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Spatial Analysis of Drug-Prone Areas in Jakarta to Enhance City Resilience

Saur Martha Agustina[1,a,*], Chotib Chotib[2,b], Hariati Sinaga[3,c]

[1]National Resilience Studies, School of Strategic and Global Studies, University of Indonesia, Jakarta
[2]Urban Studies Program, School of Strategic and Global Studies, University of Indonesia, Jakarta
[3]Gender Studies Graduate Program, School of Strategic and Global Studies, University of Indonesia, Jakarta
[a]marthasirait86@yahoo.com; [b]chotib@hotmail.com; [c]hariati.sinaga@ui.ac.id
*Corresponding author

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Abstract
Resilience has emerged as a central theme in urban planning, offering a strategic framework to manage city development while promoting sustainability. This is particularly important for Jakarta as it ranks among the world's significant cities highly susceptible to diverse challenges and disruptions. This includes vulnerability to drug crime cases. As one of the efforts to overcome vulnerability, it is necessary to analyze drug-prone areas in Jakarta based on urban villages. The purpose of this study is to analyze the spatial distribution of drug-prone areas in Jakarta using Geographic Information Systems (GIS) and to analyze the role of factors determining the level of drug-prone areas in Jakarta province by applying an ordinal logit regression model. The results of this research show that almost all independent variables have no significant impact on the level of drug-prone areas. The result shows that the presence of foreigners has a significant impact on the level drug prone areas. The research findings recommend tighter monitoring of the presence of foreigners.

1. Introduction

Jakarta is one of the world's major cities that is vulnerable to various shocks and stresses. This vulnerability arises because Jakarta is located in the delta and the Pacific Ring of Fire, so shocks in the form of floods and earthquakes are the main threats. The irregularity of spatial utilization characterized by many dense and slum areas also increases vulnerability to fire disasters and often triggers friction between communities and other social problems. In addition, Jakarta has experienced a high level of urbanization due to its status as the capital city of Indonesia as well as the center of international business activities. Population growth and the presence of commuters have increased the diversity and intensity of pressures in Jakarta, including increased congestion, crime, and the need for water resources, waste and wastewater management, electricity supply, affordable housing, and other basic services.(Sekretariat Jakarta Berketahanan, 2019)

In particular, Jakarta is prone to drug-crime cases. In the Indonesia Drugs Report 2023, Jakarta Province ranked 3rd in the success of drug cases with 3,619 cases and 4,685 suspects. (BNN Republik Indonesia, 2023) In addition, based on the Circular Letter of the Head of BNN (*Badan Narkotika Nasional*/National Narcotics Board) RI (Republics of Indonesia) Number: SE/15/II/KA/PM.01/2024/BNN dated February 2, 2024 concerning Data on Drug Prone Areas as a Reference for the Implementation of Synergy Programs in the Prevention and Eradication of Abuse and Illicit Circulation of Narcotics and Narcotics Precursors (P4GN) Activities in the BNN Environment, in Jakarta Province there are 26 villages in the Danger category, 107 villages in the Alert category and 134 villages in the *Alert* (Standby) category.

These shocks and stresses to the city system have a significant impact on the environmental, social, and economic conditions of the city. On this basis, urban resilience is very important to maintain the sustainability of the city system and its functions, as well as to protect and prevent the community from greater losses, prepare the city community to be able to continue to be better and rise from adversity (Sekretariat Jakarta Berketahanan, 2019). Resilience has become a popular concept in urban planning as a guiding principle for managing urban change while advancing urban sustainability (RodríguezIzquierdo et al., 2022). Improving urban resilience is essential in order to enhance national resilience. In the context of drug crime cases, a study on one of the drug-prone areas in Jakarta, namely Muara Bahari Village, shows that economic and social vulnerabilities shape the emergence of narcotics crimes in the area, and this is associated with weak social resilience (Rahmawati et al., 2021). The high number of drug crime cases and the existence of drug-prone areas in Jakarta may threaten the city's urban resilience.

