



# The morphology and characteristics of livable public space in gated community settlement of Medan City, Indonesia

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**Abstract** The existence of the gated community in Indonesia was formed based on the similarities between ethnic groups as observed in Balinese, Arab, Chinese, and several other villages. This initiative was further improved in the 70s through the government's efforts to encourage the involvement of private developers in the housing sector and this led to the emergence of the second form of a gated community which is a closed residential area with legally privatized public spaces. The morphology of these public spaces, however, has different typologies and characteristics based on the form, utilization, and on-going activities. Therefore, this study was conducted to determine the morphology and characteristics of public spaces in gated community settlements in order to understand the criteria to plan public spaces and shape livable space in the study area. The research used the descriptive qualitative method with variables such as the form, type, activity, and use of public space in gated community settlements. Data were collected through interviews, questionnaires, and field observations, and the results are expected to be able to

determine the criteria to design livable public spaces in gated community settlements.

**Keywords** Morphology · Gated community · Public space · Livable

## Introduction

Livable neighborhoods have become the new planning imagination for the twenty-first century and are widely discussed by the urban planning research community. According to McCann (2008), the planning process involves understanding the ways to remain relevant in the contemporary economic and cultural characteristics of cities. Meanwhile, one component of a neighborhood with the ability to maintain livability in a residential area is the public space and each neighborhood has different legible livability characteristics which are observable from the public space (Moulay & Ujang, 2016). In the urban context, great public space is associated with the clarity of the form which directs people's movements, activity patterns, and social interactions in a residential environment. Moreover, the social interaction in the public space of residential areas is influenced by the space configuration which provides several opportunities for social contact.

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The housing area inhabited for several years requires appropriate management and maintenance to avoid degradation and this is also applicable to the livability of neighborhood public space and the prevalent gentrification is often unanticipated, considered unimportant, and uneventful. (Zukun, 2016). Meanwhile, a residential environment's livability needs to be maintained to avoid the reduction in the property value due to degradation which has the ability to reduce the interest of the residents to live in the house. This means it is necessary to examine factors required to maintain the housing area with residential gentrification which has been defined to cover different forms of social upgrading, new spaces, and new actors involved (Xing & Yong Chun, 2017) such as changes in occupant characteristics, lifestyles, and socioeconomic conditions. However, commercial gentrification in public spaces is a different discussion due to the need to focus on the subjectivity of merchants and the diversity of business (Parker, 2018).

Public space planning for residential areas also affects local activity and opportunities of active residents (Sugiyama et al., 2015) as observed in gardens, grassed areas, walking paths, water features, wildlife, amenities, dog-related facilities, and off-leash areas for dogs. In reality, most public spaces provided in planned housing are under-utilized even though their planning process is usually based on physical and social factors which support the livable neighborhood. Moulay and Ujang (2016) found public spaces with higher legibility have more diverse activities and the same logic applies to the frequency of these activities which relates more to the housing area. Moreover, it is possible to create social sustainability in a housing environment by maintaining social activities in public spaces and this concept has been defined in past studies from the significance of social network, community activities, sense of place, residential stability, and security (Arnett, 2017).

The emergence of a gated community in Indonesia four decades ago has led to the gentrification of housing and this research was focused on the morphology of the commercial public space in these gated communities with an emphasis on answering certain questions. How has the gentrification process in gated housing improves the type and characteristics of commercial public space over the past 40 years? And what are the changes in the commercial public space form? Moreover, this study further determined

the factors of livable public space during neighborhood gentrification due to their importance.

