



The relation of spatial configuration in residential real estate towards its conduciveness security level



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Abstract

As a part of an area, residential real estate has various spatial configuration patterns, which are part of the elements that form its environment. Depending on the context of certain places, spatial configuration and security reinforcement become a concern regarding the issue of crime prevention, which promotes a safe neighbourhood that avoids the risk of crime. A phenomenon took place where there are several preventive actions were carried out at the basic stage of planning and designing residential real estate, but these efforts later brought various methods and priorities that determine spatial configuration or security reinforcement to serve either as the main reference or adjustment at the initial step. This research dissects the relationship between spatial configuration patterns and security systems applied using the Crime Prevention Through Environmental Design (CPTED) approach to obtain the most optimal solution in preventing crime and reducing crime rates. This research used descriptive analytical methods in a comparative way to derive the final synthesis of three residential real estates in Bintaro Jaya as study objects. The results of this research discovered the most conducive type of residential real estate in terms of its security level. These findings can enrich the development of studies on similar topics and contribute to the consideration of design criteria related to spatial configuration and security reinforcement of residential real estate in anticipating potential crimes.

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INTRODUCTION

Bintaro Jaya is an area in South Tangerang and South Jakarta that PT mainly developed. Jaya Real Property, Tbk since 1979, and several other developers with the concept of the planned township. According to the type and level based on the geographical area [1], Bintaro Jaya is classified as a neighbourhood. Even though the built environment was designed through a thorough planning phase and is still ongoing today, Bintaro Jaya cannot be denied problems related to crime. It was recorded in a report by Polri Daerah Metro Jaya, Resor Tangerang Selatan, Sektor Pondok Aren the number of criminal incidents and crime victims that occurred in

district-level Pondok Aren during the period of 2017 until 2021 increased by 22%. Pondok Jaya, Kasuari, and Emerald Residence, which are the object studies located in Pondok Aren, certainly have their way of facing these challenges while still taking into consideration the context of their place.

Understanding the context means considering the potential criminogenic capacity in the surrounding environment regarding land-use types and criminal opportunities (crime generators, attractors, detractors, facilitators, and precipitators) [2, 3, 4]. Various levels of crime risk characterize various land use functions, and land use functions have various effects on crime generation [5].

Evidence in the field shows that the two strategies emphasize different focuses in the initial stage of planning and designing residential real estate related to spatial configuration patterns and security systems. Spatial configuration discusses the existing road network in housing areas with spatial connections to areas outside its periphery. A study stated that the perception of safety is spatially and socio-culturally constructed [6] and the combination of spatial, temporal, and interaction layers contributes to predicting the most criminally prolific 3% of street segments [7]. Meanwhile, security system talks about the technique used to secure its territorial area using the Crime Prevention Through Environmental Design (CPTED) approach. Sometimes, these connected roads are accessible without access control; however, gated communities are also implemented in housing areas.

The impact that can be observed from this phenomenon is the difference in permeability level and security reinforcement applied in residential environments. High permeability in road networks means equivalent to increased connectivity, but nevertheless, it brings out new polemic that has the potential to create a vulnerable environment by allowing direct pass through that actually requires more treatment and safeguarding. This observation in some ways, becomes interesting and challenging because the diversity of each surroundings as an external factor may have various influences on an environment's security level. From the explanation above, it can be learned that there is a close relation between spatial configuration and the security system, which plays an important role in preventing crime.

This study targeted finding the typologies of residential real estate and the type that can create conduciveness security level. Therefore, this study is also expected to contribute to integrating theories regarding street patterns (spatial) and crime prevention highlighting in meso-scale area according to specific environmental context. So, through this research, a safe built environment consisting of planned residential real estate or housing clusters can be achieved and crime opportunities can be well anticipated to create a sense of security to the residents and support the continuity of a livable city.

LITERATURE REVIEW

The Contextuality of Settlements

Understanding the context of one place cannot only be observed from its physical features, but it is also necessary to learn the non-tangible perspective so that the discussion becomes more comprehensive. The built environment as a complex entity, as stated by Habraken, is formed by three orders: the order of form, the order of place, and understanding [8]. In his book titled 'The Structure of The Ordinary', Habraken describes the structure of an environment into three aspects, which are:

- Physical environment (shape, physical order), which related to form, i.e. spatial configuration and building form in the built environment,
- Territorial environment (place, territorial order), which related to place, i.e. physical boundaries, signage, regulation; and
- Cultural environment (understanding, cultural order), which related to understanding the meaning or value of architectural order in discourse of type-pattern-systems in the built environment.

Urban Morphology

Spiro Kostof, in his book 'The City Shaped' explained the development and the origins of cities throughout the world as a process of forming artifacts. He suggests that a city is like a living organism consisting of elements that continuously develop. Cities are divided into two categories, which are planned and organic. Several factors influence a city's morphology, for example, power, social and cultural aspects, natural elements, growth, and economic aspects. So, to understand the existence of a city form, one must study the history of the city's evolution over a period of time.

