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Defensible Space Concept to Prevent Criminal Action in Kampong Watugong: Micro-Spatial Morphology and Street Corridor Elements

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Abstract

The increasing crime rate in Malang City is influenced by high population mobility, inadequate security infrastructure, and limited community engagement. Kampong Watugong is a dense informal settlement located in a university district and predominantly inhabited by students. The diversity of its residents and the high permeability of its three main street corridors make the area vulnerable to criminal activities, particularly motorcycle theft and robbery. Although defensible space and CPTED principles have been examined in various Indonesian urban settings, limited attention has been given to how they operate in dense, organically developed, student-dominated informal settlements such as Kampong Watugong, leaving this specific context underexplored. This study aims to identify defensible space elements in Kampong Watugong and explore opportunities to improve environmental security through built-environment interventions. This study employed a descriptive qualitative method with a case study approach. Data were collected through field observations using a walkthrough technique and interviews with the village head. The analysis compared the existing conditions of three main corridors Watugong Street, Kerto Rahayu Street, and Kerto Sentono Street—based on Newman's four defensible space principles: territoriality, natural surveillance, image, and milieu. The findings indicate that the three corridors have not fully met all defensible space principles. The main weaknesses were identified in the image and milieu aspects, which have not been optimally designed to support a sense of safety. Proposed interventions include additional CCTV points, security posts, speed bumps, improved street lighting, and tall yet transparent fences. Non-physical measures, such as regulating portal access hours and organizing community activities, are also needed to strengthen social interaction. The novelty of this study lies in identifying opaque building fences and limited street-facing openings as key architectural weaknesses that undermine the image and milieu aspects of defensible space.

Keywords: CPTED, Community Safety, Criminality, Defensible Space, Urban Space

Abstrak

Peningkatan kriminalitas di Kota Malang dipengaruhi oleh tingginya mobilitas penduduk, kurang memadainya infrastruktur keamanan, dan terbatasnya keterlibatan masyarakat. Kampung Watugong merupakan permukiman informal padat di kawasan pendidikan yang sebagian besar dihuni mahasiswa. Keberagaman penduduk dan tingginya permeabilitas tiga koridor jalan utama menjadikan kawasan ini rentan terhadap tindak kriminal, terutama pencurian sepeda motor dan perampokan. Meskipun prinsip defensible space dan CPTED telah banyak dikaji di berbagai konteks perkotaan di Indonesia, penelitian yang membahas penerapannya pada permukiman

informal padat yang berkembang secara organik dan didominasi mahasiswa, seperti Kampung Watugong, masih terbatas. Penelitian ini bertujuan mengidentifikasi elemen defensible space di Kampung Watugong serta mengeksplorasi potensi peningkatan keamanan lingkungan melalui intervensi lingkungan binaan. Penelitian menggunakan metode deskriptif kualitatif dengan pendekatan studi kasus. Data dikumpulkan melalui observasi lapangan menggunakan teknik walkthrough dan wawancara dengan kepala desa. Analisis dilakukan dengan membandingkan kondisi eksisting tiga koridor utama—Jalan Watugong, Jalan Kerto Rahayu, dan Jalan Kerto Sentono berdasarkan empat prinsip defensible space menurut Newman, yaitu territorialitas, pengawasan alami, citra lingkungan, dan milieu. Hasil penelitian menunjukkan bahwa ketiga koridor belum sepenuhnya memenuhi seluruh prinsip defensible space. Kelemahan utama ditemukan pada aspek citra lingkungan dan milieu, yang belum dirancang secara optimal untuk mendukung rasa aman. Intervensi yang diusulkan meliputi penambahan CCTV, pos keamanan, polisi tidur, pencahayaan jalan, serta pagar tinggi yang tetap transparan. Selain itu, pengaturan jam akses portal dan kegiatan komunitas diperlukan untuk memperkuat interaksi sosial. Kebaruan penelitian ini terletak pada identifikasi pagar tertutup dan minimnya bukaan bangunan yang menghadap jalan sebagai kelemahan arsitektural utama yang melemahkan aspek image dan milieu dalam konsep defensible space.

Kata kunci: CPTED, Keamanan Masyarakat, Kriminalitas, Ruang Bertahan, Ruang Kota

1. Introduction

High levels of urbanization represent one form of urban population growth, which has contributed to the emergence of informal settlements in developing cities due to limited availability of land and infrastructure (Arsaf, Bakhtiar, & Ahmadin, 2025). In developing countries such as Indonesia, these settlements are known as *urban kampongs*, which are generally characterized by high density, inadequate basic infrastructure, and low-income residents (Bawole, 2020). Changes in land use and population growth can significantly influence the spatial structure of built-up areas, particularly through the expansion and branching of road networks and the formation of organically developed building blocks (Putra & Jordan, 2025). As a setting for community activities, cities tend to evolve over time in response to the economic and social needs of their inhabitants. Each phase of urban development produces a distinct physical character, resulting in various forms of urban morphology, such as small-scale housing and high-density residential areas. To a certain extent, such settlement patterns contribute to an increase in both the number and diversity of criminal activities.