### Shaping public space in gated housing

Gated housing is a community controlled using a fence and gate to protect inhabitants from crime and other undesirable things (Atkinson & Blandy, 2005) and also to restrict access to the residential areas. Blakely and Snyder (1997) identified the different types of gated communities in the United States to include (1) community lifestyle, (2) community prestige, and (3) community safety zones. The community lifestyle and prestige are closely related to the characteristics and lifestyles of residents and this means they need to be considered in planning the public space in the gated housing. The theory of gated community by Blakely and Snyder (1997) and Atkinson and Blandy (2005) is slightly different from those implemented in Indonesia with components such as gates, security posts, and fences around housing often found to be only symbols without any contribution to security which are used by the developers to attract home buyers. They are, however, used optimally in the GC safety zone.

The issue most frequently discussed by researchers in gated housing is public space (Treija et al., 2018; Toolis & Hammack, 2016; Lu et al., 2018) and its privatization has been discovered by some to be in the form of (1) restrictions on public access which, in rules, contradict modern urban planning, (2) exceptions to residents' participation which reduce social activities orientation in order to find solution to the limitations of space, (3) development of spatial segregation and homogenization of the inhabitant's community, and the (4) development of spatial boundaries which causes traffic jams. The privatization of public space in gated communities is considered a social problem in the United States (Toolis, 2017). Meanwhile, the shaping process has been discovered from the environmental and psychological approaches to be transforming the community narrative and building more inclusive, participatory, and democratic communities. It is also one of the ways to reclaim public space for public use and this is usually the major problem during the design phase.

The privatization of public space also led to the legalization of new buildings built in open space (Treija et al., 2018) through the process of

densification in gated housing which involves the addition of new buildings limited by fences and only accessible to limited groups. However, it does not have public service, has an additional design for public open spaces, free service on the ground floor, and located adjacent to the public open space. Several cases of densification are common in large scale gated housing.

The environmental approach shows the privatization process has a negative impact due to the energy and resources required for its development. Moreover, the limited access provided to public space in small-scale gated housing through roads, pedestrian walkways, parks, open spaces, and playgrounds ensures the management of public spaces is the collective responsibility of all the residents (Deng et al., 2015). The environmental management initiatives of the residents focus on energy and emissions in the construction and management of residential units and public spaces and this has led to several debates due to several reasons which are (1) a gated housing is a housing plan with an integrated public space, (2) the gated housing is produced from a comprehensive design under the full supervision of the designer team, and (3) the evaluation of residential units is incomparable with the environmental impact of public space management.

The privatization of roads from gated housing also indicates the inability of most roads to solve traffic problems and this further indicates the process plays an essential role in the urban environment. Meanwhile, understanding the environment is crucial to how lifestyles and activity patterns shape the urban environment (Deng et al., 2015).

Some activities are required to increase green public space in planned housing and they involve developing and adopting effective strategies to improve communities' quality by revitalizing the idea of green housing. This idea was proposed due to the fragile relationship between the residents and their environment in gated housing. Developers often adopt public space to promote a sense of place to the consumers (Korjani, 2018) and the green public space concept has been discovered to have the potential to stimulate ecological awareness by increasing people's interaction with the environment, connectivity, and livability. Moreover, the livable green infrastructure improves the quality and frequency of public space, stimulates collective activities, and directs the residents' connection to their environment's true identity.

There are several variations to residents' perceptions of public space depending on the division created between public and private space. In gated housing, the public space is a public area designed exclusively for the residents only except for visitors while private space is expected to be a quiet and peaceful environment where they are expected to feel comfortable throughout the day. Meanwhile, the high level of expectation leads to the need for the public space to be safe from crime while a semi-public space is also established as a buffer zone to limit the use of the two other spaces (Ergun & Kulkul, 2018). Therefore, further studies are required on the importance of shaping public space in gated housing due to its indirect effects on the livability of the residence.

