

Research article

Investigating the Spatial Relation between Landuse and Property Crime in Kuching, Sarawak through Location Quotient Analysis

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Abstract

Urban areas are often associated with higher crime rates, which is a growing concern among communities. This study aims to investigate the spatial relation between landuse and property crime in Kuching, Sarawak through location quotient analysis. Three methods were applied in this study: multiple buffer analysis, Pearson's correlation, and location quotient. Based on initial findings, there is an observed increase in crime levels as the distance from the centroid extends from 150 to 750 meters and decreases beyond 750 meters. The study findings reveal a strong and consistent positive correlation between property crime and land use areas across 2015-2017. Property crime is more prevalent in urban and associated areas compared to other land use categories. Offenders in Kuching often utilise various tools to break into houses and dig holes, break locks, climb gates, engage in snatch theft using motorcycles, and break car windows to steal handbags that are placed on the right seat. In certain locations, CCTV cameras are positioned far away from the target areas. All of these factors contribute to creating opportunities for offenders. Property crimes were more common during the daytime than at night as during the daytime, which may be attributed to more people being active outside their homes, providing criminals with easier targets. At night, people tend to stay home, and the opportunity for property crimes decreases. The study provides crucial geographic crime information to the Commission of Kuching North City Hall and the Council of the City of Kuching South to enhance urban safety.

Keywords: Spatial relation; landuse; property crime; buffer; location quotient analysis.

1. Introduction

Corcoran *et al.* (2021) discovered that when commercial areas are located near each other, the amount of crime experienced can differ significantly. Additionally, the patterns of crime distribution throughout the day and week can also vary. Quick *et al.* (2017) found the impact of landuse on crime patterns in more significant when looking at the physical location of crimes. This study also found that previous studies have discovered that there is a positive relationship between the spatial distribution of property crime and non-residential land uses, such as commercial areas and public transit stations. Clouse (2022) has shown property crime like theft and burglary are more likely to occur in places like shopping areas, transportation centres, and industrial zones. On the other hand, violent crimes such as assault or robbery are more common in commercial areas, places with many residential buildings, and areas designated for civic, institutional, and recreational purposes. According to previous research, property crime tends to be concentrated in commercial areas. However, to determine the specific property crime situation in Kuching, Sarawak, a localised study would be necessary. Before delving into a specific topic, it is important to understand the cities in general.

Cities are experiencing a significant increase in population worldwide. In 2012, more than half of the global population, specifically 52.5 per cent, resided in urban areas. This proportion was expected to rise to 56.9 per cent by 2022. The urban population percentage tends to be higher in developed regions, reaching 79.7 per cent in 2022, compared to the developing world, where it stands at 52.3 per cent (UNCTAD Handbook of Statistics, 2023). The high population contribute to urbanisation growth. Urbanisation refers to the growth of the urban population and the shift from rural to urban areas, typically accompanied by an increase in the urban workforce, such as manufacturing jobs replacing agricultural ones. This process often involves converting non-urban land into urban land to accommodate the expanding settlement areas and meet the growing spatial demands of urbanisation (Nuissl & Siedentop, 2020). Urban area expansion is one of the most critical types of worldwide change, and most urban areas are experiencing increased growth in population and infrastructure development. Urban change leads to many changes in the daily activities of people living within affected areas (Algahtany & Kumar, 2016). The crime rate tends to be influenced by the number of towns and districts will trigger the crime rate dues to location



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factors. From a structural standpoint, an increase in population numbers creates more opportunities for social interaction, which increases the occurrence of crime (Amirusholihin *et al.*, 2024). While the exact extent to which crime rates are higher in cities compared to less urbanised areas remains uncertain, there are several social and physical characteristics of cities that may contribute to conditions favourable for criminal activity

Urban environments are often characterised by factors such as high population density, social mobility, diverse socioeconomic classes and ethnicities, and weakened family structures (Errol *et al.*, 2021). When these characteristics are present to a significant degree and combined with factors like poverty, physical decay, limited education, the concentration of industrial and commercial activities, unemployment, low-skilled labour, economic dependency, instability in relationships, and a cultural minority facing social disadvantages, it is generally believed that deviant behaviour is more likely to occur (Sijuwade *et al.*, 2014). Crime is not solely influenced by geographical location but can also be exacerbated by the prevailing socio-economic conditions (Oyenike *et al.*, 2016).