Previous studies indicate that informal settlement design often results in uneven infrastructure distribution, including irregular street layouts and insufficient lighting, which may encourage criminal behavior. The absence of surveillance facilities further increases the vulnerability of these areas to crime (Meth, 2017; Patiño et al., 2014).

This research employs a case study approach in a dense residential area surrounding a university to explore potential design interventions. Kampung Watugong is a densely populated neighborhood in Malang City, East Java Province, Indonesia, inhabited primarily by students from diverse cultural backgrounds. The kampong functions as a *melting pot* located at the center of several universities and is supported by student-oriented facilities such as small shops, food stalls, and copy centers. Based on statistical data from 2022, theft was the most frequently recorded criminal offense in Malang City, with more than 300 cases, including motorcycle theft and robbery (BPS Kota Malang, 2023). The number of both types of crimes nearly doubled between 2021 and 2022. Incident patterns identified by the village head indicate that motorcycle thefts tend to occur at midnight (approximately 1:00–3:00 a.m.), while robberies typically take place in the early morning hours (around 5:00–7:00 a.m.).

Morphologically, the area was initially relatively homogeneous; however, it has developed organically over time into an unplanned settlement. Compact building blocks have evolved into semi-detached houses facing narrow streets, while some areas consist only of alleyways that accommodate two motorcycle lanes, a similar organic figure-ground pattern documented in another dense coastal kampong in the same city (Putra et al., 2026). These conditions potentially create *blank spots* that increase opportunities for criminal acts such as theft, robbery, and alcohol-related violence. In response, residents have installed individual security measures, including fences, window bars, and surveillance cameras.

However, these security measures tend to reduce social interaction within the community, as the neighborhood increasingly becomes a closed space due to residents' concerns about crime.

According to recent research (Wibowo et al., 2019), the level of human presence in public spaces can influence the perceived sense of safety among both users and residents. Furthermore, streets that are actively used by people can serve as a determining factor in public space security by fostering a sense of togetherness with others, including strangers (Kanigel, 2016).

This article examines the elements of *defensible space* through a single case study to explore their potential for improvement. A comparison between existing conditions and conceptual requirements reveals the strengths and weaknesses of the area in relation to its vulnerability to crime. Although *defensible space* is considered an urban design approach that enhances security through physical spatial composition, the concept is fundamentally linked to public participation and community involvement.

Although CPTED and defensible space have been increasingly examined in Indonesian urban environments, recent studies have focused on different contexts, including campus facilities (Affif & Novrial, 2021), urban street corridors (Sarimukti & Widyastuti, 2022), and conventional kampung settlements (Widyastuti, 2023). However, limited attention has been given to dense, organically developed student settlements characterized by transient occupants, population diversity, and relatively weak territorial attachment. Kampung Watugong therefore presents a distinctive research context for examining how defensible space principles operate within a student-oriented informal settlement.

Furthermore, the micro-spatial conditions identified in Kampung Watugong such as narrow alleyways, blind spots, and solid perimeter fences are not merely descriptive physical characteristics. These conditions can directly affect key defensible space mechanisms by restricting visibility, weakening natural surveillance, and reducing opportunities for informal social interaction between residents and street users. Previous CPTED research has demonstrated the importance of spatial configuration, accessibility, lighting, surveillance, and environmental design in supporting perceptions of safety and crime prevention (Affif & Novrial, 2021; Sarimukti & Widyastuti, 2022). Nevertheless, the relationship between these micro-spatial characteristics and Newman's four defensible space elements remains insufficiently explored in dense student settlements. This study therefore addresses two research questions: (1) to what extent do the physical and social conditions of Kampung Watugong's street corridors fulfil Newman's four defensible space elements; and (2) what physical and non-physical interventions are most appropriate for improving environmental security in a dense, organically developed student settlement. In line with these questions, this study proposes that the three corridors of Kampung Watugong have not yet fully satisfied Newman's four defensible space elements, with the image and milieu dimensions expected to show the greatest deficiencies due to the area's organic and unplanned morphological development.

2. Literature review

Defensible space is a theory that utilizes social control and supervision by residents, which is dependent on the design of the built environment. A good design creates informal social control and influences behavior and opportunities for crime are the core of defensible space (Wibowo et al., 2019). Meanwhile, according to one research about defensible space (Zen & Mohamad, 2014), it will encourage social structure to protect its value and lifestyle while aiming at the physical arrangement of the environment that helps residents gain control over the house. Defensible space incorporates several key physical elements that support territoriality and natural surveillance, including physical and symbolic boundaries. In dense urban settlements, street-level environmental features such as building openings, fences, lighting, vegetation, and the configuration of public and semi-public spaces can influence territorial recognition, visibility, and opportunities for informal surveillance (Park et al., 2023). Actual barriers are physical impediments to access, such as high fences and hedges. Symbolic barriers are physical characteristics of a house, such as ornamentation and nameplates, that indicate personal property and that the owners care about to defend their residence (HAM-ROWBOTTOM et al., 1999).