A city is also a process where the physical form adapts to the development of spatial patterns according to its era. Kostof described the factors that influence these changes, which influence the urban form, and how elements are modified and formed into a pattern. These factors can be topographic, political, socio-cultural, and so on. In the end, cities are formed from 4 main elements that make them as one complete unit [9], those are:

- Streets
- Public places
- Urban divisions, and
- The borders of city and countryside

Meanwhile, Aldo Rossi sees cities as man-made objects that always transform over time or urban artifacts formed from its history. A city is not only formed functionally, but many aspects also influence the formation in the dynamics of time. The evolution of a city is a process that can be analyzed in terms of its forming factors how various forces (economic, political, cultural, etc.) have essential roles within it. According to Aldo Rossi, the following factors are the urban elements that form a city [10]:

- Geographical features or geographical conditions that took a major effect to the history of the city.
- Route or road networks as a link between areas.
- Neighborhood or residential environment.
- City monuments or the landmarks of an area.

Spatial Configuration

Reading the spatial configuration of settlements can be understood from Stephen Marshall's theory in his book 'Street Pattern', which argues that roads can be seen as part of urban character. Marshall then read the characters of the streets based on their type, roles and classification, hierarchy, patterns, and process. From those elements that have been described, three aspects can be used to categorise spatial configuration in residential real estate. Those three aspects include constitution, configuration, and composition as listed in Table 1 [11].

Road networks in constitutional aspect related to the differentiation of road types are hierarchy in an ordered ranking, necessary connections associated with connectivity, and allowable connections that discuss access restrictions. Another aspect, which is the configuration aspect, will analyze the frequency of elements and configurational structure of road networks. Last, the composition aspect examines an element's size, shape, and orientation. Those three aspects that have been mentioned above are part of the Tree Analogy Connotations theory, which has branching characteristics as can be found in street patterns.

Table 1. Properties that Formed Street Patterns [11]

Constitution	Configuration	Composition
Differentiation	Frequency of elements	Size of elements
Ordered ranking	Configurational structure	Shape of elements
Necessary connections		Orientation of elements
Allowable connections		

Security System

Study about crime prevention in the environment, or what is known as CPTED, is an ongoing process of design guide on the built environment in response to crime risks in an attempt to reduce crime rate and fear of crime along with creating a safe space. So far, there are three generations of CPTED, each representing thoughts and perceptions regarding the principles of crime prevention that need to be applied effectively. The first generation was initiated by Oscar Newman's idea of Defensible Space. The second generation of CPTED later came as a criticism to the previous generation written by Gregory Saville, which was inspired by Jane Jacobs' theory that emphasized the social aspects of a neighborhood, followed by the third generation of CPTED, which combined the first and second generation of CPTED with a more holistic approach and long-term result.

First-generation CPTED put forward all the factors that promote a defensible space by focusing on territorial control. Crime opportunities are blocked by modifying the physical environment. There are seven principles used as an integrative approach: territorial reinforcement, natural surveillance ('eyes on the street' or supervision), access control, target hardening, image or maintenance, and activity support [12]. Those principles are created based on human activities and space design.

The second generation of CPTED was introduced by Saville, which was seen as a development and complement to the previous generation, which seemed to define CPTED limited to only its physical context. Saville extends the theory by considering neighborhood conditions and social relations that took place, inspired by Jacobs on creating social cohesion and a sense of community that is believed to be able to promote a longer period of the safe and livable environment [13][14]. This shows that the generation focuses more on social context related to social cohesion, community culture, and threshold capacity.

In general, the third generation of CPTED is a combination of the first and second generations with the aim of creating a healthy and sustainable environment with a balanced community in a well-maintained urban setting. It can be achieved by considering the ecology, urban design, and security aspects. The main theme promoted by this generation is focused on public health and sustainability [15, 16, 17, 18, 19], while others also highlight how crime also has carbon costs [20]. Sustainability can be assessed from environmental, economic, social, and health perspectives, as shown in Figure 1.

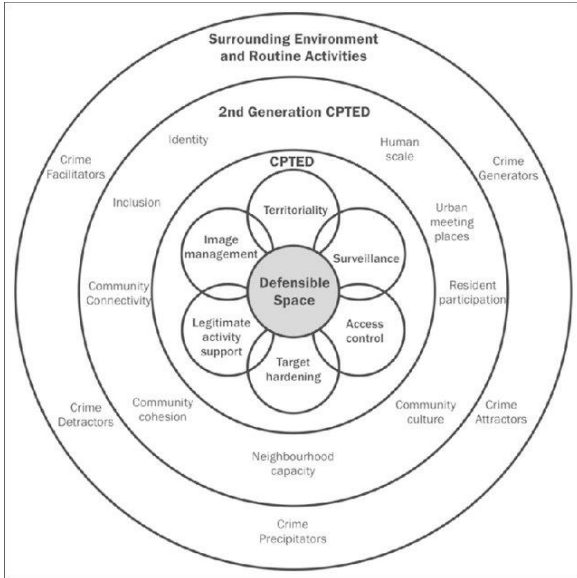


Figure 1. A Dynamic Integrated Model for CPTED [19]

