank, 2018).

Kuching serves as a gateway to various wildlife parks, including Bako National Park, Kuching Wetlands National Park, Bario and Kelabit Highlands, Semenggoh Wildlife Center, Gunung Gading National Park, and Kubah National Park (Muhamad Azman et al., 2021; Wan Azman et al., 2022). However, despite its beauty and attractions, Kuching faces crime-related challenges. Crime refers to deliberate acts socially deemed destructive or dangerous, subject to criminal sanctions (Sallaberry et al., 2022). The COVID-19 pandemic has had far-reaching consequences beyond public health, affecting areas such as property crime, specifically burglary (Dewinter et al., 2021; Johnson & Roman, 2022). In Kuching, property crime has seen a significant increase in recent years. It's crucial to assess whether this pattern has changed because of COVID-19 and related containment measures. Given the confinement of individuals to their residences and the emptiness of public areas, one might expect a reduction in property crime (Ortiz-Prado et al., 2022; Sun et al., 2021). However, studies worldwide have presented conflicting results, with some showing lower-than-expected reductions in property crime despite initial expectations (Liu et al., 2022; Payne et al., 2021).

Spatial and Aspatial Data

This study uses secondary data sources obtained from the Intelligence/Operations/Records Division, Criminal Investigation Department (D4 JSJ), Royal Malaysian Police Headquarters (PDRM), Bukit Aman. This division meticulously documented every reported case that was reported to the Sarawak Contingent Headquarters through the Police Headquarters Kuching District. The data comprises of ~~is~~ original records detailing the number of property crimes that occurred in the Kuching District, Sarawak, spanning from 2020 to 2022. The property crime including Section 457 of the Penal Code (burglary), Section 379 of the Penal Code (stealing off-premises), Section 379A of the Penal Code (stealing motorcycles, cars, and heavy machinery such as lorries and vans), and Section 380 of the Penal Code (stealing on premises) (Jubit, Redzuan, et al., 2022; Laws of Malaysia, 2018). Therefore, the researcher is equipped to conduct data analysis using accurate information derived from crime records that occur in the study area (Figure 1).

The Kuching District Police Headquarters (IPPDK) has nine police stations. The nine police stations in the Kuching district, which comprise the following areas and are divided into 57 police station sectors, have been the focus of the study since 1920. These areas are (1) Padungan, (2) Bintawa, (3) Sekama, (4) Tabuan Jaya, (5) Sungai Maong, (6) Gita, (7) Santubong, (8) Central and (9) Satok (Jubit et al., 2019, 2020b, 2020a; Jubit, Masron, & Marzuki, 2021; Jubit, Masron, et al., 2022; Jubit, Masron, Nordin, et al., 2021; Jubit & Masron, 2022; Masron et al., 2021). The data is spatially analyzed and aggregated using fishnet at the Kuching District Boundary Level using ArcGIS software (Figure 1). The purpose of using a fishnet with 30 Rows and 30 Columns replaces the absence of station or sector boundary data (ArcGIS Pro 3.1, 2022). It illustrates the importance of ESRI's ArcGIS software, particularly ArcMap, in assisting with the analysis of this research, which also includes ArcCatalog, ArcScene, ArcGlobe, ArcGIS Online, and ArcGIS Pro (Ahmad, 2015; Ahmad et al., 2011, 2013, 2015; 2024a; Ahmad & Masron, 2013; Ariffin et al., 2024; Basiron et al., 2014; Jubit et al., 2023b; Marzuki et al., 2023; Mohd Ayob et al., 2013, 2014; Zakaria et al., 2023). This is because using smaller units of analysis proves to be more effective as it allows law enforcement to concentrate on crime prevention within smaller, localized areas rather than huge areas (Ahmad et al., 2024b, 2024c; Braga et al., 2012; Inlow, 2021; Weisburd & Telep, 2014).

Method Hot Spot Analysis (Getis-Ord Gi*)

The analysis used a mapping process employing the Getis-Ord Gi* statistic (commonly referred to as G-i-star) to assess each feature in the dataset. This statistical approach generated z-scores and p-values, which showed spatial clustering of features with either the highest or lowest values. To qualify as a statistically significant hotspot, a feature needed to exhibit a high value and be surrounded by other high-value features, demonstrating a concentrated hotspot. This determination

was made by comparing the sum of a feature's adjacent points to the total sum of all features. Statistical significance was established when the point total significantly deviated from the expected point total, showing that the difference was not because of random chance. The study applied FDR correction to account for multiple testing and column dependence, further refining the identification of hotspot areas and areas free from property crimes (ESRI, 2022). The local Getis-Ord statistical equation for this calculation is provided below:

$$G_i^* = \frac{\sum_{j=1}^{n} w_{i,j}x_j - \bar{x}\sum_{j=1}^{n} w_{i,j}}{S\sqrt{\frac{\left[n\sum_{j=1}^{n} w_{i,j}^2 - \left(\sum_{j=1}^{n} w_{i,j}\right)^2\right]}{n-1}}} \quad \text{…Equation 1}$$

Where x_j is the attribute value for feature j, w_{ij} is the weight of the space between features i, j and n is equal to the total number of features and:

$$\bar{x} = \frac{\sum_{j=1}^{n} x_j}{n} \quad \text{…Equation 2}$$

$$S = \sqrt{\frac{\sum_{j=1}^{n} x_j^2}{n} - (\bar{x})^2} \quad \text{…Equation 3}$$

The statistic G_i^* is a z-score, so no further calculations are required (ESRI, 2022; Muhamad Ludin et al., 2013).

3. Result and Discussion

Result

This section presents the exploration, interpretation, and visualization of geospatial data about property crimes in the city of Kuching. The goal of this analytical procedure is to discover insightful conclusions and hotspot patterns and comprehend the geographic distribution of criminal episodes before and after lockdown from COVID-19. Data analysis using GIS technology enables comprehensive understanding of crime hotspots, the temporal evolution of crime patterns, and relationships between crime and their neighborhood. The following are the main elements of data analysis in Kuching's GIS crime property. Figure 2 shows that the trend of property crime cases dropped from 1,144 cases in 2020 to 813 cases in 2021 and ended with 683 cases in the year 2022. The total number of cases amounts to 2,640, signifying property-related incidents that occurred during MCO period and the subsequent return of normalcy following the endemic phase. Table 1 shows that in 2020, the highest crime rate is in January, at day (11.29%) and night (13.54%). Similarly, in 2021, the highest daytime rate was in October (9.98%), while the nighttime peak occurred in August (11.39%). For 2022, the day with the highest crime rate was in July (11.55%) and the night with highest rate was in August (12.56%). Table 1 also shows the lowest and highest cases for the day and in the years 2020 to 2022.

The information provided in Table 1 indicated that the lowest number of cases occurred in April 2020, with only 44 cases during the daytime, whereas the highest numbers, 90 cases, was recorded in January. In the nighttime for the same year, April had the lowest count with approximately 15 cases and the highest count with 47 cases were reported in January 2020. In 2021, the highest daytime case count was 61 cases in October, while the lowest for the day was 41 cases in February. In 2021, the lowest number of cases during the nighttime was in February with just 11 cases, while the highest occurred in August with 23 cases. This trend shifted to January 2022, where the lowest daytime cases amounted to 28, with the highest registered in July at 55 cases. The trend persisted into 2022 for nighttime cases, with the highest recorded in August, totaling 26 cases, and the lowest in January, with 10 cases.