Based on previous research conducted in Surabaya, Indonesia, (Satiawan et al., 2019), some elements of spatial planning said to influence the existence of crime, namely: lighting, surveillance lines, natural vision, building design, mixed land use, landscaping, accessibility, and territorial reinforcement. Despite its impact on criminal acts, these elements are arranged to raise the opportunities for social interaction. Meanwhile, another study states that such research is essential to understanding the relationship between security and spatial patterns of settlements in both gated settlements and informal settlements (Maharika, 2009). The use of non-parametric statistical analysis techniques using a questionnaire instrument resulted in the conditions that fenced settlements are not proven to be safer than open settlements. In addition, sophisticated security tools do not provide a sense of security to the community. However, the community prefers to involve professional security forces for 24 hours in guarding their settlements.

Similarly, research conducted in South Korea shows that the implementation of a CPTED (Crime Prevention Through Environment Design) system in a city, such as using an identity card upon entering, a vivid territory, underground parking, lighting on each side, CCTV, using an access code to enter a room, are very practical and safe compared to cities without the system. According to researchers' view of whether the CPTED system is effective in use in South Korea or not, this system can reduce crime. On one hand, the effectiveness of using the CPTED system can be assessed from the ability to implement strategies in CPTED to cover the shortcomings of other CPTED strategies, otherwise, it will reduce the convincingness of the other strategy. For example, the physical territoriality strategy can reduce the environment's ability to implement a natural surveillance strategy. Territorial restrictions through fences and walls can limit or hinder the ability of residents to monitor their environment. This problem can increase the risk of theft charges due to the difficulty of monitoring the environment (Seifi et al., 2019). Therefore, the implementation of the CPTED strategy should be carried out properly and simultaneously, while being refined by methods that focus on socio-environmental conditions for the physical implementation of the strategy.

On the other hand, the use of CPTED was said to be linked to the existing environmental culture and cannot be directly applied in the same way in locations with different cultures (Ekblom et al., 2013). Applying the concept to the cultural environment of Abu Dhabi, the previous study used a modification of the basic CPTED concept that was suited to local culture. Some aspects that are considered in transferring the use of CPTED include access and movement, spatial layout, ownership, surveillance, activity, public image, and adaptability. In this case study, the CPTED concept that will be used includes only a few important points to suit the environmental conditions, which are access and movement, surveillance, territoriality, image, and target hardening. Correspondingly, a relation between defensible space and social factors was also found in a study in Bogor, Indonesia. Community interrelationship is fundamental to determining the urgency of defensible space. In one housing, the concept was planned in the housing design, while the other is likely to apply the concept because of the closeness of community (Muhyi et al., 2019).

Apart from these findings, place attachment theory explains how local community or residents have a sense of belonging and an emotional attachment to the environment. Place attachment which usually exist near the communities' daily activities have the shape of landmarks or public spaces. An inclusive public space will create a sense of belonging of the community to the place, like the place attachment that was formed by a building owner to its private space. The ability of place attachments to encourage people and residents by maintain and ensure a good environmental condition can be one solution in addressing security problems of environmental crime. This relates to its role to provide a place identity of the environment, which leads people's recognition of a place. Such relationship was shown in a study that place attachment is formed by a good relationship between the location and the individual in it, meanwhile, place identity can be developed by emotions, principles, beliefs, meanings, and behaviors that are implanted in that location (Purwanto & Harani, 2020). The application of place attachment theory as a solution of criminal problems was conducted by a study in Brazil which aims to find out the effect of urbanization interventions to prevent the increase of crime around settlements. Using

Hierarchical Linear Models, the researcher found that a significant development of the housing quality reduced the number of criminal incidents in the neighborhood. In addition, it is argued that the use of the place attachment concept with good understanding of CPTED can help improve the quality of environmental security from criminal activities (Furtado & Renski, 2021).