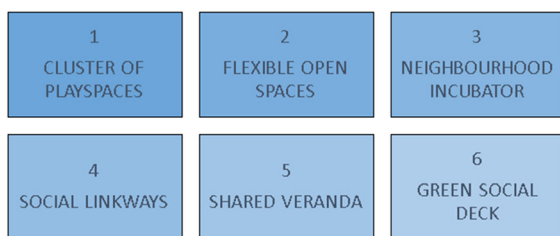
### **The function of public space in livable housing**

Livability is defined as the relationship between the residents and their residential environment and its maintenance depends on this psychological connection. Moreover, the efforts towards increasing place attachment and sense of belonging to the neighborhood (Prompayuk & Sahachaisaeree, 2012) also have the ability to maintain a residential environment's livability and this can be achieved in gated housing through the public space. Meanwhile, the lack of appropriate management has led to the degrading quality of this component (Chitakar et al., 2017) and the maintenance of public space has become the focus of several studies. For example, Konst (2018) studied the most appropriate scheme to maintain public space in gated housing among the local governments, housing developers, and the residents. This, however, showed the need for the sustainability of responsible stakeholders in maintaining public space in a residential area to ensure adequate livability.

The concept of public space management is related to four interlink processes (Chitakar, 2017) which include (1) regulation and utilization of conflict resolution strategies in public spaces, (2) regular pattern of maintaining public spaces, (3) new and ongoing investment management, and (4) coordination of parties interfering with public space. This means adequate management practices have the ability to fill public space with social interaction activities for the residents. Several studies have been conducted to determine the appropriate neighborhood

strategy to strengthen the relationship between housing residents and their residential environment. A survey, however, showed that the level of social interaction between neighbors in a gated housing is minimal and tends to decrease due to physical distance when facing social changes such as the vocal youth population, more elderly residents, and increasing social diversity (Sik, 2016). This further indicates the importance of neighborhood design principles in the facilitation of community activities and increasing social interaction in public. Meanwhile, community bonding in a residential environment has been discovered to be supported by three aspects (Sik, 2016) which are the physical or hardware design requirements, programming of social activities or software, and housing support or management institutions. The typology of spatial space is shown in Fig. 1 to be the community space for interaction.

The public space in the housing area is important to ensure social interaction between residents, outside communities and its shape and placement have been reported to be affecting the residential environment (Farida, 2013). Some houses in gated housing have open spaces which are made available for the general public and this changes the function of the public space to a common space. Meanwhile, some studies showed the setbacks in the social life of a residential environment are strictly related to public communal spaces and this further worsens social cohesion followed by vandalism and lack of maintenance which also leads to criminality. This means a gated community is created to secure the residents from the rising criminality in the city but the lack of public space maintenance also causes insecurity (Kaker, 2014). The components usually used to assess social sustainability in the area include social networks and community availability (Arnett, 2017). There is, however, the need for the mobilization of residents and changes in lifestyle in the process of gentrification.



**Fig. 1** Six typologies of community spaces (Sik, 2016)

## Facilities of gated housing

There has been a change in the lifestyle and patterns of settlements in urban communities in recent decades, especially in metropolitan cities. The transformation observed in England was reported by Macleod and Johnstone (2012) to be due to the Urban Renaissance while gentrification was found in big cities with the economic boom and increased privatization and this further affects the changes in the gated housing facility. The facilities and infrastructures in gated housing are provided for the residents but some developers also make them available for people from the outside. The concept of sharing housing between families and residents is the original form of reciprocal distribution and shared use while the joint use of facilities and infrastructure tends to form a sense of community (Belk, 2017). This study discusses the contrast between legal shared ownership of facilities and infrastructure of gated housing and the legal exclusion of the general public. In economic terms, the sharing activities within gated communities involve shared “club goods” and different services, and the two concepts are widely applied by developers.