Against this backdrop, this article seeks to identify drug-prone areas in Jakarta based on urban villages. In so doing, this study will analyze the spatial distribution of drug-prone areas in Jakarta using Geographic Information Systems. Using descriptive analysis, this article attempts to understand drug-prone areas in Jakarta province and their influencing factors.

2. Literature Review

2.1. City Resilience

In the City Resilience Index, urban resilience is described as the capacity of cities to function so that the people who live and work in the cities, particularly the poor and vulnerable, can survive and thrive whatever pressures or shocks they face. Supported by the Rockefeller Foundation, the City Resilience Index (CRI) is being developed by Arup. The index is designed to enable cities to measure and monitor the various factors that contribute to city resilience. (Rockefeller Foundation, 2019). The structure of Arup's City Resilience Index (CRI) instrument consists of 4 dimensions, 12 objectives, and 52 indicators. The first dimension is health and well-being, whereas the second dimension refers to economy and society. Meanwhile, the third dimension points to infrastructure and environment. The fourth dimension underlines leadership and strategy. In particular, one of the objectives in the health and well-being dimension highlights effective protection for health and human life. The indicator of this objective poses a question of the extent to which programs to address drug abuse and addiction are implemented throughout the city and extended to disadvantaged or vulnerable groups (Hanita, 2023).

In the economy and society dimension, the objective is comprehensive security and the rule of law, with indicators of effective systems to prevent crime. In the infrastructure and ecosystem dimension, the goal is reducing exposure and vulnerability/fragility, with indicators of comprehensive hazard and exposure mapping (Hanita, 2023). The interplay of many factors influences city resilience. Economic recovery ability, urban development level, policies and institutions, and infrastructure development have different degrees of positive impact. The interaction between economic. Economic recovery ability and urban development are the main driving factors affecting city resilience in Sichuan (Peng et al., 2024).

City Resilience focuses on how to improve the "mitigation and preparedness capability" and "self-recovery capability" of cities. From a linguistic point of view, resilience comes from the Latin word "resilio", which means to return to one's original state. The term resilience emerged in the science of ecology. The term was first proposed by Canadian ecologist Holling. According to this theory, the expressive behavior of ecosystems can be defined by two distinct attributes, namely resilience and stability. Research on *Smart Cities* has incorporated the concept of resilience as one of the areas where cities can become smarter (Chen et al., 2019).

2.2. Jakarta City Resilience

Jakarta was selected as one of 37 global cities to join the international network of 100 Resilient Cities (100RC) in May 2016. The 100RC program was pioneered by The Rockefeller Foundation in 2013 and aims to help cities become more resilient in the face of increasing social, economic, and physical challenges and issues in the 21st century. Jakarta's resilience vision refers to a resilient Jakarta that provides equal opportunities for all its citizens to live safe, healthy, prosperous, and happy lives through public services and innovation. In achieving its vision, the city of Jakarta has created 3 pillars of resilience, namely: (1)

Jakarta SIGAP, which refers to the ability to mitigate and adapt in the face of shocks and stresses, including disaster risks and the impacts of climate change; (2) Jakarta SEHAT, which ensures accessibility to clean water, wastewater, and sustainable waste management services; and (3) Jakarta TERHUBUNG, which promotes connectivity and mobility of its citizens by providing affordable intermodal public transportation and networking between citizens through communication systems that are accessible to all citizens (Jakarta Berketahanan Secretariat, 2019).

2.3. Factors that Influence Drug Abuse

The 2019 Indonesia Drugs Report shows the results of the 2018 Survey on Drug Abuse and Illicit Trafficking (Student and Student Groups). The results mention that the top three reasons for using drugs are: (1) curiosity/trial by 64%; (2) fun by 16.8%; and (3) invitation/persuasion/forced by friends by 6.60% (BNN, 2019). Factors that can influence a person to abuse drugs include (1) behavioral and environmental factors, (2) educational and ecological factors, and (3) policy and political factors. Behavioral and environmental factors that influence drug abuse behavior comprise curiosity and an unharmonious family environment. Educational and ecological factors also play a role in drug abuse behavior, especially formal education. In addition, informal education applied in the family and community environment, such as devotion to worship and influence from peers, also shapes drug abuse behavior. In the meantime, the affordability and availability of nightlife venues serve as one of the ecological factors influencing a person's drug abuse behavior. Furthermore, policy and political factors that contribute to drug abuse behavior include the ineffectiveness of sanctions given to drug abusers (Faiz et al., 2023).