From the discussion, the theory of defensible space and the crime prevention through environment design (CPTED) can be applied to raise environmental safety. Newman (1972) stated four elements of defensible space, which are territoriality, natural surveillance, image, and milieu. Meanwhile, the CPTED concept has six design elements, namely surveillance, territorial, access control, target hardening, activity support, and maintenance. Practically, the CPTED concept is a method that can be used by developers and architects in planning defensible space (Tjoa & Devon, 2010). The nature of using CPTED in the environment is as a preventive measure against crime and to overcome the fear of criminal acts in the environment. From the elements that have been mentioned, the defensible space theory and the CPTED concept have similarities, which are territoriality and natural surveillance. Territorial is the bounded area that not only distinguishes two or more areas but physiologically defines the difference or ownership. Meanwhile, natural surveillance is a condition of the environment to let people supervise and observe, which focuses on the placement of physical attributes in public spaces, such as electronics and natural (Ellis & Hertig, 2010). Apart from these two elements, access control and maintenance in the environment will affect the image of the environment. Research shows that several considerations were made for environmental design based on CPTED, including two major aspects, a general design strategy and a specific design strategy. General design strategies are building height, density, surveillance, landscape design, activity support, road design, access control, and territoriality.

3. Methodology

This research was conducted with a qualitative method that focuses on the fact description of a case study. Narration was developed to interpret the logical phenomena of people, settings, and interactions through factual evidence. The everyday matter that occurred and experienced by the users become the main materials which shape the research question. In general, there are 5 essential elements in qualitative research, which are genuine condition of the setting in a specific period of time, role of explanatory ability of the researcher to make sense the meaning, ability of people or respondent to explain the situation, the use of various plan to illustrate the result and the process, and an iterative process as a confirmation of the initial research question. In addition, the use of case study in this research will supports the understanding of a concept application in a particular social unit. Interaction between the community and the built environment is observed by some variables (Darjosanjoto, 2012; Groat & Wang, 2013).

The research will focus on environmental safety issues related to criminal activities which include theft, pickpocketing, and bullying. For this reason, the theory used is the theory of defensible space proposed by Newman in 1972, and the CPTED site assessment that used to evaluate the location security factors and decide what element should be improved (Rice, 2008). Data collection of this research was done by field observation of the street condition and interview with the head of the village to obtain the criminal acts' data. Field observation was done by a walkthrough technique with mapping of point of potential and problem. Meanwhile, the comparison of existing data and expected criteria of the theory used a literature review, to position the observed object. The data analysis followed a descriptive-comparative technique consisting of three stages: (1) data reduction, in which field notes, photographs, and interview transcripts were organized and coded according to the four defensible space elements (territoriality, natural surveillance, image, and milieu); (2) data display, in which the coded findings for each corridor were arranged into comparative matrices (Tables 1–3) juxtaposing existing conditions against Newman's theoretical requirements; and (3) conclusion drawing, in which gaps between existing conditions and theoretical requirements were interpreted to identify the dominant weaknesses of each corridor and to formulate corresponding design recommendations.

To account for the diurnal variation of physical activity, lighting, and natural surveillance effectiveness that is vital in CPTED-based research, the walkthrough observations were conducted twice for each corridor: once during the day (approximately 10:00 a.m.–12:00 p.m.) and once at night (approximately 7:00–9:00 p.m.), when differences in visibility, activity levels, and perceived safety were most apparent. The walkthrough used a structured observation matrix covering measurable architectural parameters, including fence height and visual transparency, the position and orientation of door and window openings relative to the street, the spacing of street lighting points, the presence and continuity of active frontage, and the width of the road corridor. The three corridors (Watugong Street, Kerto Rahayu Street, and Kerto Sentono Street) were selected based on the administrative boundary of the Kampung Watugong RW (neighborhood unit), which together with the block's internal alleyways constitutes the total observed area of approximately 8.5 Ha; these three streets were purposively selected because they function as the only vehicular corridors connecting the internal block to the surrounding public road network, making them representative of the area's overall accessibility and crime exposure. It is acknowledged as a limitation of this research that interviews on the perceived sense of security and territoriality were conducted only with the head of the village; perceptions from boarding house residents, migrant students, and long-term local residents were not independently captured and should be included in future research to strengthen the social dimension of the analysis.

4. Result And Discussion

The study area covers Kampung Watugong in Malang, East Java Province—a high-density "campus village" strategically situated adjacent to major higher education institutions, including the State Polytechnic of Malang, Islamic State University of Maulana Malik Ibrahim, and the Faculty of Administrative Sciences at Universitas Brawijaya. Spanning approximately 8.5 hectares, this residential block primarily comprises semi-detached houses across varying plot sizes (Satelite, 2016). As shown in Figure 1, the spatial structure reveals a distinct morphological contrast between the larger plots in the eastern zone and the fine-grained, densely packed plots in the western area..