Housing facilities and infrastructure packages have the ability to directly increase the prices of properties and the competition among developers in providing these packages has been observed to have increased due to more homogeneity of gated housing. The diversity of the packages has also increased (Benefield, 2009). Moreover, the housing unit price bears the cost of building the facilities but the developer controls and retains the ownership, especially in commercial and public space areas, because of the profit. It is also necessary to review the influence of the types of facilities and infrastructure available on the quality of life of the residents after the ownership and increase in prices have been discussed (Wang et al. 2018). This study proves the satisfaction of an occupant with the available facilities and infrastructure has a significant variation between gated housing and this means the preference of the residents also affects the housing livability. Several studies showed the growing number of gated housing in urban areas has led to changes in the policies associated with facilities and infrastructure as observed from the ownership aspect. According to Peraturan Menteri Dalam Negeri No.1 Tahun 1987 concerning the Submission of Environmental Infrastructure and

Public Facilities, facilities and infrastructure need to be handed over and become the assets of the city government after the gated housing has been occupied. Furthermore, the privatization of the public space in a neighborhood led to the privatization of facilities and infrastructure in gated housings in cities (Kusno, 2010).

Gated housing developers compete in providing different facilities and infrastructure to meet the needs and lifestyles of residents. Some of the facilities required by the regulation to be submitted to the city government include those related to education, health, shopping, religion, recreation, and sports. This is necessary because the whole perception of housing's attractiveness and vitality is influenced by location, environmental conditions, and public spaces which are the indicators of living standards and housing sustainability (Sopirova & Bradova, 2019). Meanwhile, recreational facilities can be designed to be in sports or shopping facilities to expose the affective bonds between people and their surroundings due to the frequent visit to public space by residents and others from the surrounding community (Madgin et al., 2016).

### **Commercial public space characteristic in gated housing**

Public spaces are an essential part of a city where several human contacts and social interactions occur and those considered to be successful are designed and developed in easily accessible locations with the ability to attract different activities and users. This means they are spaces created for humans to conduct activities such as routine events or periodic festivals required to strengthen ties in a community (Chitakar, 2017). Moreover, shopping facilities such as traditional markets which sell daily necessities in a residential environment are required to be available within a walking distance radius. It is important to note that Indonesia's traditional markets have always been the place for trade, social interaction, and recreation (Aliyah et al., 2017a, b; Caliskan et al., 2018). However, the limited availability of public space in planned housing has led to the transformation of these traditional markets into a super or mini-market (Chen & Yen, 2018).

According to Kanazawa & Jun (2002), public spaces in gated housing have different characteristics based on a location with high density. First, professional interaction in public open spaces such as the comfortable pedestrian spaces which provide spatial shelters from rains and hot sun. Second, most residents at the city center are middle-class families that migrated from other parts of the city while those in suburban areas are middle-class informal traders and this is the reason for different activities in the public space. Third, the activities in suburban gated housing are six times more than those in the city center. Fourth, the residents in the suburban are delighted with public space because it is different, usable, and comfortable while those in the city center feel dissatisfied with public space due to its monotonous nature even though it has a more diverse design. Fifth, there is a different hierarchy in the function of public space with those in the city center not seen either as public, semi-public, or private while those in the suburbs have a visible structure. Ergun & Kulkul (2018) also studied the hierarchy of public spaces in gated housing and discovered those in Ankara are categorized as semi-public space while the gated housing is classified as private based on its accessibility. Meanwhile, another activity observed to have changed in the housing environment is the social interaction activities with the housing residents found in the past to be interacting in traditional markets and opened public spaces such as parks, walkways, and roads but this has been changed in present times to commercial and public space due to the lifestyle and daily activities in the residential environment (Jansen et al., 2016).

There is a change in the gated housing commercial public space in comparison with other planned residential environments and this is based on two types of flexibility which include the flexibility for urban planning purposes and behavioral flexibility for sociological purposes. The first is a space which allows residents to be productive with their lifestyles and fit into the community's lifestyle while the second is a life strategy chosen by individuals without restrictions due to regional development. Some people believe the eye of a security camera means freedom while others see it as prohibition and the public space tends to be differentiated into freedom or supervision, flexible and regulated places, areas of access, and exclusion. (Kotus, 2009). Therefore, these explanations led to the conduct of this research on two gated housing in

Medan City with the Deli Indah Estate used to represent the gated housing planned with conventional public space in the form of the traditional market while J City Estate was for modern commercial public space.