Various countries, including Malaysia, implemented stringent lockdowns and movement restrictions during the early phases of the COVID-19 pandemic in 2020. As a result of these measures, people remained at home, businesses closed, and public spaces became less crowded (Rahman et al., 2022). Criminals frequently adapt to changing conditions; in reaction to lockdowns and increased security, some criminals may shift their focus to various sorts of property crimes or change their mode of operation (Teo et al., 2021). The Law Enforcement Response to the COVID-19 Impact by MCO grants authority to the National Security Council, restricting residents to a 5 km radius for their movements, leading to the installation of numerous barriers. This has an impact on all citizens, including criminals, as each check point necessitates spot check and cannot be traversed without a valid reason and the completion of a specific form obtained from a designated Police Station or District Police Headquarters (Murukesu et al., 2021). The drop (Figure 2) was significant, but it does not show that the has been stopped property crime amidst COVID-19 that hit Kuching even in urban areas.

Table 2 shows that the value of GiZScore from the lowest 2.066694 to the highest 13.365677 in the year 2021. It highlights the significant of each year, where the urban center of Kuching became the target of Property Crime even when Malaysia was still in Movement Control Order (MCO) from 18 March 2020, until it ended on 1 November 2021 (1 year, 7 months, and 2 weeks). Figure 3 until 5 shows the result from Hot Spot GiZScore & Gi_Bin Level that is significant for the year 2020 until 2022. The property crime pattern in Kuching in 2022 (Figure 4) remains consistent with that of 2020 and 2021 (Figure 3 and Figure 4). The result shows how often property crimes are in different parts of Kuching. The location has been identified for hotspot 2020 until 2021 for highest significant, primarily falls in Southern Kuching mainly identified as urban area such as AADK Sarawak, Bangunan BINAMAS, bus stop route to Bako National Park, Canna Lily Boulevard, Chung Hua Primary School No. 3, Crown Square, Crown Square Shopping Centre, Chung Hua Primary School No. 5, Chung Hua Middle School No. 3, Dewan Masyarakat Kuching, Hock Lee Centre, Hokkien Park, Kenyalang Commercial Complex, Kolam Renang Kuching MBKS, Kuching Park Hotel, Kuching Fire Station, Kingwood Inn, Kuching Park, Kenyalang Community Centre, Kenyalang MBKS Market, Kenyalang Shopping Centre, Jubilee Ground, Jubilee Ground Hawker Centre, MBKS Swimming Pool, Padang Sukan Jubilee, Palmarium Park, Pangkalan Ang Cheng Ho, Reverine Emerald Resort, SMK Bandar Kuching No. 1, SK Kenyalang, SK St. Theresa Padungan (M), Surau Al Kornia, Surau Darul Islah, Surau Hayaluddin Kampung Semarang, Surau Kampung Panglima Seman Lama, Surau Nurulhilal, Stadium Hoki Negeri Sarawak, SK Lumba Kuda, SMK Padungan, Taman Central, TPI-Kpg Panglima Seman Ulu, Travilion Commercial Centre, Taman Lalu Lintas, Wisma PERKESO, Wisma STA, Wisma Prudential, Wisma Mahmud, Wisma DUBS Multi-storey Car Park, and UMW Toyota

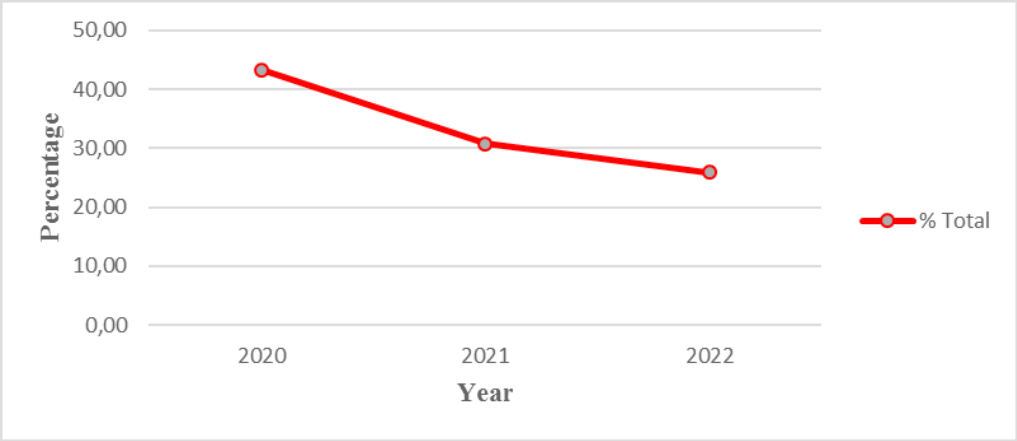

Figure 2: Percentage of Property Crime Cases in Kuching Division Sarawak 2020 to 2022
Source: Kuching Crime Investigation Department (D4, CID

Table 1: Property Crime Cases by Time of Occurrence (Day/Night) Kuching Division Sarawak 2020 to 2022

Month	% Day 2020	% Night 2020	% Day 2021	% Night 2021	% Day 2022	% Night 2022
January	11.29	13.54	8.51	8.42	5.88	4.83
February	10.41	8.93	6.71	5.45	7.14	5.80
March	8.03	5.76	8.51	7.43	7.14	8.21
April	5.52	4.32	9.17	10.89	8.82	9.66
May	5.90	6.34	8.02	9.90	8.82	8.21
June	6.15	6.34	9.17	8.91	7.77	11.11
July	9.79	9.51	7.36	8.42	11.55	8.21
August	8.66	8.36	8.67	11.39	9.24	12.56
September	10.79	8.36	8.51	8.91	8.61	6.76
October	8.53	11.24	9.98	6.93	7.56	5.31
November	8.03	9.51	7.53	7.43	7.77	7.25
December	6.90	7.78	7.86	5.94	9.66	12.08
Total	100	100	100	100	100	100

Source: Kuching Crime Investigation Department (D4, CID)

Motor. The hotspot also detect the road as Jalan Abell, Jalan Ang Cheng Ho, Jalan Berjaya, Jalan Chawan, Jalan Chawan 2, Jalan Chong Kiun Kong, Jalan Dato Bandar, Jalan Ellis, Jalan Foochow 1 & 2, Jalan Nipah, Jalan Gersik, Jalan Mendu, Jalan Padungan, Jalan Petanak, Jalan Pending, Jalan Penyau, Jalan Pinang, Jalan Three Hills Park, Jalan Tan Sri Datuk William Tan, Jalan Tan Sri Datuk Amar Sim Kheng Hong, Jalan Tun Razak, Lebuh Sekama, Lorong Dato Bandar, Lorong Mendu 3, Lorong Sim Kheng Hong Selatan 3, and Lorong Chawan 2.

The location identified as the hotspot for 2022 differs from 2020 and 2021. It shifted to Southern Kuching which is also an urban area that includes landmarks like Bangunan MBKS, Chung Hua Primary School No. 5, Chung Hua Middle School No. 3, Golden Dragon City, Kampung Sungai Laru, Kenyalang Commercial Complex, Kenyalang Community Centre, Kenyalang Food Centre, Kenyalang Shopping Centre, Kuching Specialist Hospital, KPJ Kuching Specialist Hospital, I-CATS East Campus/PPKS, SK Lumba Kuda, SMK Padungan, SMK Bandar Kuching No. 1, SK Kenyalang, Taman Lalu Lintas, Taman Stutong Indah, Tabuan Laru Playground Park, Unaco Supermarket (Stutong), Stutong Indah Commercial Centre, and Setia Commercial Centre. Meanwhile, the road that has the highest hotspot is Jalan Berjaya, Jalan Canna, Jalan Chawan, Jalan Chong Kuin Kong, Jalan Dato Bandar, Jalan Ellis, Jalan Foochow 1 & 2, Jalan Kedandi, Jalan Mendu, Jalan Penyau, Jalan Pinang, Jalan Setia Raja, Jalan Song 1B2, Jalan Tan Sri Datuk Amar Sim Kheng Hong, Jalan Tan Sri Datuk William Tan, Jalan Three Hills Park, Lebuh Sekama, Lorong 2, 2A, 2A5, 2C, 3,4A, 4C5, & 7, Lorong Canna 2 & 2B, Lorong Chawan 2, Lorong Kedandi, Lorong Kedandi 6, 8, 9A, 11 & 12, Lorong Mendu 3, Lorong Setia Raja 2A, 2A5, 4, 4A 4C, 4D, 4E & 12A, and Lorong Sim Kheng Hong Selatan 3.