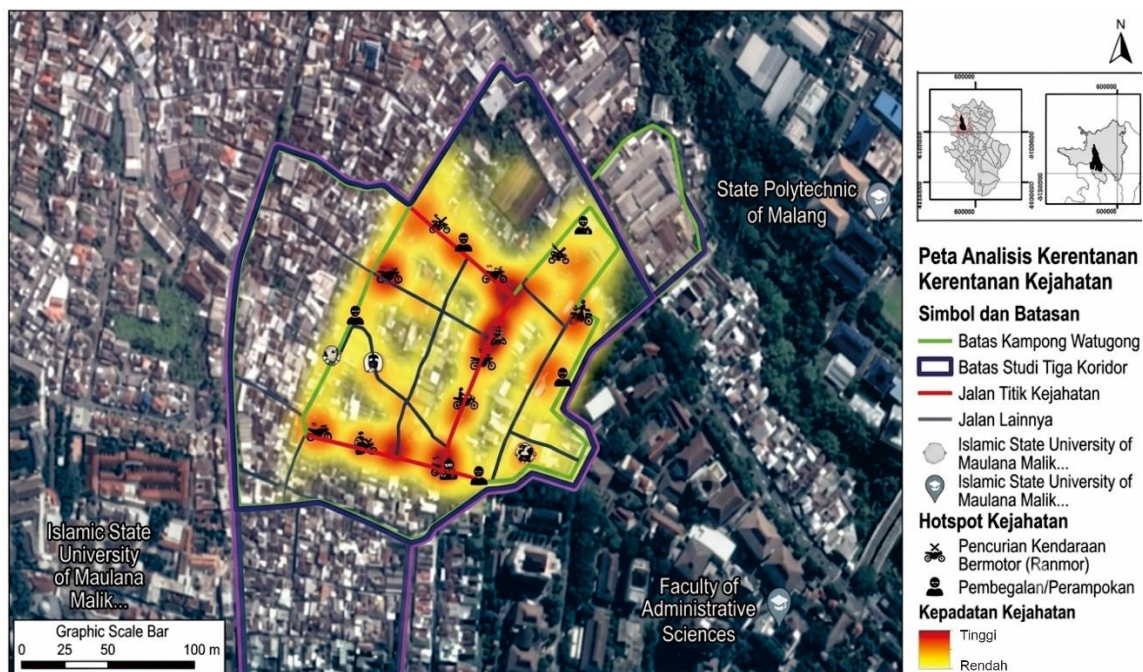


Figure 1. Study Area and Crime Hotspot Distribution in Kampung Watugong, Malang
Source: This figure demonstrates the study scope in Kampung Watugong, 2024

Driven by the inflow of university students, the area has rapidly developed into an intensive student hub characterized by student housing, eateries, retail shops, and printing services. Within this dense fabric, three primary corridors serve as critical movement channels, providing internal circulation and connectivity across the broader urban grid. These corridors were selected as the focal units of analysis due to their high concentration of boarding houses, elevated pedestrian volumes, and reported spatial vulnerability to specific criminal acts—namely motor vehicle theft and robbery. To empirically evaluate how physical configurations influence crime distribution, these corridors were examined through spatial mapping and a comparative analysis based on Defensible Space Theory.

4.1 Watugong Street

Watugong Street is approximately 4 m wide and functions as the main corridor connecting the internal part of the settlement to a tertiary access of a public university. The building frontage consists predominantly of medium- to large-sized plots, with a relatively consistent building setback of approximately 2–3 m from the street edge. The corridor presents a relatively enclosed spatial configuration, with building heights, street width, fence conditions, openings, street lighting, and vegetation collectively shaping visual permeability and natural surveillance. Door and window openings facing the street provide opportunities for passive observation, whereas solid fencing may restrict visual connectivity between private properties and the public corridor. These characteristics are relevant to the assessment of territoriality, natural surveillance, image, and milieu within the defensible space framework.