## Research method

This research was conducted using the morphology approach due to the use of facilities and infrastructures present in the visual built environment. Moreover, descriptive qualitative methods were used to describe the basis of scientific studies accurately and precisely (Oliveira, 2016) using two housing categories with different types of commercial public spaces. The morphology method was used to assess the physical form of the commercial public space through seven elements which are road network accessibility, building density, building age, road dimension, building line, the ratio of building height and road width, and building utilization used in describing the roads, building plots, and buildings (Oliveira & Medeiros, 2016).

Two gated housing estates were selected as case studies and these include Deli Indah which was used to represent those built more or less 43 years ago and J City for those built eight years ago. The morphological changes in the commercial public space of the two cases were analyzed based on the seven variables previously mentioned. The data obtained were analyzed using social-spatial methods to provide an overview of the social conditions in commercial public spaces in gated housing. Moreover, the variables used to evaluate the social conditions include the type of user, space, social groups, several activities, time of activity, and social interaction in spatial spaces such as road networks, road size, and space between buildings. It is, however, possible to design the results of observations from residential spatial spaces to identify how the strategy improves the quality of livable commercial public space (Groat & Wang, 2013). This method is also usable in determining the specific social boundaries required to design public spaces (Bonenberg, 2015). Furthermore, the public spaces in the gated housing areas have been discovered not to be well managed in line with the age of the housing but regeneration based on environmentally friendly housing significantly depends on public space quality. The data analysis method implemented

involved comparing the morphology of commercial public space in the two gated housing estates of Medan.

Medan is the third-largest metropolitan city in Indonesia as shown in Fig. 2 and the growth of gated housing estate is relatively rapid in the city starting from 1980. The morphology of the housing is observed to be growing after four decades and the same is found with the commercial public space based on the era the housing was built.

## Data analysis

### Deli Indah Estate, Medan

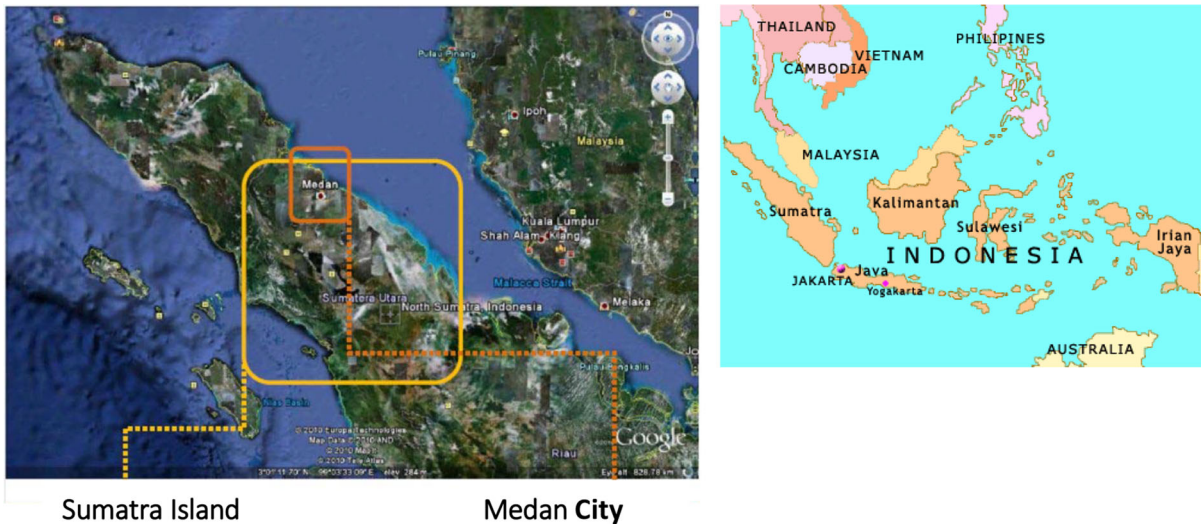
The Deli Indah Estate is located on Jl. Deli Indah II, Pulo Brayan Kota, West Medan, Medan City, North Sumatra 20,239 and built in 1976. The housing units were already sold out long before the time of this research and this means it was impossible to find the data on the developer. It has 302 residential units and the site plan is presented in the following Fig. 3.