Other researchers argue that several factors lead a person to commit drug trafficking crimes. The first factor is economic factors. Low economic levels are a separate motive for dealers to distribute drugs. The second factor is the family factor. The family is the earliest and fundamental place to form a person's personality. The family also serves as a place to establish affection between family members. The third factor is the influence of social communities. Lack of community control may have an impact on a person to act and behave freely without heeding the norms that exist in society. The fourth factor is the lack of supervision/availability. In this case, the government plays an important role in limiting the chain of circulation and abuse of narcotics. The illicit trafficking and drug addict population increases when there is a lack of supervision (Muammar, 2019).

3. Method

3.1. Research Design

This research uses a quantitative approach. Quantitative Research is a method to test a particular theory by examining the relationship between variables. These variables are measured by research instruments so that data consisting of numbers can be analyzed based on statistical procedures. (Creswell, 2013).

3.2. Data Source

The data sources in this study are Podes (*Potensi* Desa/Village Potential) 2021 microdata and Secondary Data from the Circular Letter of the Head of BNN RI Number: SE/15/II/KA/PM.01/2024/BNN dated February 2, 2024. Podes 2021 micro data contains independent variables in explaining the spatial variation of drug-prone areas in Jakarta based on urban villages. The independent variables used in this study are entertainment venues, number of slum houses, presence of public facilities, presence of foreigners, bordering the sea, and presence of police posts. Meanwhile, the data obtained from the Circular Letter of the Head of BNN Circular Letter of the Head of BNN RI Number: SE/15/II/KA/PM.01/2024/BNN dated February 2, 2024, contains the dependent variable, which is the focus of research, namely drug-prone areas, which contains 4 categories of urban villages as follows: danger, alert, *alert* (standby) and safe categories. From this data, there are no safe urban villages in Jakarta, so this study only uses 3 categories, namely danger, alert, and standby.

3.3. Operational Definition of Variables

Table 1. Research Variables

No.	Variable Name	Operational Definition	Data Source
1	Dependent Variable: Drug Prone Areas	Drug Prone Areas are areas identified from the community in accordance with the indicators of Drug Prone Areas presented in the Technical Guidelines for the Drug Prone Area Recovery Index.	1. Deputy for Community Empowerment of the Indonesian National Narcotics Agency. (2019). 2. Circular Letter of the Head of BNN RI Number: SE/15/II/KA/PM.01/2024/BNN dated February 2, 2024 (BNN, 2024)
2	Independent Variable 1:	The existence of pubs/discotheques/karaoke bars that are still functioning in the village/kelurahan	Podes 2021 question number 902a
3	Independent Variable 2: Number of slum building houses	Number of slum-building houses	Podes 2021 question number 512b2
4	Independent Variable 3: Existence of public facilities	Open public spaces whose main designation is as a place for village/kelurahan residents to relax/play without the need to pay (for example, open field/alun-alun, park, etc.)	Podes 2021 question number 807 a
5	Independent Variable 4: Presence of foreigners	Presence of foreign nationals (WNA) in the village/kelurahan	Podes 2021 question number 402d
6	Independent Variable 5: Direct border with the sea	There are village/kelurahan areas that are directly adjacent to the sea	Podes 2021 question number 308a
7	Independent Variable 6: Presence of a police post	Presence of a police post (including a police station) in the village/kelurahan:	Podes 2021 question number 1306-a

3.3. Analysis Technique

3.3.1. Spatial Analysis

Spatial analysis is a set of methods for analyzing spatial data. Meanwhile, spatial data is data that is geographically referenced and represents certain objects based on spatial elements. A GIS, or Geographic Information System (GIS), is a computer-based information system that is a single component used to create, open, store, manipulate, analyze, integrate, and display data in a geographic-based information system (Muhardi, 2018). This study uses QGIS ver 3.34.5 software.