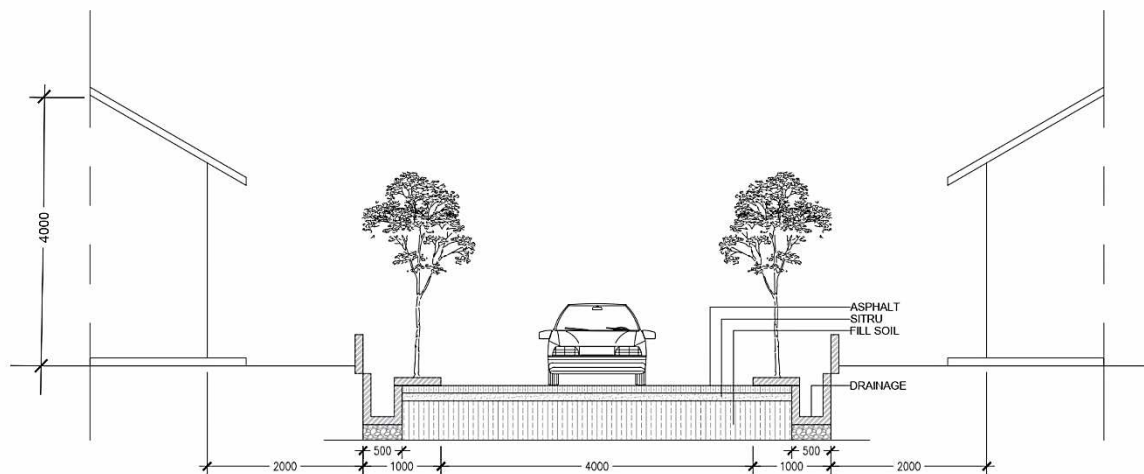


Figure 2. Cross Section of Watugong

Source: This figure demonstrates Watugong Street corridor cross section, 2024

From the safety point of view, the road is not equipped with any security posts or signage, while the linear streets have no traffic calming elements. Security equipment such as CCTV is also not found along the road, however the most visible protection against crime is that each house is equipped with a fairly tall fence. Fences are rather dependable because they serve as a boundary, barrier, and obstruction for criminals (figure 2). According to the head of village, the most frequent crimes are mugging and theft of motor vehicles. Mugging can occur in this environment because there are no restrictions or treatments to limit the speed of motorized vehicles. On the other hand, motor vehicle theft occurs due to the negligence of migrants who do not secure their vehicles and park their vehicles carelessly on road side.

Table 1. Comparative Analysis of Watugong Street

Aspects	Requirement		Analysis
Territoriality	Physical territories	Provision of edge or access restriction of area or	Every house use fence, however there is no such restriction access to go through the corridor

Aspects	Requirement		Analysis
		houses, such as fence, wall, or gate	The interaction of inhabitant, who are migrants, are quite low
	Social territories	The social intimacy such as the level of attachment and familiarity between residents	
Natural Surveillance	Physical Natural Surveillance	The connectivity of every area and every street	The link between this street and the other is clear, that connected with the same road materials
	Social Natural Surveillance	The ability of resident to observe any incident	Resident can examine incident that happen in the area because the street is not wide and the house is attached each other
Image	Sense of security	The ability of physical arrangement for the sense of security	The absence of security device along the street raise the vulnerability, and the grid layout give easy access for criminals to ran away
Milieu	Setting of Activity or community	The condition of environment as the place of dwell	Majority of buildings are residential, so the environment tends to be quiet and not busy. Dark conditions also contribute to an atmosphere that feels unsafe

Source: Author, 2024

Based on the comparison, it was found that Watugong Street was not completely correspond with the requirement of defensible space theory in several aspects. The image and milieu are the aspect that is not maximally planned to enhance the sense of security of the area. However, this street already has strength in natural surveillance aspect. It is worth noting that this natural surveillance strength is derived mainly from the narrow street width and attached building form rather than from the orientation of building openings; most fences and walls along Watugong Street are solid, with few windows or balconies facing directly onto the street, which weakens the actual visual connection between dwellings and the corridor.

4.2 Kerto Rahayu Street

The Kerto Rahayu street is one corridor that is prone to crime because the position of this corridor is close to the main road and is often used as the main access to the Kampong. The occupancy in this road corridor varies, including residential houses, boarding houses, and shops or stalls. Public activity results in the presence of crowds at particular times, which supports the active atmosphere.

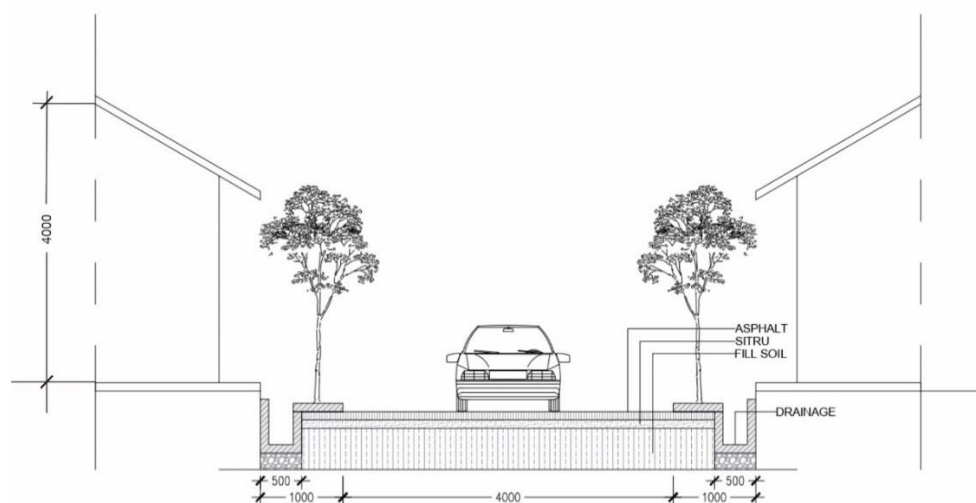


Figure 3. Cross Section of Kerto Rahayu

Source: This figure demonstrates Kerto Rahayu Street corridor cross section, 2024

This road is not equipped with a portal due to high mobility, but the entrance area has been equipped with a security post. In term of social engagement, there is an information board to published any event or incident for the community. The semi private area in Figure 2 mostly used for on street parking of residents and the guests, that tend to be the spot of criminal acts.