Discussion

Studies on the impact of COVID-19 on property crime in Malaysia are limited. However, a study conducted in Kuching, Sarawak, analyzed the spatial temporal of property crime hotspots using the Getis Ord Gi* technique (Jagun et al., 2022; Jubit et al., 2020b; Jubit & Masron, 2022). The study found that holidays and festivals are exogenous factors that can influence the increase in property crime rate in Kuching, Sarawak (Jubit et al., 2020b, 2020a). Another study analyzed the effects of macroeconomic evils on property and violent crimes in Malaysia (Tang, 2010). The study found a positive linkage between crimes, income inequality, and unemployment, while showing that poverty does not seem to have a significant effect on crime. Overall, more research is needed to understand the impact of COVID-19 on property

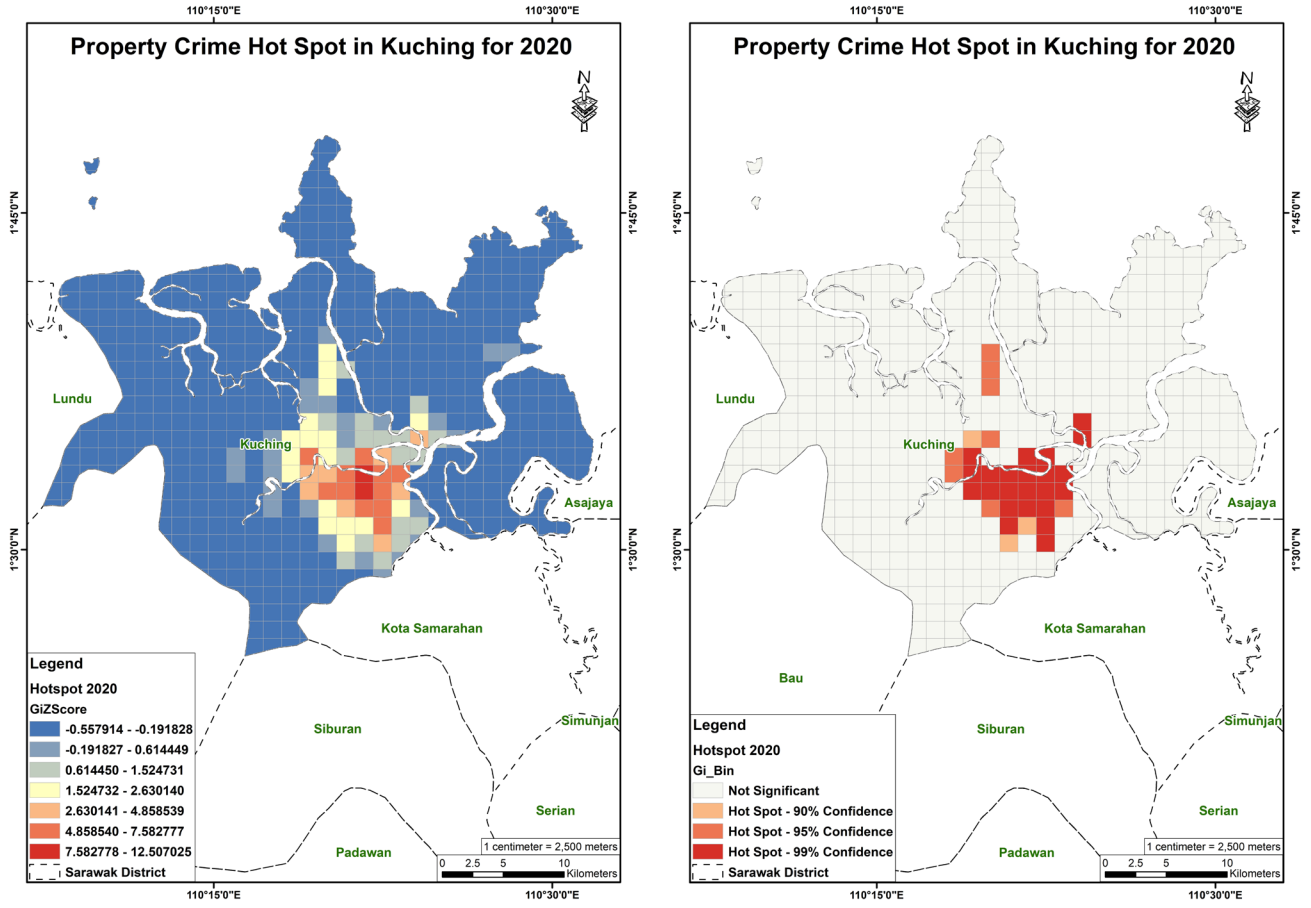

Figure 3: Result Hot Spot GiZScore & Gi_Bin Level for 2020

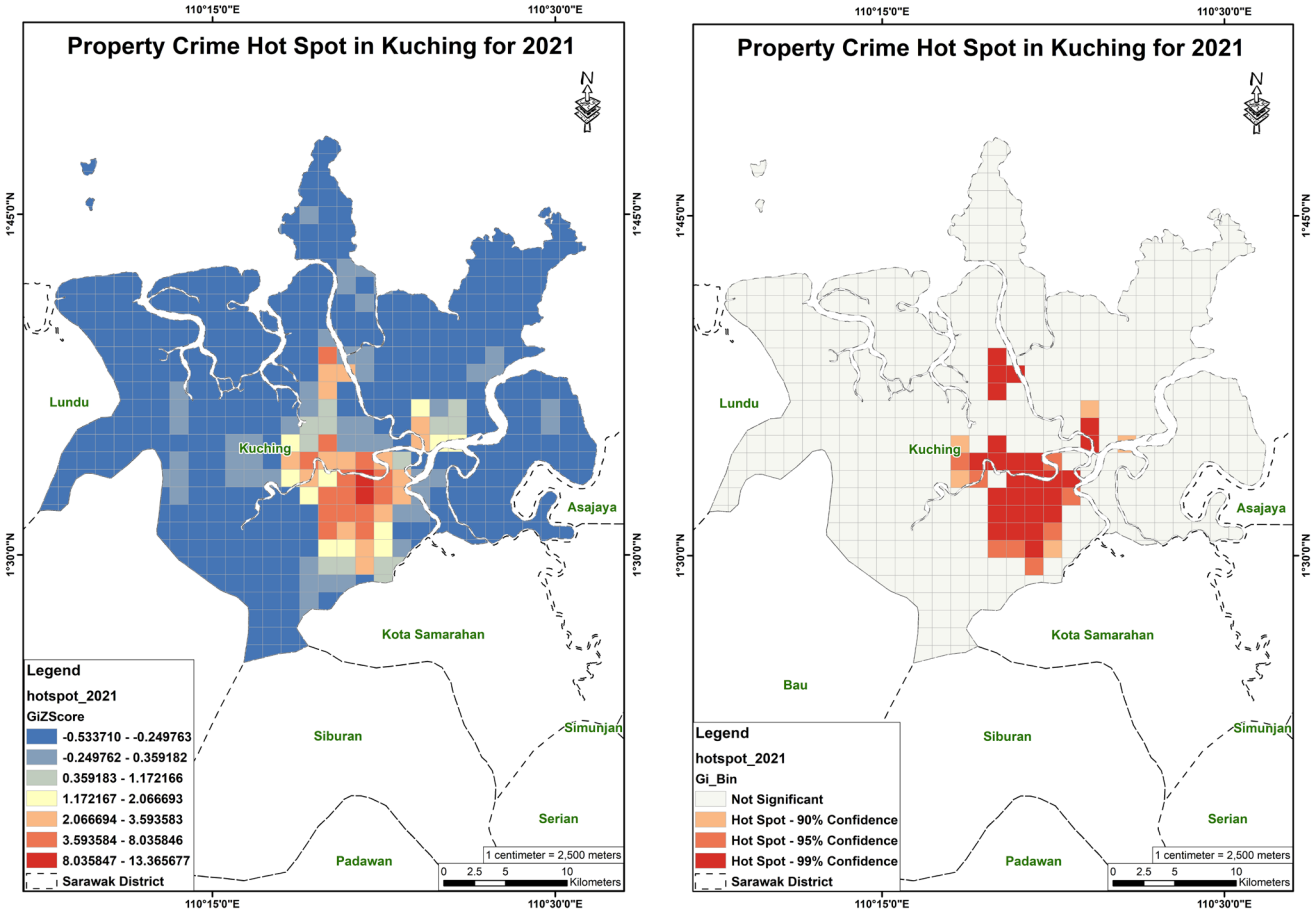

Figure 4: Result Hot Spot GiZScore & Gi_Bin Level for 2021

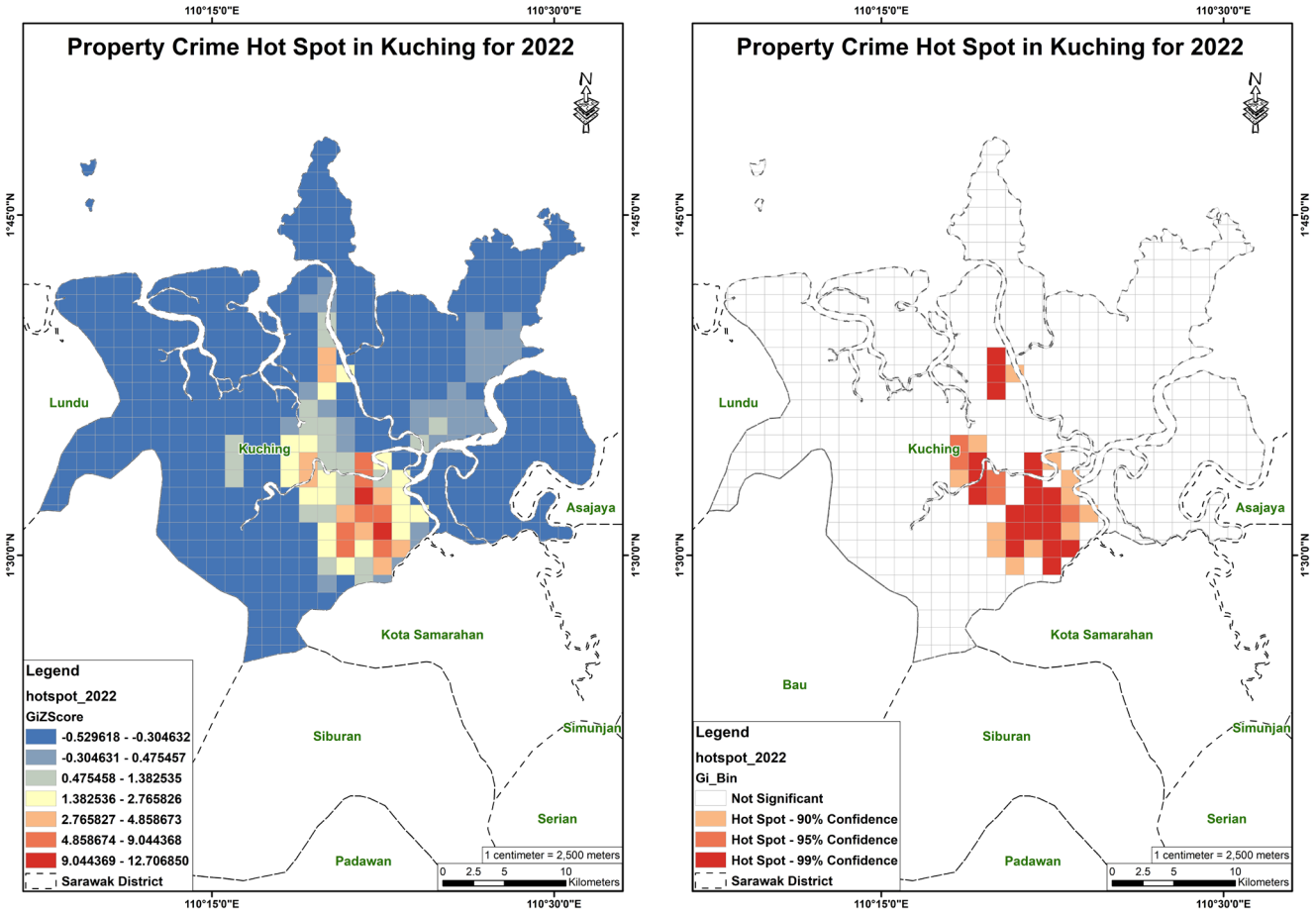

Figure 5: Result Hot Spot GiZScore & Gi_Bin Level for 2022

Table 2: GiZScore

No.	Year	GiZScore
1.	2020	2.630141 - 12.507025
2.	2021	2.066694 - 13.365677
3.	2022	2.765827 - 12.706850

crime in urban areas in Malaysia (Abrams, 2021). Some people assume that property crime in urban areas would surge during COVID-19. Initially, there were expectations of a decline in property crime in metropolitan areas because of lockdowns and movement restrictions. Property crimes, such as burglary, appeared to decrease as people stayed at home and public venues became less crowded. However, during the early stages of the pandemic, the trends were mixed with reductions observed in several property crime categories. Vehicle thefts and commercial burglaries, for example, may have dropped when businesses closed, and fewer people were on the streets. Crimes such as snatch thefts and commercial burglaries decreased in the first several weeks of the lockdown, most likely because of fewer opportunities as companies closed and individuals stayed at home (Halford et al., 2020; Teo et al., 2021). Criminals often adapt their strategies to changing circumstances. As more individuals stayed at home during the pandemic, there were tales of criminals shifting their focus to new targets, such as residential homes. Criminals responded to the shifting scenario by targeting residential properties, which resulted in an upsurge in home burglaries during the lockdown (Andresen & Hodgkinson, 2020; Gerell et al., 2020).