3.3.2. Descriptive Statistics Analysis

Descriptive statistics are statistics used to analyze or describe a statistic of research results without having to draw broader conclusions (Yuliardi & Nuareni, 2017). Descriptive statistics is also called

deductive statistics. This statistical method approach serves to describe or provide information about data conditions or phenomena (explaining conditions, symptoms, or problems) (Nurhasanah & Vikaliana, 2021).

3.3.3. Ordinal Logit Regression Analysis

Ordinal logistic regression is one of the statistical methods for analyzing response (dependent) variables that have an ordinal scale consisting of two or more categories. Predictor (independent) variables that can be included in the model are categorical or continuous data consisting of two or more variables (Darnah, 2011). This study conducts descriptive statistics and ordinal logit regression analysis using SPSS version 29 software. Kleinbaum and Klein (2010) stated that when there are as many as J categories of independent variables, there will only be one regression coefficient (β) for each independent variable, but the intercept value (α) in the Proportional Odds Model will be different for each J-1 model produced. Logit transformation can be done to obtain a linear form of the proportional odds model as follows (Putri & Budyanra, 2020).

$$\begin{aligned} logit[P(Y \geq j|x)] &= ln\left[\frac{P(Y \geq j|x)}{1 - P(Y \geq j|x)}\right] = \frac{P(Y \geq j|x)}{P(Y < j|x)} \\ &= ln\ [\exp(\alpha + \beta_1 X_1 + \cdots + \beta_k X_k)] \\ logit[P(Y \geq j|x)] &= \alpha + \beta_1 X_1 + \cdots + \beta_k X_k \ \ldots\ldots\ldots\ldots\ldots\ldots \end{aligned} \quad (1)$$

If the dependent variable has three categories (j=1,2,3), then the model formed is:

$$\begin{aligned} logit[P(Y \geq 1|x) &= \alpha_1 + \beta_1 X_1 + \cdots + \beta_k X_k \\ logit[P(Y \geq 2|x) &= \alpha_2 + \beta_1 X_1 + \cdots + \beta_k X_k \ \ldots\ldots\ldots\ldots\ldots\ldots \end{aligned} \quad (2)$$

Specifically, this research applies the model as follows:
Y: Drug Prone Areas
X1: Entertainment venues
X2: Number of slum building houses
X3: Existence of public facilities
X4: Presence of foreigners
X5: Direct border with the sea
X6: Presence of a police post

4. Result and Discussion

4.1. Spatial Distribution of Drug Prone Areas

The distribution of drug-prone areas in Jakarta is 50.2 percent with standby status (yellow), 40.1 percent with alert status (blue), and 9.7 percent with hazard status (red). In the Arup City Resilience Index, we can see in Figure 1 that one of the objectives of the health and well-being dimension is the effective protection of human health and life. This objective has an indicator with the question of the extent to which programs to address drug abuse and addiction are implemented throughout the city and extended to disadvantaged or vulnerable groups. Associated with the resilience strategy of the city of Jakarta, in the dimension of the Jakarta SIAP pillar, the city of Jakarta is expected to be able to mitigate and adapt in the face of shocks and stresses, including overcoming drug-prone areas according to the categories that exist in Jakarta.

4.2. Descriptive Analysis Results

The results of the bivariate cross-tabulation show differences in the proportion of each category of vulnerability according to each of the independent variables proposed in this study, as we can see in Table 2. The danger and alert categories are higher in neighborhoods with entertainment venues than in neighborhoods without entertainment venues. Meanwhile, more neighborhoods in the alert category do not have entertainment venues. Research by Faiz et al. (2023) argues that the affordability and availability

of nightlife venues are also one of the ecological factors that play a role in a person's drug abuse behavior (Faiz et al., 2023).