METHOD

The unit data needed to describe the context of place are classified into three sections: physical, territorial, and cultural environments. The sub-units of physical data are taken from Kostof and Rossi’s theory, which is related to elements that formed a city, such as the precise location, surroundings, streets, land use, block, and plot layouts. The sub-units of territorial data refer to residential permeability location point(s), such as the precise intersections to the outer periphery and its relevance to access control or physical boundaries. Meanwhile, the sub-units of cultural data linked to habitable culture of the residents regarding social cohesion and activity programs. Apart from that, the data concerning the security system and crime rates must be collected as supporting evidence for the conclusion. The data sources are gathered through library research (books, literature, journals, scientific writing, etc.) and field research (observation and interviews with key informants).

This research uses a mixed-method approach in quantitative and qualitative manners. The method used in this research is analytical descriptive in a comparative process to execute the discussion and result. Comparisons are made based on three selected object studies, Pondok Jaya, Kasuari, and Emerald Residence. The following are the specific steps on how to get into the synthesis:

1. Inventory of the sub-unit’s data based on existing conditions from field observations.
2. Identify and classify the data units related to physical, territorial, and cultural elements that

formed the residential real estate based on Habraken’s theory.

3. Analyze and elaborate the spatial configuration pattern related to road networks in residential real estate based on Marshall’s theory with complete narratives and illustrations.
4. Analyze and elaborate on the security system related to security reinforcement applied in residential real estate based on CPTED theory with complete narratives and illustrations.
5. Conclude and provide suggestions or recommendations regarding the typology of residential real estate conducive to preventing crime based on research in the specific object studies.

Figure 2 shows a diagram that explains the research flow in several phases.

RESULTS AND DISCUSSION

Pondok Jaya

Other clusters and several organic settlements surround Pondok Jaya on the East, South and West sides. Bintaro Utama 3A Street, situated on the North side of the cluster, is the main access that must be passed to get into the front gate of a residential area. The road also becomes the borderline between Pondok Jaya and areas across its cluster, which is State Accounting College (STAN). On the west side, the Pisok Cluster is marked by a small river as a divider. Meanwhile, on the East side, Pondok Jaya is side by side with Mandar Cluster and Kampung (an organic settlement) Mandar Dalam that extends through the South side and finally encountered other settlements, which are Kampung Beruang and Kampung Unta as depicted in Figure 3.

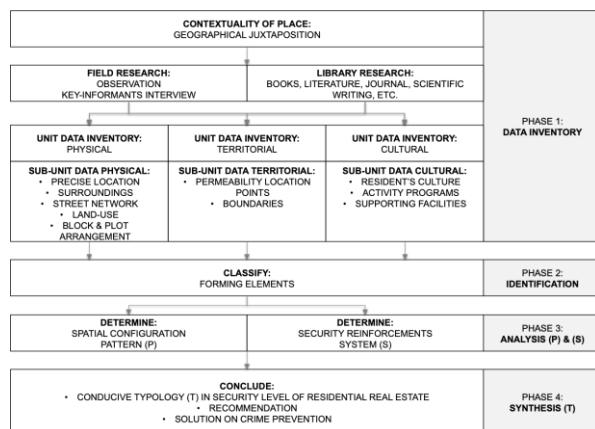


Figure 2. Block Diagram of Research Method



Figure 3. Residential Map of Pondok Jaya
Source: Resident Permit File with Personal Edit

There are distributions of 10 permeable location points in Pondok Jaya, which are spatially connected to road structures outside the housing area. Of all the points described above, 1 function as main access and gate for vehicles (Point 1); 3 that are connected to other clusters (Points 2, 9, and 10); and 6 others which are directly connected to organic settlements (Points 3, 4, 5, 6, 7, and 8). The high level of permeability represented in Pondok Jaya is aligned with some studies that believed more entrances to and exits of communities, high mobility of people, and larger on-street populations are more prone to criminals [21, 22, 23, 24]. Figure 4 – Figure 13 show the conditions.



Figure 4 – Figure 13. Permeability Location Points (1-10) in Pondok Jaya
Source: Personal Photos

Pondok Jaya has open spaces that spread across the housing area, which provide sports facilities that can be used for basketball, soccer, or multi-purpose outdoor activities; a culinary area that is supplied by food carts at night and street vegetable vendors in the morning; and a park with jogging tracks and gazebos. It is proven that a higher level of visible natural features leads to greater reductions in fear of crime [25, 26, 27] and promotes the use and social interaction in them [28][29]. Meanwhile, the building facilities provided in Pondok Jaya are more complete compared to the other clusters, including a mosque, kindergarten (PAUD), community hall, and integrated healthcare center. A study found that the regeneration of building facilities significantly decreases residents' fear of crime [30].