After COVID-19 pandemic-related restrictions were gradually lifted and life started returning to normal, property crime did not consistently conform to anticipated patterns. Certain property crime rates stubbornly persisted at high levels or even increased. Residential burglaries continued to be a problem even after lockdowns ended, suggesting that other factors were at play (Liu et al., 2022; Miyar et al., 2021). Socioeconomic factors, such as economic conditions, played a significant role in property crime rates. The economic aftermath of the pandemic, including job losses and financial instability, contributed to property crimes persisting or rising in some urban areas. The increasing unemployment and financial stress from the pandemic played a part in keeping property crime rates high in cities (Chen et al., 2022; Onyeneke & Karam, 2022). Law enforcement response was also adopted during and after the pandemic. Their effectiveness in dealing with property crimes, especially in urban areas, depended on the availability of resources and priorities. Law enforcement agencies had to manage limited resources and prioritize pandemic-related tasks, which might have affected their ability to address property crimes effectively (Gill et al., 2017; Jerome, 2020). Urban areas have diverse community

dynamics, which can significantly influence property crime rates. Factors like community cohesion, neighborhood watch programs, and citizen engagement can impact these rates. Communities with robust neighborhood watch programs and active citizen participation experienced fewer property crimes during and after the pandemic (An & Liu, 2012; Johnson & Roman, 2022). In conclusion, the property crime trends in urban areas of Malaysia, including Kuching, Sarawak, during and post COVID-19 pandemic, were influenced by a multifaceted interplay of elements encompassing criminal behavior, economic conditions, law enforcement response, and community dynamics. Contrary to initial assumptions of reduced property crime during lockdowns, the actual trends exhibited complexity and diversity, underscoring the necessity of thorough research and adaptable crime prevention strategies.