Differences in crime occurrence across various land uses can be attributed to the specific types of daily activities that take place and the opportunities they create for criminal behaviour (Brunsdon *et al.*, 2021). There is a general consensus that various factors, including socio-economic conditions, demographic characteristics, and the physical environment of high-crime areas, impact urban crimes. These crimes tend to be geographically concentrated, meaning they occur in specific spatial locations within urban areas (Wang *et al.*, 2019). Research suggests that crime rates are typically higher in urban areas compared to non-urban areas (Knox and Pinch 2009). As a result, it has become widely believed that urban spaces, including urban open green spaces, are more susceptible to experiencing elevated levels of criminal activity.

Previous studies related to crime and land use found crime mainly concentrated near commercial, recreational, and residential areas, as well as alcohol outlets, clubs, and cultural facilities (Dutkowska and Leitner, 2017). There are several methods that some researchers have used to identify the spatial relationship between crime and land use, such as logistic regression, crime location quotient, buffering, global colocation patterns, local colocation patterns and ordinary least squares (Sadeek *et al.*, 2019; Yue *et al.*, 2017; Brunsdon & Corcoran 2022; Mburu & Mutua., 2023). Oka (2023) uses location quotient to measure residential segregation. Temurcin and Dziwornu (2016) employed the Location Quotient of Crime (LQC) as a tool to pinpoint and illustrate clusters of robbery, assault, and threat incidents, as well as identify neighbourhoods that are at a higher risk of these crimes. Hashim *et al.* (2018) used LQC to identify hotspot schools in Mukim Petaling and Klang. Zhou and Wang (2024) used LQC to identify spatial relation characteristics and patterns of commercial and residences in the city of Beijing. This research focuses specifically on the spatial relationship between property crime and landuse in Kuching, Sarawak, through location quotient analysis. While previous studies have used location quotient analysis to examine crime patterns or identify high-risk areas, this research aims to explore how landuse types influence property crime rates in Kuching, Sarawak. Additionally, this study also focuses on property crime on the specific police station boundaries in Kuching, Sarawak, which may have unique characteristics compared to the locations examined in the previous studies, such as Mukim Petaling, Klang and Beijing.

From 2015-2017, Kuching, Sarawak had one of the highest property crimes among the districts in the state, accounting for 81.3% of the total cases. Additionally, violent crime made up 18.6% of the overall crime rate during the period (Police Kuching District Headquarters, 2018). This study aims to identify the spatial relation between land use and property crime through Location Quotient Analysis. This study uses Location Quotient analysis to explore this relationship, which could provide new insights into the factors influencing property crime rates in landuse boundaries. While past research has conducted, a study on property crime in Kuching is using Getis Ord G_i^* , Kernel density estimation, Local Indicator Spatial Autocorrelation, and Global Moran's I (Norita Jubit *et al.*, 2019; Norita Jubit *et al.*, 2020a; Norita Jubit *et al.* 2020b; Norita Jubit *et al.*, 2021). However, there is still a gap in research when it comes to applying location quotient analysis to study crime related to landuse in Kuching, Sarawak. Thus, this study is the first to specifically investigate the impact of land use on property crime in Kuching, Sarawak, using Location Quotient analysis. Based on the current literature, there is a gap in research regarding the spatial relationship between land use and property crime in Kuching, Sarawak, specifically through location quotient analysis. No existing studies have been identified that directly investigate this specific topic in the context of Kuching, Sarawak.

The importance of this research is understanding the spatial relationship between landuse and property crime, which can provide valuable insights for crime prevention strategies, urban