There is a traditional market in the middle of the estate which serves as the public space as shown in Fig. 4 and the users assume the market has an image and comfort as observed in the shops and shop stands. Meanwhile, the front is considered not to be suitable for access and linkage but the public space ensures social interaction in Deli Indah Estate (Aulia & Halim, 2019).

### J City Estate, Medan

This estate is located in the Medan Johor area and has roads which are accessible to the surrounding community such as the one connecting Jalan Wisata Wisata with Jalan Luku 1 and the connecting road in the J City housing complex is known as the Jalan J City. The estate has public spaces in the form of corridors and there are a food court and several other activities in the main corridor which is available for the public.

J Walk is one of the public spaces located inside J City. It was planned to be situated at the shopping center but later changed into the gated housing. J Walk is a corridor which is accessible to the public and has a food court or department store and several shops selling accessories and other things. It is physically a



**Fig. 2** Location of Medan City. Source: <https://www.pinterest.com/pin/301107925056803901/>



**Fig. 3** Deli Indah estate site plan. Source: Aulia and Halim (2019)

commercial center mostly dominated by culinary areas including Social Cafe, Kudeta Shop, Atjeh Kopi, and many other shops as well as retail stores selling clothing materials, coffee, perfume, and accessories as shown in Figs. 5, 6. The corridor also has public facilities such as two toilets located at both ends and a small mosque (Aulia & Napitupulu, 2019).

The morphological analysis conducted using the data obtained showed the characteristics of the livable public spaces in the gated housing estates studied include the following:

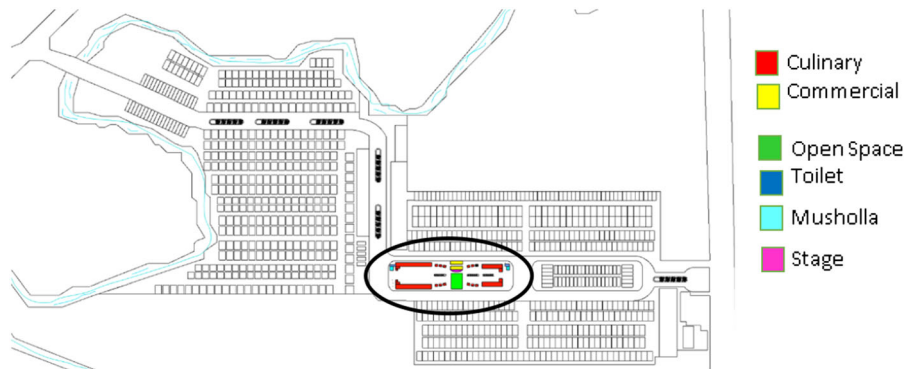
### Results and discussion

Table 1 shows there has been a change in the characteristics of commercial public spaces in planned housing and the variations in the lifestyle and activities of residents in public spaces were observed to have produced different morphologies. Forty years ago, commercial activities in the planned housing environment were conducted in public spaces such as traditional markets which are known in Indonesia to be the place for life conception, socio-cultural interaction, and a place for trade. These activities make the market space flexible to accommodate different operations (Aliyah et al., 2017) and location also attracts street vendors to sell and some of them have been reported to be conducting informal business in illegal places (Harjoko & Adiarto, 2012). Therefore, it was recommended that local government involve local traders, the Department of Industry and Commerce, and housing managers to maintain traditional markets' livability (Putra & Rudito, 2015).