4. Conclusion

This study of GIS on property crime during COVID-19 pandemic has shed light on the patterns and spatial distribution involved in Kuching, Sarawak. GIS helps to analyze property crime and is an effective way to visualize data as a key component of descriptive analytics. To combat the COVID-19 epidemic, Malaysia, and many other countries enacted measures, such as lockdowns and movement restrictions. These policies have the unexpected consequence of changing the dynamics of property crime in cities. This research can increase the awareness of the people in Kuching and the Royal Malaysia Police to reduce the crime rate to create a peaceful and safe environment in Kuching, Sarawak. Understanding the causes of crime is essential for its prevention and for keeping Kuching city in a safe environment. This knowledge has the potential to significantly reshape law enforcement tactics, enabling the Police Headquarters in Bukit Aman to make more informed decisions regarding resource allocation and the implementation of preventative policing initiatives to stop criminal activity. As a conclusion, property crime in Malaysian cities, including Kuching, fluctuated during and after the COVID-19 outbreak. While expectations suggested a decrease during lockdowns, actual trends were influenced by a variety of factors, such as unfavorable social, economic, cultural, and family circumstances. It demands continued research and flexible law enforcement measures to handle property crime concerns in the shifting urban setting. Previous studies have focused on the impact of COVID-19 on property crime in Malaysian cities, however, further research is necessary to fully understand the contributing factors and lasting trends. Continuous monitoring and analysis of property crime data is required to build effective crime prevention and response tactics in the post-pandemic age.

Acknowledgment

This paper was funded under Fundamental Research Grant Scheme (FRGS) FRGS/1/2020/SS0/UNIMAS/01/1. The authors wish to express appreciation to Royal Malaysian Police Headquarters, Bukit Aman, The Criminal Investigation Department (Intelligence/Operations/Records-D4 Division JSJ), Contingent Police Headquarters in Sarawak, Kuching District Police Headquarters especially the Kuching Crime Investigation Department (CID) and head of Police stations in Kuching for giving support and cooperation.

References

Abdullah, D. A., Masron, T., Zaini, F., & Jubit, N. (2021). *Sistem Maklumat Geografi (GIS) dalam Pemetaan Jenayah di Miri, Sarawak*. https://ir.unimas.my/id/eprint/35938/

Abrams, D. S. (2021, March 30). *Crime in the Time of COVID*. Crime and Criminal Justice, Econofact. https://econofact.org/crime-in-the-time-of-covid

Ahmad, A. (2015). Aplikasi Sistem Maklumat Geografi dalam Pengurusan Data Tapak Arkeologi. In T. Masron & M. Saidin (Eds.), *Teknologi Maklumat Ruangan Dalam Arkeologi*. Penerbit Universiti Sains Malaysia.

Ahmad, A., & Masron, T. (2013). Aplikasi Sistem Maklumat Geografi (GIS) dalam Menganggar Keluasan Petempatan Awal di Tapak Arkeologi Lembah Lenggong, Hulu Perak, Perak, Malaysia. *Jurnal Perspektif: Jurnal Sains Sosial Dan Kemanusiaan*, *5*(1), 19–38. https://myjurnal.mohe.gov.my/public/article-view.php?id=78703

Ahmad, A., Masron, T., Jubit, N., Redzuan, M. S., Soda, R., Bismelah, L. H., & Mohd Ali, A. S. (2024b). Analysis of the Movement Distribution Pattern of Violence Crime in Malaysia's Capital Region-Selangor, Kuala Lumpur, and Putrajaya. *International Journal of Geoinformatics*, *20*(2), 11–26. https://doi.org/10.52939/ijg.v20i2.3061

Ahmad, A., Masron, T., Osman, M. A., Mohammed, B., & Marzuki, A. (2011). Initial Studies on Web Based Tourism Decision Support System (WBTDSS) Case Study: Langkawi Island, Kedah. In Azizi Bahuddin (Ed.), *Proceedings of 2nd Regional Conference on Tourism Research: Venturing into New Tourism Research* (pp. 344–359). Sustainable Tourism Research Cluster (STRC), Universiti Sains Malaysia. https://www.semanticscholar.org/paper/Initial-studies-on-web-based-tourism-decision-case-Ahmad-Masron/ed8ee1cdad4caf130964be266ebc6453a50529fe

Ahmad, A., Masron, T., Ringkai, E., Barawi, M. H., Salleh, M. S., Jubit, N., & Redzuan, M. S. (2024c). Analisis Ruangan Hot Spot Jenayah Pecah Rumah di Negeri Selangor, Kuala Lumpur dan Putrajaya pada tahun 2015-2020. *Geografia-Malaysian Journal of Society and Space*, *20*(1), 49–67. https://doi.org/10.17576/geo-2024-2001-04

Ahmad, A., Masron, T., & Saidin, M. (2015). Aplikasi Sistem Maklumat Geografi Untuk Menganggar Keluasan Petempatan Awal Tapak Arkeologi Lembah Lenggong, Hulu Perak, Perak. In T. Masron & M. Saidin (Eds.), *Teknologi Maklumat Ruangan Dalam Arkeologi*. Penerbit Universiti Sains Malaysia.

Ahmad, A., Mohd Ayob, N., & Abdul Majid, A. (2013). Regional Carrying Capacity (RCC) Issues Langkawi Islands, Kedah. In B. Mohamed & A. Bahauddin (Eds.), *Proceedings of International Conference on Tourism Development: Building the Future of Tourism, Penang, Malaysia, 4 & 5 February 2013* (p. 487). Sustainable Tourism Research Cluster, Universiti Sains Malaysia. https://www.researchgate.net/publication/329084336_Regional_Carrying_Capacity_RCC_Issues_Langkawi_Islands_Kedah

Ahmad, A., Said, M. Z., Masron, T., Ariffin, N. A., Zakaria, Y. S., Ardiansyah, A., Jamru, L. R., Talib, N. K., Idris, N. R. A., Abd. Rahman, N., Bismelah, L. H., Mohd Ali, A. S., Wis, B. A., & Musa, N. (2024a). Faktor Kesukaran dalam Proses Memodelkan Sebuah Tapak Arkeologi Menerusi Pendekatan Geospatial. *E-Bangi: Journal of Social Science and Humanities*, *21*(1), 492–501. https://doi.org/10.17576/ebangi.2024.2101.42

An, R., & Liu, J. (2012). Local Labor Market Fluctuations and Physical Activity among Adults in the United States, 1990–2009. *International Scholarly Research Notices-Public Health*, *2012*, 1–7. https://doi.org/https://doi.org/10.5402/2012/318610

Andresen, M. A., & Hodgkinson, T. (2020). Somehow I Always End Up Alone: COVID-19, Social Isolation and Crime in Queensland, Australia. *Crime Science*, *9*(25). https://doi.org/10.1186/s40163-020-00135-4

ArcGIS Pro 3.1. (2022). *How Create Fishnet Works*. Environmental Systems Research Institute, Inc (ESRI). https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/how-create-fishnet-works.htm

Ariffin, N. A., Wan Ibrahim, W. M. M., Rainis, R., Samat, N., Mohd Nasir, M. I., Abdul Rashid, S. M. R., Ahmad, A., & Zakaria, Y. S. (2024). Identification of Trends, Direction of Distribution and Spatial Pattern of Tuberculosis Disease (2015-2017) in Penang. *Geografia-Malaysian Journal of Society and Space*, *20*(1), 68–84. https://doi.org/10.17576/geo-2024-2001-05

Basiron, N. F. Z., Ahmad, A., & Masron, T. (2014). Spatial Analysis of International Tourist Movement to Langkawi for 2010 and 2011. *4th International Conference on Tourism Research (4ICTR), SHS Web of Conferences*, *12*(01066). https://doi.org/https://doi.org/10.1051/shsconf/20141201066