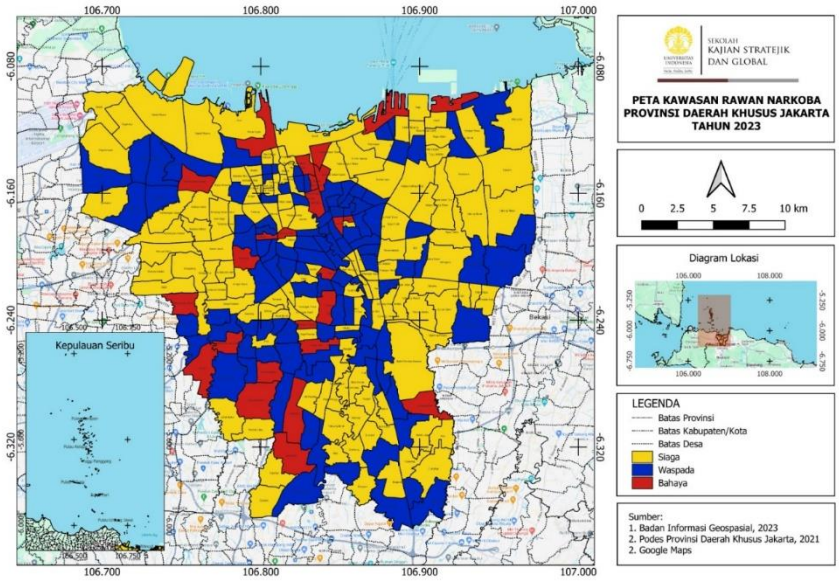

Figure 1. Spatial Distribution of Drug Prone Areas Levels in Jakarta 2023

Table 2. Result of Bivariate Cross-Tabulation

NO	Level of Insecurity		1 = Standby	2 = Alert	3 = Danger	Total	
	Free Variable	Category				Count	Row N %
1	Entertainment venues	1 = present	44,20%	43,20%	12,60%	95	100%
		2 = none	53.5%	38,40%	8,10%	172	100%
		Sub Total	**50,20%**	**40,10%**	**9,70%**	**267**	**100%**
2	Existence of public facilities	1 = present	47,90%	41%	11.1%	217	100%
		2 = none	60%	36%	4%	50	100%
		Sub Total	**50,20%**	**40,10%**	**9,70%**	**267**	**100%**
3	Presence of foreigners	1 = present	43,10%	45,90%	11,00%	181	100%
		2 = none	65,10%	27,90%	7,00%	86	100%
		Sub Total	**50,20%**	**40,10%**	**9,70%**	**267**	**100%**
4	Directly adjacent to the sea	1=there is	75,0%	6,3%	18,80%	16	100%
		2 = none	48,60%	42,20%	9,20%	251	100%
		Sub Total	**50,20%**	**40,10%**	**9,70%**	**267**	**100%**
5	Presence of police posts	1= present	49,70%	39,50%	10,80%	185	100%
		2 = none	51,20%	41,50%	7,30%	82	100%
		Sub Total	**50,20%**	**40,10%**	**9,70%**	**267**	**100%**

The results also show that urban villages in the danger and alert categories are more likely to have public facilities. In contrast, urban villages in the alert category are more likely to have no public facilities. Lowe et al. (cited in Lu et al. 2021) show that urban public spaces, such as green spaces, squares, and parks, can benefit health and improve social resilience. Supervision is needed regarding the function and existence of public facilities in urban villages with hazard categories. On the variable of the presence of foreigners, the

results show that villages in the danger and alert categories are more likely to have foreigners. In contrast, villages in the alert category are more likely to have no foreigners. Drug crimes in Indonesia are part of transnational crimes committed by professional and organized perpetrators involving Indonesian and foreign nationals (Ompu Jainah, 2013). Around 70% of narcotics in Indonesia come from outside the country(Abimanyu, 2019). In a study conducted in Bali, cases of drug abuse were mostly committed by civilians. However, this figure continues to be augmented by the presence of foreign nationals who contribute to drug use (Dewi et al., 2024).