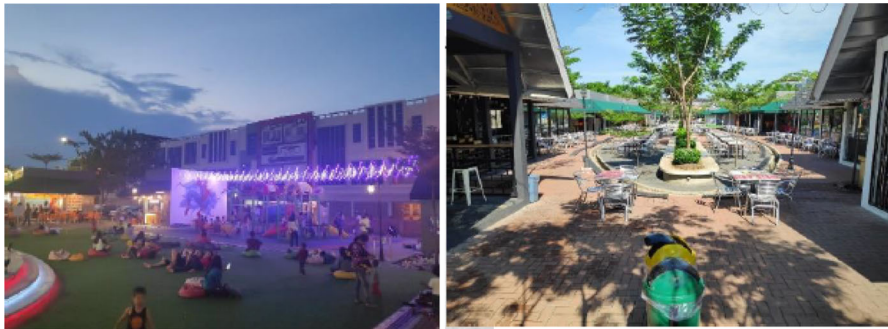
Commercial activities in public spaces in recent have more diverse uses of space with different spatial use patterns. According to Wu and Cheng (2019),



**Fig. 4** The condition of traditional market Deli Indah estate. Source: Aulia and Halim (2019)



**Fig. 5** J Walk at J City estate site plan. Source: Aulia and Napitupulu (2019)



**Fig. 6** The atmosphere of J Walk. Source: Aulia and Napitupulu (2019)

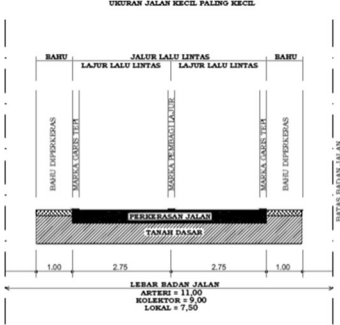
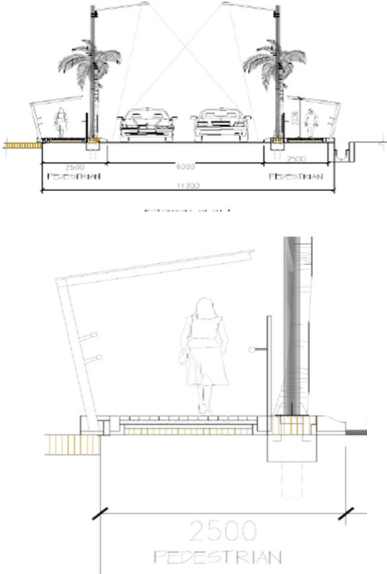
China's political and economic changes have changed urban morphology and those associated with socio-economic and housing institutions have also transformed public spaces in the housing area. Moreover, the design of spaces, forms, functions, and commercial public space characteristics at the end of the twentieth century has changed in line with globalization and the increase in the use of technology. The transformations

observed in the public spaces of China are also occurring in the GC public space of Indonesia and it was suspected that the majority of commercial public space stakeholders in Indonesia are Chinese which is possibly the reason for the trends observed in the public space of the country.

Some of the activities usually conducted in the open space have been turned into closed spaces like