Borg, A., & Svensson, M. (2022). All Burglaries Are Not the Same: Predicting Near-Repeat Burglaries in Cities Using Modus Operandi. *ISPRS International Journal of Geo-Information*, *11*(3). https://doi.org/https://doi.org/10.3390/ijgi11030160

Braga, A., Papachristos, A., & Hureau, D. (2012). Hot Spots Policing Effects on Crime. *Campbell Systematic Reviews*, *8*(1), 1–96. https://doi.org/https://doi.org/10.4073/csr.2012.8

Campedelli, G. M., Aziani, A., & Favarin, S. (2021). Exploring the Immediate Effects of COVID-19 Containment Policies on Crime: an Empirical Analysis of the Short-Term Aftermath in Los Angeles. *American Journal of Criminal Justice*, *46*(5), 704–727. https://doi.org/10.1007/s12103-020-09578-6

Campedelli, G. M., Favarin, S., Aziani, A., & Piquero, A. R. (2020). Disentangling Community-Level Changes in Crime Trends During the COVID-19 Pandemic in Chicago. *Crime Science*, *9*(21). https://doi.org/https://doi.org/10.1186/s40163-020-00131-8

Chai, S. S., Wong, W. K., & Goh, K. L. (2016). Backpropagation Vs Radial Basis Function Neural Model: Rainfall Intensity Classification for Flood Prediction Using Meteorology Data. *Journal of Computer Science*, *12*(4), 191–200. https://doi.org/https://doi.org/10.3844/jcssp.2016.191.200

Chen, T., Bowers, K., Zhu, D., Gao, X., & Cheng, T. (2022). Spatio-Temporal Stratified Associations Between Urban Human Activities and Crime Patterns: A Case Study In San Francisco Around The COVID-19 Stay-At-Home Mandate. *Computational Urban Science*, *2*(1). https://doi.org/10.1007/s43762-022-00041-2

Cheng, B., Chen, L., & Yang, B. (2023). Qualitative Exploration and Correction Strategies of the Criminal Psychological Mechanism of the Burglars. *International Journal of Mental Health Promotion*, *25*(4), 595–611. https://doi.org/https://doi.org/10.32604/ijmhp.2023.027321

Dewinter, M., Vandeviver, C., Dau, P. M., Vander Beken, T., & Witlox, F. (2021). The Impact of Strict Measures as a Result of the COVID-19 Pandemic on The Spatial Pattern of the Demand for Police: Case Study Antwerp (Belgium). *Crime Science*, *10*(20). https://doi.org/https://doi.org/10.1186/s40163-021-00156-7

Du, F., Liu, L., Jiang, C., Long, D., & Lan, M. (2019). Discerning the Effects of Rural to Urban Migrants on Burglaries in ZG City with Structural Equation Modeling. *Sustainability (Switzerland)-Sustainability in Geographic Science*, *11*(3). https://doi.org/10.3390/su11030561

ESRI. (2022). *How Hot Spot Analysis (Getis-Ord Gi*) Works*. Environmental Systems Research Institute, Inc. (ESRI). https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/h-how-hot-spot-analysis-getis-ord-gi-spatial-stati.htm#:~:text=The%20Hot%20Spot%20Analysis%20tool,the%20context%20of%20neighboring%20features.

ESRI Canada Education and Research. (2021). *GIS for Crime Analysis-Career Path Series*. ESRI Canada. https://storymaps.arcgis.com/stories/44709a4de7ac46ebb6b862ddf016722a

Gerell, M., Kardell, J., & Kindgren, J. (2020). Minor COVID-19 Association with Crime in Sweden. *Crime Science*, *9*(19). https://doi.org/https://doi.org/10.1186/s40163-020-00128-3

Gill, C., Weisburd, D., Telep, C., Vitter, Z., & Bennett, T. (2017). Protocol: Community-Oriented Policing to Reduce Crime, Disorder, and Fear and Improve Legitimacy and Satisfaction with Police: A Systematic Review. *Campbell Systematic Reviews*, *13*(1), 1–30. https://doi.org/https://doi.org/10.1002/CL2.174

Halford, E., Dixon, A., Farrell, G., Malleson, N., & Tilley, N. (2020). Crime and Coronavirus: Social Distancing, Lockdown, and the Mobility Elasticity of Crime. *Crime Science*, *9*(11). https://doi.org/10.1186/s40163-020-00121-w

Hunter, J., Ward, B., Tseloni, A., & Pease, K. (2021). Where Should Police Forces Target Their Residential Burglary Reduction Efforts? Using Official Victimisation Data to Predict Burglary Incidences at the Neighbourhood Level. *Crime Science*, *10*(11). https://doi.org/https://doi.org/10.1186/s40163-021-00144-x

Ibrahim, S., & Abd Rahman, I. H. (2021). Pandemik COVID-19: Kesan Terhadap Kadar Indeks Jenayah Di Malaysia. *International Journal of Law, Government and Communication (IJLGC)*, *6*(25), 114–134. https://doi.org/10.35631/IJLGC.625010

Inlow, A. R. (2021). A Comprehensive Review of Quantitative Research on Crime, the Built Environment, Land Use, and Physical Geography. *Sociology Compass*, *15*(7), 1–18. https://doi.org/https://doi.org/10.1111/soc4.12889

Jagun, Z. T., Nyakuma, B. B., Daud, D., & Samsudin, S. (2022). Property Development During the COVID-19 Pandemic: Challenges and Outlook in Malaysia. *Environmental Science and Pollution Research (Springer Nature - PMC COVID-19 Collection)*, *29*(57), 85717–85726. https://doi.org/10.1007/s11356-021-18378-2

Jerome, B. (2020). Criminal Investigation and Criminal Intelligence: Example of Adaptation in the Prevention and Repression of Cybercrime. *Risks (This Article Belongs to the Special Issue Cyber Risk and Security)*, *8*(3), 1–10. https://doi.org/https://doi.org/10.3390/risks8030099

Jiang, X., Zheng, Z., Zheng, Y., & Mao, Z. (2023). Spatiotemporal Distribution and Influencing Factors of Theft during the Pre-COVID-19 and COVID-19 Periods: A Case Study of Haining City, Zhejiang, China. *ISPRS International Journal of Geo-Information (This Article Belongs to the Collection Spatial Components of COVID-19 Pandemic)*, *12*(5). https://doi.org/https://doi.org/10.3390/ijgi12050189

Johnson, N. J., & Roman, C. G. (2022). Community Correlates of Change: A Mixed-Effects Assessment of Shooting Dynamics During COVID-19. *PLoS ONE*, *17*(2). https://doi.org/https://doi.org/10.1371/journal.pone.0263777

Jubit, N., & Masron, T. (2022). Geographic Information System for Crime Mapping: A Case Study of Property Crime in Kuching, Sarawak. *Journal of Asian Geography*, *1*(1), 25–33. http://creativecommons.org/licenses/by/4.0/

Jubit, N., Masron, T., & Jamian, M. A. H. (2022). *Permodelan Jenayah Harta Benda & Kebimbangan tentang Jenayah di Bandar Raya Kuching, Sarawak*. UNIMAS Publisher.