According to the Urban Design Compendium theory [31], the road network in the Pondok Jaya Cluster is classified as residential streets. The classification is determined by combining the road capacity and the road character [32]. Based on character, 'street' is more urban than 'road', which tends to be more rural [33]. Viewed from roads fragmentation layer, the highest tier in the Pondok Jaya Cluster is the



local street type, which then split into several branches to produce a minor street type. It is important to note that generating a road network with an extensive depth of branches (sub-sub-minor roads resembling maze corridors) that are too far from the main residential street can make monitoring difficult.

Configurational reading in street networks related to integrated road structure as a whole unity. In Pondok Jaya, the local street is formed in a line from North to South and produces lots of T-junctions. Judging from the existing type of T-junctions, there is domination of T-tree configuration since the ends of the minor streets are mostly cul-de-sacs. However, T-cell configuration can still be found in streets that are linked to other streets at the end of the road.

The road network in Pondok Jaya is formed in rectilinear (straight-lined) geometry with a branching system. Some of the minor streets generate a pattern of oblong-gridiron which can be found on blocks D2, D3, D4 and E6, E7, E8, but others formed in cul-de-sacs on most of the minor streets, as seen on blocks C6, C7, C8, D6, D7, D8, etc. The geometric pattern of streets with rectilinear means that blocks are not locked rigidly in a grid, but the buildings can be an expression of sequence in a set of flowing spaces. Apart from that, this shape can give a modern impression with its simple topology and provide direct connection. Meanwhile, an oblong gridiron with the same block size looks equal and produces X-cells.

The blocks in Pondok Jaya have rectangular shapes arranged in grid and produce many intersections. This shape slows down the traffic and makes it easier for pedestrians [34]. A set of blocks that are formed regularly makes the subdividing of row plots more simplistic by allowing the same plot size within one block [35]. The regular blocks applied in this cluster do not actually respond to the existing site, as can be seen from the arrangement of blocks perpendicular to its abstract site.

Pondok Jaya has various types of physical boundaries. On the border side with the main road (Bintaro Utama 3A Street), there is an automatic gate with guardhouse that monitor the movement of people and passing of vehicles and the presence of a front park as a barrier. On the border side with other clusters (Mandar Cluster and Pisok Cluster), it is installed with fences and a pedestrian access door. While on the border side with organic settlements, the roads are left open without any barrier, but the narrow width can only be accessed with motorcycle. Figure 14-Figure 15 show the spatial configuration and permeable access of Pondok Jaya

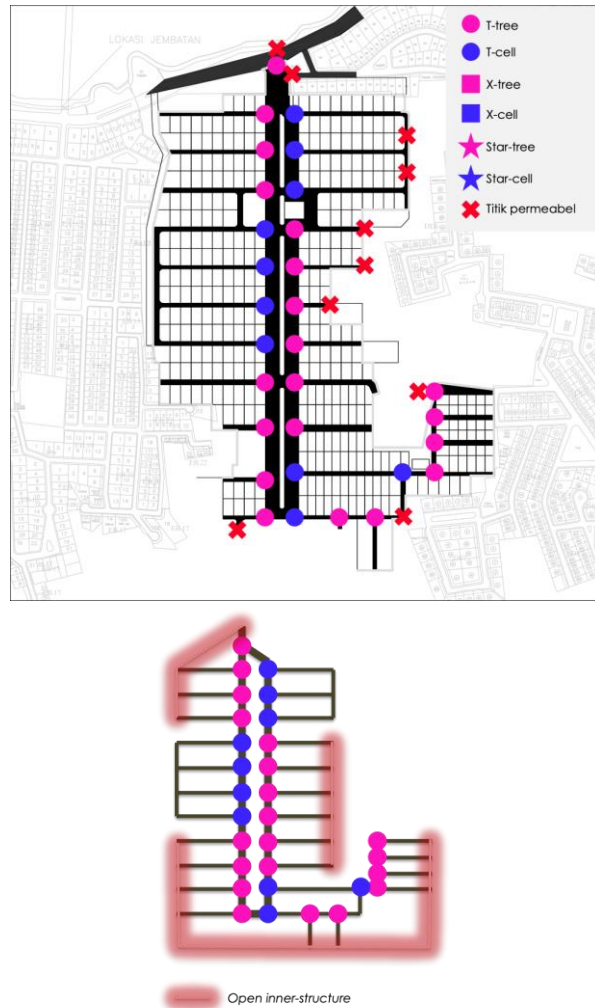


Figure 14-Figure 15. Spatial Configuration and Permeable Access of Pondok Jaya
Source: Jaya Real Property with Personal Edit

Those open-access roads certainly require more awareness and security reinforcement because it can be a threat that linked to unemployment and less educated residents. An evident show that perceived lack of safety was associated with unemployment and less educated residents, not with reported crime events [36, 37, 38]. Whereas on the border between a single plot and the residential street, it is dominated with front yard as a semi-private area and fences mark the boundary of its territory, although there are still several houses that appear without fences.