Table 2. Comparative Analysis of Kerto Rahayu Street

Aspects	Requirement		Analysis
Territoriality	Physical territories	Provision of edge or access restriction of area or houses, such as fence, wall, or gate	There is a post security in the access gate, while fence is used by every house
	Social territories	The social intimacy such as the level of attachment and familiarity between residents	The social interaction of residents, who are migrants, are quite low
Natural Surveillance	Physical Natural Surveillance	The connectivity of every area and every street	The road is connected with the same ground cover, and marked with portal
	Social Natural Surveillance	The ability of resident to observe any incident	Since the road is quite narrow, the resident can easily observe others activity and any incident
Image	Sense of security	The ability of physical arrangement for the sense of security	The provision of gate and portal in the single linear road gives sense of security, especially at night
Milieu	Setting of Activity or community	The condition of environment as the place of dwell	This presence of commercial activity allows people to use the road extensively than the watugong street, so the crowd can give such sense of security

Source: Author, 2024

4.3 Kerto Sentono Street

Kerto Sentono street is a very accessible corridor because this area is inhabited by various land use, such as copy center, food stalls, clothes store, kindergarten, internet cafes, boarding houses, and mosque. It encourages the awareness of the residents to be able to supervise each other. Even though this street is widely accessible for public, the intimacy of the residents is quite high because it is inhabited by local residents.

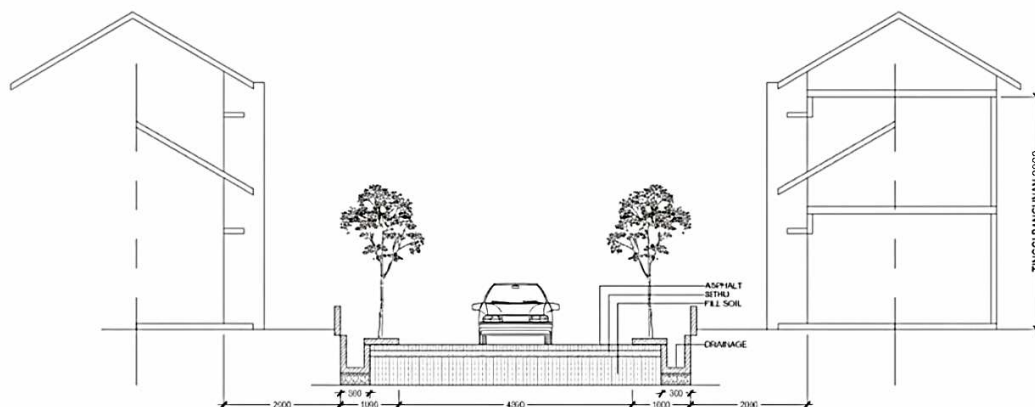


Figure 4. Cross Section of Kerto Sentono

Source: This figure demonstrates Kerto Sentono Street corridor cross section, 2024

The area is very lively and has been equipped with signage related to CCTV surveillance, slow down signage, and prohibitions for one-way roads specifically for cars. In addition, to slow down the vehicle

circulation there are speed bumps and street lighting at every junction at the Kerto Sentono road. At the end of this corridor, there is a post and an information board, while fence is use in each building.

Table 3. Comparative Analysis of Kerto Sentono Street

Aspects	Requirement		Analysis
Territoriality	Physical territories	Provision of edge or access restriction of area or houses, such as fence, wall, or gate	Every house is fronted by a fence, except for shops, but 6 access routes are not equipped with portal
	Social territories	The social intimacy such as the level of attachment and familiarity between residents	The inhabitant of this street are more familiar with each other, because the original owner of the building tend to stay during the day and night
Natural Surveillance	Physical Natural Surveillance	The connectivity of every area and every street	The street is connected to 6 other streets by the same material of vehicle path
	Social Natural Surveillance	The ability of resident to observe any incident	The high accessibility of the street drives the visibility of any incident that can be observed by the residents
Image	Sense of security	The ability of physical arrangement for the sense of security	A rather wide junction gives a sense of security for residents in other street, however, the height of the building corner obstructs the visibility, especially at night
Milieu	Setting of Activity or community	The condition of environment as the place of dwell	The public activity enhances the lively atmosphere of the street, which raises public awareness

Source: Author, 2024

4.4 Discussion

Although the head of village identified motorcycle theft and robbery as the dominant crime types along the three corridors, this study did not construct a spatial hotspot map plotting individual incident locations along the corridors due to the unavailability of geocoded incident data. Consequently, the causal link between specific physical configurations and crime vulnerability presented below is interpretive rather than empirically mapped, and should be strengthened by spatial hotspot mapping in future research.