Jubit, N., Masron, T., & Marzuki, A. (2020a). Analyzing The Spatial Temporal of Property Crime Hot Spots. A Case Study of Kuching, Sarawak. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, *18*(4), 1–11. https://doi.org/http://dx.doi.org/10.21837/pm.v18i14.813

Jubit, N., Masron, T., & Marzuki, A. (2020b). Spatial Pattern of Residential Burglary. The Case Study: Kuching, Sarawak. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, *18*(3), 190–201. https://doi.org/https://doi.org/10.21837/pm.v18i13.785

Jubit, N., Masron, T., & Marzuki, A. (2021). Application of Kernel Density Estimation to Identify Motorcycle Theft Hot Spots in Kuching, Sarawak. *Planning Malaysia: Journal of the Malaysian*

Institute of Planners, *19*(5), 148–159. https://doi.org/https://doi.org/10.21837/pm.v19i19.1067

Jubit, N., Masron, T., Nordin, M. N., & Chabo, D. (2019). Aplikasi GIS dalam mengenal pasti Kawasan Hot Spot Jenayah Harta Benda di Kuching, Sarawak. *Geografia: Malaysian Journal of Society and Space*, *15*(4), 30–49. https://doi.org/10.17576/geo-2019-1504-03

Jubit, N., Masron, T., Nordin, M. N., Jamian, M. A. H., & Yusuf, A. (2021). Spatial Analysis of Vehicle Theft in Kuching, Sarawak. *Malaysian Journal of Tropical Geography*, *47*(1), 46–66. https://ejournal.um.edu.my/index.php/MJTG/article/view/35190

Jubit, N., Masron, T., Puyok, A., & Ahmad, A. (2023b). Geographic Distribution of Voter Turnout, Ethnic Turnout and Vote Choices in Johor State Election. *Geografia-Malaysian Journal of Society and Space*, *19*(4), 64–76. https://doi.org/https://doi.org/10.17576/geo-2023-1904-05

Jubit, N., Masron, T., & Redzuan, M. S. (2023a). High Risk Areas of Snatch Theft in Kuala Lumpur, Putrajaya, and Selangor, Malaysia. *Geografia-Malaysian Journal of Society and Space*, *19*(4), 15–29. https://doi.org/10.17576/geo-2023-1904-02

Jubit, N., Redzuan, M. S., Ahmad, A., Salleh, M. S., & Masron, T. (2022). Tren Jenayah Harta Benda di Malaysia: Kajian di Selangor dan Kuala Lumpur. *Geografi*, *10*(2), 35–53. https://doi.org/https://doi.org/10.37134/geografi.vol10.2.3.2022

Keng, Z. Y., Saw, Y. M., Thung, S. C., Chong, W. W., Albert, A., Kariya, T., Yamamoto, E., & Hamajima, N. (2021). Rate of Achievement of Therapeutic Outcomes and Factors Associated with Control of Non-Communicable Diseases in Rural East Malaysia: Implications for Policy and Practice. *Scientific Reports*, *11*(3812). https://doi.org/https://doi.org/10.1038/s41598-021-83168-2

Kuok, K. K., Mersal, M. E., Chiu, P. C., Chin, M. Y., Rahman, Md. R., & Bakri, M. K. (2022). Climate Change Impacts on Sea Level Rise to Flood Depth and Extent of Sarawak River. *Frontiers in Water*, *4*. https://doi.org/https://doi.org/10.3389/frwa.2022.870936

Lai S. H, Darrien M. Y. S, Frederik J. P, & Salim S. (2008). Ecological Sanitation, Sustainable Strategy as An Alternative Urban Water Source. *International Conference on Environment ICENV*, 1–10. https://www.semanticscholar.org/paper/Ecological-Sanitation%2C-Sustainable-Strategy-as-an-Hin-Mah/d326f0219e8b65147185d3eb4368351a59620c83

Laws of Malaysia. (2018). *Laws of Malaysia Online. Version of Updated Text of Reprint. Act 574 Penal Code as at 1 February 2018*. extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/61339/117909/F1085941047/MYS61339%202015.pdf

Liu, L., Chang, J., Long, D., & Liu, H. (2022). Analyzing the Impact of COVID-19 Lockdowns on Violent Crime. *International Journal of Environmental Research and Public Health*, *19*(23). https://doi.org/10.3390/ijerph192315525

Marzuki, A., Bagheri, M., Ahmad, A., Masron, T., & Akhir, M. F. (2023). Establishing a GIS-SMCDA Model of Sustainable Eco-Tourism Development in Pahang, Malaysia. *Episodes: Journal of International Geoscience*, *46*(3), 375–387. https://doi.org/https://doi.org/10.18814/epiiugs/2022/022037

Masron, T., Marzuki, A., Yaakub, N. F., Nordin, M. N., & Jubit, N. (2021). Spatial Analysis of Crime Hot-Spot in the Northeast Penang Island District and Kuching District, Malaysia. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, *19*(5). https://doi.org/https://doi.org/10.21837/pm.v19i19.1057

Miyar, J. R. B. de la, Hoehn-Velasco, L., & Silverio-Murillo, A. (2021). The U-Shaped Crime Recovery During COVID-19: Evidence from National Crime Rates in Mexico. *Crime Science*, *10*(14). https://doi.org/10.1186/s40163-021-00147-8

Mohd Ayob, N., Ahmad, A., & Mohamed, B. (2013). Spatial Distributions of Tourist in Langkawi Island. *Proceedings of International Conference on Tourism Development*, 301–309. https://www.semanticscholar.org/paper/Spatial-distributions-of-tourist-in-Langkawi-Ayob-Ahmad/e8063d2ba8ad3d20d02af9a82be22069c56c11ed

Mohd Ayob, N., Masron, T., & Ahmad, A. (2014). Taburan Ciri-Ciri Sosio-Demografi Pelancong Domestik mengikut lokasi di Pulau Langkawi. *International Journal of Environment, Society and Space*, *2*(2), 35–49. https://www.researchgate.net/publication/330132773_Taburan_Ciri-Ciri_Sosio-Demografi_Pelancong_Domestik_Mengikut_Lokasi_di_Pulau_Langkawi

Muhamad Azman, H. I., Tingga, R. C. T., & Adrus, M. (2021). Species Diversity of Non-Volant Small Mammals Between Lowland and Highland of Gunung Serapi, Kubah National Park, Sarawak. *Borneo Journal of Resource Science and Technology*, *11*(2), 110–117. https://doi.org/https://doi.org/10.33736/bjrst.3058.2021

Muhamad Ludin, A. N., Abd. Aziz, N., Hj Yusoff, N., & Wan Abd Razak, W. J. (2013). Impacts of Urban Land Use on Crime Patterns Through GIS Application. *Planning Malaysia: Journal of the Malaysian Institute of Planners (Special Issue 2: 2013, Geospatial Analysis in Urban Planning)*, *11*(2), 1–22. https://doi.org/10.21837/pm.v11i2.113

Murukesu, R. R., Singh, D. K. A., Shahar, S., & Subramaniam, P. (2021). Physical Activity Patterns, Psychosocial Well-Being and Coping Strategies Among Older Persons with Cognitive Frailty of the "WE-RISE" Trial Throughout the COVID-19 Movement Control Order. *Clinical Interventions in Aging*, *16*, 415–429. https://doi.org/https://doi.org/10.2147/CIA.S290851

Nivette, A. E., Zahnow, R., Aguilar, R., Ahven, A., Amram, S., Ariel, B., Burbano, M. J. A., Astolfi, R., Baier, D., Bark, H. M., Beijers, J. E. H., Bergman, M., Breetzke, G., Concha-Eastman, I. A., Curtis-Ham, S., Davenport, R., Díaz, C., Fleitas, D., Gerell, M., … Eisner, M. P. (2021). A Global Analysis of the Impact of COVID-19 Stay-at-Home Restrictions on Crime. *Nature Human Behaviour*, *5*, 868–877. https://doi.org/https://doi.org/10.1038/s41562-021-01139-z

Nordin, M. N., Masron, T., Jubit, N., & Yunos, N. (2022). The Spatial Relationship Between Drug Abuse and Home Burglaries: Northeast District of Penang. *International Journal of Current Science Research and Review*, *5*(7). https://doi.org/https://doi.org/10.47191/ijcsrr/V5-i7-11

Nordin, M. N., Masron, T., Yunos, N. E., & Jubit, N. (2020). Spatial Hotspot Patterns of a Home Burglary in Penang. *Geografia: Malaysian Journal of Society and Space*, *16*(2), 29–40. https://doi.org/https://doi.org/10.17576/geo-2020-1602-03