Social cohesion supports the positive connection in a neighborhood context to create collective relations, one of them is through a group or community with social-based programs that target the sense of common purpose.

It is also important to ensure community members actively participate in decision-making processes for managing or modifying their

neighborhood [39]. Some activities that can be found in Pondok Jaya that activate the public places include community gatherings at the hall, routine morning exercise at the court, blood check at the healthcare center, domestic waste sorting in a specified building which the local community has set. Those activities liven up the environment and added more 'eyes' on the street as natural surveillance.

Kasuari

On the North and East sides of Kasuari, there can be found Kasuari Utama Street, an intersection between the housing complex and the river, as well Cluster Kasturi, which lies across the street. Bintaro IX Street, which is the outer border on the South side, separates Kasuari and Maleo Cluster that face each other. On the West side, this cluster intersects with Santunan Jaya as organic settlement and next to Santunan Jaya is another cluster namely Rajawali Cluster. In Santunan Jaya, there are several facilities including Pondok Pucung Sub-District Office, Pondok Pucung Health Center, and a burial area called Serut Cemetery. The residential map of Kasuari is shown in Figure 16.

Kasuari has six permeable location points, first is a main gate (Point 1), where the residential road intersects with the main road (Bintaro Utama IX Street). Kasuari Utama Street, which currently serves as public road for some clusters, is still become the only access for several houses in Kasuari (Points 3 and 4). Point 2 is located parallel to Point 1 and it likewise showing a connection to Bintaro Utama IX Street. Figure 17-Figure 23 show the permeability location points (1-6) in Kasuari.

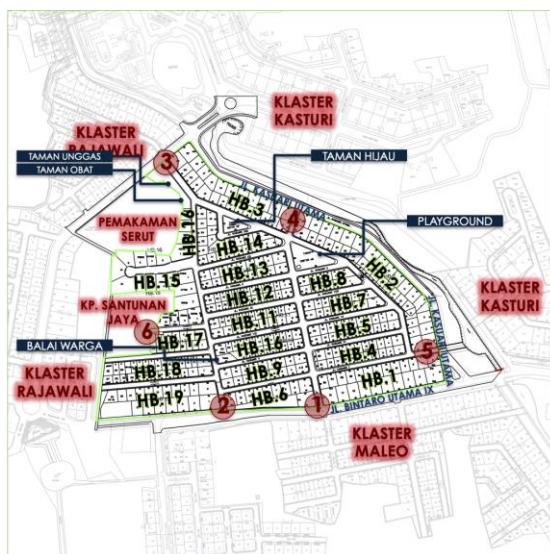


Figure 16 Residential Map of Kasuari
Source: Jaya Real Property with Personal Edit



Figure 17-Figure 23. Permeability Location Points (1-6) in Kasuari. Source: Personal Photos

It can be seen from Point 5 where the residential road is spatially connected to another road that is part of Cluster Rajawali. And Point 6 is where an intersection occurred between two streets of Kasuari and Santunan Jaya. It is considered important, specifically on the edge of residential's periphery, in minimizing the route network which potentially connected to a road network outside the housing area with high criminal opportunities, that all roads sides and road ends better surrounded by rows of blocks or house plots.

This cluster has three types of open space. The largest one functioned as a playground. Another one located at the end of a housing complex functions as an urban farming and poultry park. Meanwhile, the last one is used as green space. Effective functional spaces that accommodate public interest may bring mutual efficacy. Therefore, mutual efficacy plays a key role in activating social resources and facilitating community-based crime prevention [40]. This is supported by a statement that said concentrated disadvantage and low collective efficacy at the street level might indirectly increase fear via higher levels of social disorder or crime [41]. Apart from that, Kasuari also has a building facility that operated as a community hall located at the corner lot with a building characteristic of Betawi tribe architecture. This facility is often

used for community gatherings, holding social events, and as a space for waste bank activities.

Based on the capacity scale and character of roads, the road network in Kasuari is classified as residential street. There are three grades of roads that are spatially connected to the cluster, from the highest tier, which is the major collector (Bintaro Utama IX Street), followed by the local distributor (Kasuari Utama Street), and the access road (residential street inside the housing area).