The analysis shows that most street are not complete the entire requirement of defensible space aspects. Physical and non-physical aspect are two elements that related to each other to improve the area. Physical aspects include building design and the environment intervention, while the non-physical aspects include policies and community activities. Some of the physical improvement that can be given include the existence of security guard or additional monitoring points, the existence of outdoor study spaces for students and the community, the addition of CCTV points, fence designs for surrounding residential areas, procurement of bumps, and procurement of signage or information boards (Figure 5). While, the non-physical enhancement includes policies for access hours with a portal, provision of security personnel, and holding community activities at the neighborhood level to raise the intimacy. The addition of security post points or monitoring points is related to several concepts of defensible space. The existence of a security post increases natural surveillance on the corridor, tends to enable more efficient supervision for the community, and reinforces the territorial aspects of the environment. In addition, public activity, especially commercial and worship activity, shapes a milieu that ensures a sense of safety for both local residents and migrants. This finding corresponds with Satiawan et al. (2019), who identified lighting, surveillance, and territorial reinforcement as spatial planning elements that shape opportunities for crime, and with Zen and Mohamad (2014), who argued that physical arrangement of the environment strengthens residents' control over their surroundings. It also echoes Seifi et al. (2019), who cautioned that overly restrictive territorial measures, such as solid fencing, can conflict with natural surveillance; a tension that is clearly reflected in Watugong Street, where solid fences limit visual connectivity despite the corridor's otherwise strong natural surveillance.

Meanwhile, public outdoor learning spaces also serve as a form of natural surveillance in the environment. Given the narrow 4 meter road width and limited land availability in this organic settlement typology, this outdoor learning space is proposed as a pocket park utilizing leftover space, such as street corners, widened junctions, or setback areas in front of the security post, rather than requiring dedicated new land. Next physical development is an additional CCTV point that focus on the Watugong Street and Kerto Rahayu Street. The CCTV placement will be made with signage at every 30 meters, so the sense of awareness will be raised. In addition, speed bumps have a role as a circulation control that acts as a territorial security boundary within the environment. Lastly, a certain fence design can also provide security for the environment in terms of residential territory and natural surveillance. In this case, the expected fence design is tall but quite transparent fence, so the community can still observe each other. As a more measurable criterion, the fence is recommended to have a visual permeability ratio of at least 60%, achieved using perforated or hollow materials such as metal grille or lattice screening, with a maximum height of approximately 1.8–2 meters so that it still restricts physical access without fully blocking sightlines between the house and the street.

Apart from physical procurement, the welfare of residents also needs to be considered. Non-physical improvement is a gathering activity at the neighborhood level, in the form of a community service inside the Kampong or a citizen festival. The purpose is to engage the diverse community and to increase residents' attention to one another.



Figure 5. Recommendation Map

Source: Author, 2024

5. Conclusion

In response to the research questions posed at the outset of this study, the findings indicate that the three street corridors of Kampong Watugong have not yet fully satisfied Newman's four defensible space elements, with the image and milieu dimensions showing the most pronounced weaknesses, while the recommended physical interventions (additional CCTV points, security posts, speed bumps, improved street lighting, and permeable fencing) together with non-physical interventions (regulated portal access hours and community activities) are considered the most appropriate measures for improving environmental security in this dense, organically developed student settlement. The crime rate in a settlement may increase due to resident diversity, which is influenced by physical and non-physical aspects. Most diverse communities have little attachment with one another and with the environment itself, including an unfamiliar surrounding for migrants. In addition, limited security facilities raise the

vulnerability of the area to criminal acts. Comparative process showed that some physical and non-physical aspects are not fulfilled by several spots of the case study, results in the weakness of the area. Defensible space aspects refer to the maximum use of the area and the existence of the community. A lively street is one of the keys to increasing the sense of security, while this also depends on the provision of street furniture and security devices. Study on the vulnerability of criminal acts in residential areas cannot be separated from spatial planning and user behavior, as well as community experiences. Historical spatial analysis of past events is also needed to anticipate the possibility of an increase in the frequency of crime incidents, in order to realize the security and welfare of the community, especially the residents of the area. Future research is recommended to involve a broader range of respondents, including boarding house residents, migrant students, and relevant security personnel; to construct a spatial hotspot map of documented incidents; and to evaluate the effectiveness of the proposed physical and non-physical interventions through post-occupancy evaluation.

Theoretically, this study enriches Newman's defensible space framework by showing that, in a dense, horizontally organic kampong such as Watugong, territorial control cannot rely primarily on formal boundary markers as in Newman's original suburban context; instead, territoriality and natural surveillance are more strongly mediated by the transparency of fences, the orientation of building openings toward the street, and the presence of everyday public activity, indicating that defensible space in organic informal settlements is achieved through incremental, socially negotiated adjustments rather than comprehensive spatial redesign.

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