Omoregie, A. I., Senian, N., Li, P. Y., Hei, N. L., Leong, D. O. E., Ginjom, I. R. H., & Nissom, P. M. (2016). Screening for Urease-Producing Bacteria from Limestone Caves of Sarawak. *Borneo Journal of Resource Science and Technology*, *6*(1), 37–45. https://doi.org/https://doi.org/10.33736/bjrst.213.2016

Omorinoye, O. A., Assim, Z., & Jusoh, I. (2021). Geomorphological and Sedimentological Features of River Sadong, Sarawak, Malaysia. *Indonesian Journal on Geoscience*, *8*(1), 119–130. https://doi.org/10.17014/ijog.8.1.119-130

Onyeneke, C. C., & Karam, A. H. (2022). An Exploratory Study of Crime: Examining Lived Experiences of Crime through Socioeconomic, Demographic, and Physical Characteristics. *Urban Science-Special Issue Sustainable Transformation in the Global South: Context-Driven Urban Design, Livelihoods and Development Challenges*, *6*(3). https://doi.org/https://doi.org/10.3390/urbansci6030043

Ortiz-Prado, E., Andrade, F., Vasconez, E., Escobar-Espinosa, C., Vallejo-Janeta, A. P., Freire-Paspuel, B., Coronel, B., Galvis, H., Morales-Jadan, D., Rivera-Olivero, I. A., Lozada, T., Henriquez-Trujillo, A. R., Garcia-Bereguiain, M. A., & the UDLA-COVID-19 Team. (2022). High SARS-CoV-2 Infection Rates Among Special Forces Police Units During the Early Phase of the COVID-19 Pandemic in Ecuador. *Frontiers in Medicine*, *8*. https://doi.org/https://doi.org/10.3389/fmed.2021.735821

Paramasivan, K., Subburaj, R., Jaiswal, S., & Sudarsanam, N. (2022). Empirical Evidence of the Impact of Mobility on Property Crimes During the First Two Waves of the COVID-19 pandemic. *Nature: Humanities and Social Sciences Communications*, *9*. https://doi.org/https://doi.org/10.1057/s41599-022-01393-0

Payne, J. L., Morgan, A., & Piquero, A. R. (2021). Exploring Regional Variability in the Short-Term Impact of COVID-19 on Property Crime in Queensland, Australia. *Crime Science*, *10*(7). https://doi.org/https://doi.org/10.1186/s40163-020-00136-3

Rahman, M. M., Marzo, R. R., Chowdhury, S., Qalati, S. A., Hasan, M. N., Paul, G. K., Abid, K., Sheferaw, W. E., Mariadass, A., Chandran, D., Kanan, S., Firdaus, A. U. S. B. A., Sabarin, F. A. Z. binti, & Lin, Y. (2022). Knowledge, Attitude and Practices Toward Coronavirus Disease (COVID- 19) in Southeast and South Asia: A Mixed Study Design Approach. *Frontiers in Public Health*, *10*. https://doi.org/https://doi.org/10.3389/fpubh.2022.875727

Ristea, A., & Leitner, M. (2020). Urban Crime Mapping and Analysis using GIS. *ISPRS International Journal of Geo-Information*, *9*(9), 1–8. https://doi.org/10.3390/ijgi9090511

Roach, J., & Pease, K. (2011). Evolution and the Prevention of Violent Crime. *Psychology*, *2*(4), 393–404. https://doi.org/10.4236/psych.2011.24062

Sallaberry, J. D., Martínez-Conesa, I., & Flach, L. (2022). Whistleblowing in Small and Large Accounting Firms in Brazil. *Small Business International Review*, *6*(2), e502. https://doi.org/10.26784/sbir.v6i2.502

Sarawak Department of Statistics. (2015). *Sarawak Statistics Yearbook*. http://www.malaysiaeconomy.net/download/18072016_2.html

Sun, Y., Huang, Y., Yuan, K., Chan, T. O., & Wang, Y. (2021). Spatial Patterns of COVID-19 Incidence in Relation to Crime Rate Across London. *ISPRS-International Journal of Geo-Information*, *10*(2). https://doi.org/https://doi.org/10.3390/ijgi10020053

Tang, C. F. (2010). The Effects of Macroeconomic Evils on Property and Violent Crimes in Malaysia. *International Journal of Business and Society*, *11*(2), 35–50. https://www.proquest.com/docview/863651130

Teo, C., Kim, C., Nielsen, A., Young, T., O'Campo, P., & Chum, A. (2021). Did the UK COVID-19 Lockdown Modify the Influence of Neighbourhood Disorder on Psychological Distress? Evidence from a Prospective Cohort Study. *Frontiers in Psychiatry*, *12*. https://doi.org/https://doi.org/10.3389/fpsyt.2021.702807

Thayaparan, S., Robertson, I. D., & Abdullah, M. T. (2015). Serological and Molecular Detection of Leptospira Spp. from Small Wild Mammals Captured in Sarawak, Malaysia. *Malaysian Journal of Microbiology*, *11*(1), 93–101. https://doi.org/http://dx.doi.org/10.21161/mjm.67514

The World Bank. (2018). *Annual Report*. https://documents1.worldbank.org/curated/en/630671538158537244/pdf/The-World-Bank-Annual-Report-2018.pdf

UNODC. (2020). *Research Brief: Effect of the COVID-19 Pandemic and Related Restrictions on Homicide and Property Crime*. https://www.unodc.org/documents/data-and-analysis/covid/Property_Crime_Brief_2020.pdf

Wan Azman, W. N. S., Mazlan, N., Bernard, H., Silang, S., Zaini, M. K., & Khan, F. A. A. (2022). Diet Analysis of Sympatric Colobine Monkeys from Bako National Park, Sarawak, Borneo. *Borneo Journal of Resource Science and Technology*, *12*(1), 157–165. https://doi.org/https://doi.org/10.33736/bjrst.4418.2022

Weisburd, D., & Telep, C. W. (2014). Hot Spots Policing: What We Know and What We Need to Know. *Journal of Contemporary Criminal Justice*, *30*(2), 200–220. https://doi.org/https://doi.org/10.1177/1043986214525083

Yesufu, S. (2021). The Socio-Economic Impact of The Covid-19: A South African Perspective on Its Impact on The Socio-Economic, Inequality, Security, and Food Systems. *ScienceRise*, *4*, 68–79. https://doi.org/https://doi.org/10.21303/2313-8416.2021.002036

Zainol, F. A., Wan Daud, W. N., Abdullah, Z., & Yaacob, M. R. (2014). Overcoming Poverty through Social Entrepreneurship: A Conceptual Paper. *International Business Research*, *7*(7). https://doi.org/10.5539/ibr.v7n7p183

Zakaria, S. M., Abdullah, N., Md Akhir, N., Amin, A. S., Mohd Shukry, A. N. A., Abdul Rashid, M. R., & Wan Yusof, W. N. (2022). Perceptions of Quality of Life during the Pandemic: A Case Study on B40 Single Mothers. *International Journal of Environmental Research and Public Health*, *19*(19). https://doi.org/10.3390/ijerph191912219

Zakaria, Y. S., Ahmad, A., Said, M. Z., Epa, A. E., Ariffin, N. A., M Muslim, A., Akhir, M. F., & Hussin, R. (2023). GIS and Oil Spill Tracking Model in Forecasting Potential Oil Spill-Affected Areas Along Terengganu and Pahang Coastal Area. *Planning Malaysia: Journal of the Malaysian Institute of Planners*, *21*(4). https://doi.org/https://doi.org/10.21837/pm.v21i28.1330

Zhang, X., & Chen, P. (2023). The Impact of Urban Facilities on Crime during the Pre- and Pandemic Periods: A Practical Study in Beijing. *International Journal of Environmental Research and Public Health*, *20*(3). https://doi.org/10.3390/ijerph20032163