Carrying out an integrated approach of this cluster's road structure, Kasuari is formed from a combination of junctions dominated by T-junctions that can be seen on the edge of the perimeter, but the middle part of the cluster is a set up of several X-junctions arranged in a row. The T-junctions that are created in this cluster are due to the presence of cul-de-sacs and block intersections that are not aligned to each other. It can be clearly seen that the West side is structured from a collection of T-trees meanwhile the East side is from T-cells, so that it brings irregular form of blocks. Another variant of intersection resembles a radial-tree (star-shaped), which is a meet point of 5 roads. At that location point, higher average daily traffic is occurred, and it was associated with crashes, while crimes were associated with lower average daily traffic [42], and both types of incidents tended to be higher in lower-income neighborhoods. In contrast with that, another study found that crowded places and riversides create an excellent opportunity for criminals [43]. But those opposite two sides agreed that uneducated and unemployed neighborhoods increase the probability of committing property crime.

The road network in Kasuari has the same geometric type as Pondok Jaya, which is rectilinear (straight-lined) with branches. The minor roads create a pattern of oblong gridiron, which is equal in size (non-differential). The cul-de-sacs are dominant on the side of the cluster that intersects with organic settlements. All blocks in Kasuari are foremost formed in rectangular that arranged in gridiron. Although some of the blocks appeared more organic because they follow the line of the river, which is the natural element around the site, the specific blocks look less rigid and have more flows. The spatial configuration and permeable access of Kasuari is shown in Figure 24-Figure 25.

In contrast to Pondok Jaya, the intersecting areas with the organic settlements in Kasuari are restricted permanently.

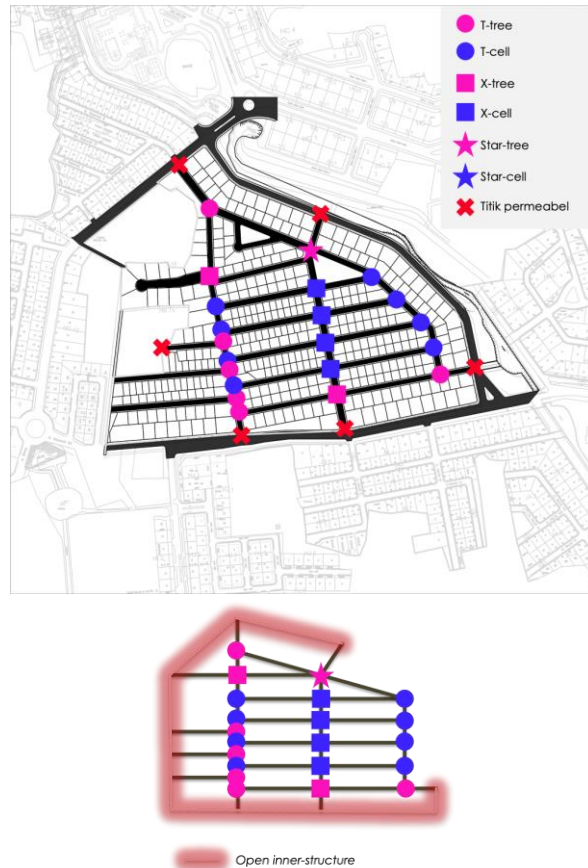


Figure 24-Figure 25. Spatial Configuration and Permeable Access of Kasuari
Source: Jaya Real Property with Personal Edit

This can be found on Kasuari XVI Street, where a massive solid wall was built at the end of the road to limit the access to Kampung Santunan Jaya.

Restricting access to the surrounding organic settlements of course has its pros and cons. On the one hand, the monitoring can be done more easily because the outsiders cannot freely pass over the housing area. But on the other hand, it is more difficult to reach directly to near available informal services (e.g. small stalls, drinking gallon outlets, mechanic handyman, etc.). Physical boundaries of real estate can be a common ground, potentially to be developed for two distinct settlements, otherwise if it neglected, it can be a source of problems for all parties [44].

Initially, the house type in Kasuari were designed to have an open garage for vehicles, but as time goes, now many of them have changed to semi-to-fully-closed by walls or a roof. The number of houses in Kasuari that do not have fences is relatively small but is still higher than Pondok Jaya. In a fact from that, fences can indicate the residents' fear of crime.

As it already mentioned before, this cluster also has a row of lots that have direct access to

public roads with a high level of traffic, which generate crowds and noise and later make it less comfortable to live in. Over that time, the buildings in that certain row tend to adapt their function from residential to commercial. Areas around those buildings can be risky because the study stated that the higher levels of business density are consistently associated with higher levels of crime [45].

Emerald Residence

Emerald Residence is one of the five clusters that are located along Emerald Street Boulevard, among other clusters, which are Emerald Garden, Emerald Townhouse, Emerald Terrace, and Emerald View. Those clusters are in one area complex and close to CBD (Central Business District) area of Bintaro Jaya. Apart from that, Emerald Residence tends to have higher housing prices than Pondok Jaya and Kasuari. An observation revealed that areas with higher crime rates are in areas with lower housing prices than those with higher average housing prices. These observations are evident for all crime variables except for home burglaries [46].