The results show that villages with higher danger categories are villages bordering the sea. The Head of the National Narcotics Agency, Komjen Pol. Drs. Heru Winarko, S.H, 2018 stated that Indonesia's geographical conditions, the majority of which are in the form of oceans, are used as a favorite route for syndicates to smuggle drugs from abroad. Winarko further explained that around 80% of narcotics smuggling into Indonesia alone was conducted via sea (Lemhannas RI, 2019). The results show that a higher proportion of neighborhoods in the danger category have a police station. In contrast, more neighborhoods in the alert categories did not have a police station. Several studies have been conducted on the impact of police presence on crime. Studies on police presence using a spatial data analysis conducted in two different places gave different results. On the one hand, research by Fondevila et al. (2021) in Mexico reveals that the installment of police in areas with high crime rates had no statistically significant impact in bringing down criminal behavior. On the other hand, a study conducted by Fondevila et al. (2021, cited Olea et al., 2023) in Buenos Aires shows that police stations deter criminal activity as fewer crimes were recorded near police stations.

Table 3. Summary Statistics of the Number of Slum Buildings by Level of Drug Insecurity

Level of Insecurity	1 = Standby	2 = Alert	3 = Danger	Total
Mean	393	262	834	383
Median	14	40	80	40
Mode	0	0	0	0
Minimum	0	0	0	0
Maximum	10011	4800	9546	10011
Standard Deviation	1042	616	1992	1045
Count	134	107	26	267

The summary of the statistics results above shows that the average number of slum buildings is higher in urban villages with hazard status, as we can see in Table 3. Research on slum areas in Palembang reveals that the economic resilience of slum communities is highly vulnerable still very high as they do not have economic resilience in the form of savings in the event of a crisis, sick families, school fees, and increasing basic needs. In this case, it is feared that those whose lives are only enough to meet their daily needs are more vulnerable to health problems such as hunger, poverty, malnutrition, and social problems such as school dropouts, unemployment, and increased crime (Sukmaniar et al., 2020). The study entitled '*Drug Abuse in Slum Population*' shows that tobacco was the most commonly abused substance in 53.9% of the population, followed by gutka. Other drugs include alcohol (46.5% of the population), cannabis (8.9%), opiates (4.9%), tranquilizers and hypnotics (2.0%), solvents (1.0%), and cocaine (0.1%). Slum populations have higher prevalence rates than the general population (Ghulam et al., 2016).

4.3. Ordinal Logit Regression Analysis Result

The results of the ordinal logit regression analysis with parameter estimation show that the presence of foreigners factor provides significance below 0.05, as we can see in Table 4, which means that the presence of foreigners increases the level of drug vulnerability. The odds ratio value for the foreigner presence variable is 2.44, which means that neighborhoods with foreigners have a 2.44 times chance of increasing the vulnerability status.

5. Conclusion

Mapping the spatial distribution of drug-prone areas across Jakarta province enhances data presentation, providing a clearer understanding of the issue. Descriptive statistical analysis shows that areas labeled as high-risk tend to have a higher concentration of entertainment venues, public facilities, coastal borders, foreign residents, and police posts, along with a significant presence of slum buildings.

Urban villages with foreigners have a 2.44 times chance of increasing the vulnerability status. The research findings recommend tighter monitoring of the presence of foreigners. Collaboration between government, stakeholders, and community participation is needed to tighten monitoring of the presence of foreigners.

Table 4. Parameter Estimation Results

		Estimate	Sig.	Odd Ratio
Threshold	[Data_bnn23=1]	1.006	.018	
	[Data_bnn23=2]	4.055	<,001	
Location	slums	.000	.578	
	[Pub=1]	0,33	.361	1,39
	[Pub=2]	0[a]	.	
	[public=1]	0,483	.196	1,62
	[public=2]	0[a]	.	
	[WNA=1]	0,89	.031	2,44
	[WNA=2]	0[a]	.	
	[Sea=1]	-3.471	.320	0,00
	[Sea=2]	0[a]	.	
	[pospol=1]	0,007	.985	1,01
	[pospol=2]	0[a]	.	

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