Emerald Residence is generally located between two typical clusters on the north and south sides: Emerald Garden and Emerald Townhouse. Two schools surround this cluster, the first one is Global Jaya International School that is located on the West side across the street and the second one is Auliya Islamic Kindergarten and Elementary School which is located on the Southeast side of the cluster. The result of binary logistic regression analysis shows that schools have a negative and insignificant relationship with property crime events because such places are relatively safe, mainly due to the presence of law enforcers [47]. Emerald Street Boulevard situated on the West side is the main access that must be passed before entering the main gate of the cluster. Figure 26 depicts the residential map of Kasuari.

As a residential real estate, Emerald Residence only has one permeable location point that is connected to the road network outside the housing area. Main gate with manual portal bar, house-guard, and wrought iron fences is placed at the exact location point. It is the only access for pedestrians and vehicles to entry the cluster. Traffic regulation is considered to lead to higher security and enhancement of physical status results in an increase in the sense of belonging [48]. The permeability location points (1) in Emerald Residence is shown in Figure 27.

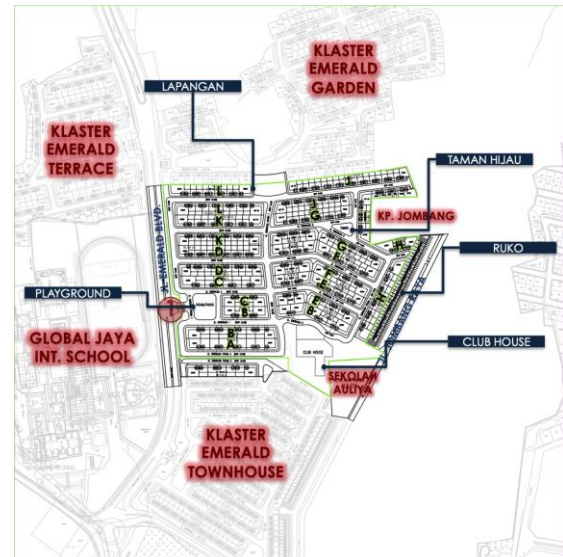


Figure 26. Residential Map of Kasuari
Source: Jaya Real Property with Personal Edit



Figure 27. Permeability Location Points (1) in Emerald Residence. Source: Personal Photo

Emerald Residence has several open spaces in its residential area. The first one can be found shortly after entering the cluster's main gate, which is a green space with a jogging track and sitting area, there is also an open space for basketball court and a playground. The building facility in Emerald Residence is a clubhouse that is used as communal space including a swimming pool with a small tenant in it. And since it is accessible and open to the public (with operational hours), two different gates and parking area are provided, one is for the residents and another for the outsiders to use.

In general, there are only two types of roads including distributor road, which is specifically designed for movement and access road, which has a role in occupying buildings in environmental areas [49]. In Emerald Residence, the residential road only has one connection to the local distributor road, which is Emerald Street Boulevard. Furthermore, Emerald Street Boulevard will lead to CBD area, which also means it serves as a connecting road that linked residential street as an access road and major collector road. The road grades described that represent the intercourse of major-average-minor

connections create a smooth transition in urban space. Creating hierarchy between road's intersections that occurred to be categorically too contrast by not having a smooth transition is important to avoid disparity in traffic speed and volume at point where the roads crossed.

Emerald Residence is formed from a mixture of T-junctions and X-junctions. Block A-G and Block J-L are formed in an X-cell configuration, where all the sides of the block are surrounded by residential roads. Meanwhile, Block H-I, which is located on the East side of the cluster and attached to the perimeter, has an X-tree configuration. Therefore, the blocks on the East side of the cluster look more irregular compared to those on the West side of the cluster.

The type of geometry in Emerald Residence can be thought of as arrangement of cells, where the minor roads that lead to dead-end are minimized. From the configuration of cells, it is created a rectilinear pattern including minor roads that consisted of rigid lines. The road structure is predominantly arranged perpendicularly and created an orthogonal pattern, namely rectangular or what is known as a grid pattern, which is formed from a collection of basic rectangular shapes. Therefore, a road network formed in such a way can produce blocks that generally formed in oblong shape.

However, it cannot be denied that Emerald Residence also has an X-tree geometry, which is formed from a road that ends in cul-de-sac. This pattern is constructed from tributary minor roads that have a configuration like branching system of tree pattern. This can be observed at the ends of Emerald 7 (cul-de-sac with loop), Emerald Utama 1 (cul-de-sac), and Emerald Utama 3 (cul-de-sac). Figure 28-Figure 29 show spatial configuration and permeable access of Emerald Residence.

Emerald Residence has been designed at the beginning of planning stage to become a housing area with one gate system, so the efforts for access restrictions within the cluster are minimum and effectively reduced compared to other two clusters discussed previously. The practice that appears to be the same applied in those three clusters is that all of them implement a one-way system for vehicles immediately after entering the main gate to reduce traffic crossings and potential accidents.

The same thing is done to the area that borders with other Emerald Clusters. Meanwhile, on the other side of the cluster that a border with areas that are not under the developer's management, such as organic settlements, school, and public roads is complex and quite challenging.

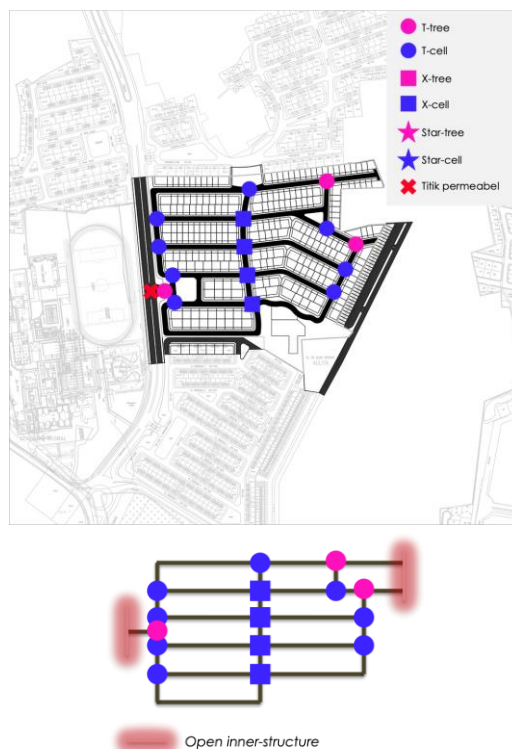


Figure 28-Figure 29. Spatial Configuration and Permeable Access of Emerald Residence
Source: Jaya Real Property with Personal Edit

In the area that intersects with Kampung Parigi, all the inner roads are blocked by placing row of blocks in the perimeters and solid walls on cul-de-sacs. The other area that intersects with Jombang Raya Street, also blocked by building a row of shop-houses facing the main road as an active frontage. It is convinced that active frontage can enrich street functions and deploy more 'street eyes' that generate natural surveillance [50]. Whilst the area that intersects with Auliya Islamic Kindergarten and Elementary School, a building facility (clubhouse) is built with a concept of sharing-space.

Unlike Pondok Jaya and Kasuari, houses in Emerald Residence are generally have similar design, so as a whole unit of cluster its unity is still maintained. Each of the houses also do not have fence on its border as a territory sign. Meanwhile, the garage is built open without any walls that blocked the visual and only provided with canopy for one to two carport(s) for car parking. The developer as well has provided a mosque, shop-houses, shopping arcade, and modern market outside the area near the cluster that functioned as a sharing-space for all the Emerald Clusters.

Crime Rates

The data report referring to social vulnerability during January to March 2023 by Polri Daerah Metro Jaya, Resor Tangerang Selatan, Sektor Pondok Aren shows the criminal incident that arises most often in Sub-District Pondok Aren is theft, with the specific amount of 15 cases happened during the period time mentioned. So, the criminal case constituted as theft then used as a reference for calculating crime rate. It strengthens by study concluded that property crime is larger on residential streets, while violent crime is larger on commercial streets [51]. The crime rate is acquired by calculating the number of thieveries that have been recorded in one residential real estate divided by the total number of its quantity of plot land. Therefore, the calculation result shows that there is a difference in percentage between those 3 clusters, which are 4.54% as the highest crime rate, followed by 2.71%, and 2.46% as the lowest amount.

CONCLUSION

From the result on the index crime rate, it can be concluded that the highest level of crime rate associated with high permeability in one specific area. High permeability in residential real estate represents high connectivity in road network. This is proven by the lowest number of crime recorded in one cluster which was

discovered to have the lowest road connectivity towards its outer periphery.

Based on three residential real estates discussed, the most conducive type of residential real estate in terms of security level observed from its spatial configuration and security system is *Low Connectivity Streets with Gated Residential*, and the most prone to crime is *High Connectivity Streets with Non-Gated Residential* because all movements can be monitored optimally and it is easier to secure its territory. Therefore, the relationship that occurs between spatial configuration and the security system implemented in a residential real estate is that the higher the connectivity of a road network to the outer side of its housing area, will be equivalent to the increasing efforts of strengthening its security reinforcements that support a conducive security level.

The most appropriate solutions are to understand the context of one place and its surrounding area regarding criminal opportunities that could possibly threaten. Pay more attention to permeable location points by generating a mindful design and planning at the most initial stage is no less important. Other than that, provoke reachable (human scale) and visibly guarded circumstances to all road ends, create interstitial space between residential street and major street that functioned to provide busy area (e.g. placement of active frontages or shared-space facilities), create road width that not too narrow with enough street lighting to avoid dark road sequence, and placement of multi-use open areas or public facilities which enhance social activities are very likely to minimize criminal act.

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