**Table 1** Spatial analysis of the morphology and characteristics

Element of public space analysis	Deli Indah estate traditional market	Commercial corridor of J. City estate
1. Accessibility to the road network	Direct access from the front of the Estate The general public is allowed to enter the market which operates up to 16.00 in the afternoon after merchandise has been supplied in the morning. The school building located near the market also operates from morning to afternoon	Direct access from the estate boulevard The corridor is usually crowded with the general public in the afternoon and evening. There are few activities in the morning and during the day, and some restaurants only open from noon to night
2. Building density	The building has 80% coverage with a relatively narrow spatial space in-between for the movement of pedestrians and motorized vehicles. Public transportation such as rickshaws also passes through this spatial space in the morning till afternoon. The residential buildings are landed house with 1 and 2 story row houses	The building has 40% coverage with a quite large spatial space in-between and a plaza designed as a stage for musical performances in the evening and at night. There is also a children’s play area in its public open space
3. Building age	43 years	8 years
4. Road dimension	 <p>The road dimension can only be passed by a 2-lane car without any separation. It has become increasingly narrow due to public transportation systems such as rickshaws. In the morning and during the day, the road becomes jammed, especially during school entry and exit hours</p>	 <p>Two car lanes can traverse the dimensions of the road and there are pedestrian paths. There are usually crowded conditions in the afternoon and evening</p>
5. Building border line	2 m Street vendors use the building border space in the morning and afternoon after which it is deserted due to the closure of the market	4 m The building border space is quite spacious and used to park by visitors’ motorbikes and bicycles. Street vendors are prohibited from selling in the area

**Table 1** continued

Element of public space analysis	Deli Indah estate traditional market	Commercial corridor of J. City estate
6. The ratio of building height and road width	Ratio 1:1 The spatial space forms a narrow impression coupled with the traffic jams during operational hours. It feels less secure at night because the market is closed and dark. Residents avoid walking in this area due to its quietness at odd hours	Ratio 1:2 The spatial space is spacious and only a few trees grow to provide shade because the housing has not been inhabited for long. The space is usually empty in the morning and afternoon but the situation changes in the afternoon and evening
7. Building utilization	Shophouse, shophouse space, and toilet The building's shape and facade are monotonous due to its use as shops and stalls. The shopping activities and supply of goods are daily activities	Culinary, Retail, open space, toilet, Musholla, and stage The shape of the building is more diverse due to several functions it performs. Meanwhile, the restaurants, playgrounds, and plazas are spatial spaces where the majority of visitors visit. Musical performances are also used on some nights to attract more visitors

shopping centers and the interactions in public spaces now take place in many coffee shops, restaurants, and food courts. The privatization of public space tends to create social problems which contribute to the entrenchment of social, economic, and racial inequality and also advance the “critical placemaking” as a tool to reclaim public space (Toolis, 2017). Moreover, commercial public facilities also experience changes by creating more creative and flexible spaces as observed in the appearance of several temporary restaurants and the creation of new liminal spaces where innovative ideas on food, home, and community are negotiated.

The changes in building density have reduced private spatial space with the use of spaces where humans move and interact for commercial purposes in order to increase developers' profit. Moreover, the road dimensions are widening in line with the increase in residents' mobility, and the same pattern was found by Azad et al. (2018) on the effect of building density and road width on residential areas' quality of space. These findings proved the ability of more public spatial space to improve the quality of a residential environment based on urban densification to privatize public space. The road patterns in residential neighborhoods are segmented in the cities while those in local areas connect the houses. This condition is, however, very different in Indonesia due to the direct severance of ties between the gated housing and the

surrounding environment. Furthermore, an increase in the implementation of information and communication technology also has the ability to cause changes in commercial public space activities with further effects on building density. Modern societies promote physical laziness, isolation from nature, and a preference to stay indoors and this has led to an increase in the number of commercial public space buildings providing convenience for visitors such as shopping centers and malls (Kusumowidagdo et al., 2012).

The community housing environment also depends on the changes in the number of Building Base Coefficients and building permeability but the compact city concept which increases building density does not apply to public space buildings. However, the residential environment is also increasingly crowded with landed buildings from one to two floors but the changes in the building density are also observed in almost all cities of the world due to urbanization and increasing population (Alawadi & Benkraouda, 2019; Zhou et al., 2020). Therefore, density in the residential environment has been agreed by researchers to be necessary for future sustainability. A study conducted in Dubai showed the residential environment of the 1970s was formed using traditional methods marked by narrow streets and surrounded by one-story buildings and the same is observed in Deli Indah Estate which was built almost the same period. The traditional residential environment is relatively pedestrian-

oriented and this makes the housing layout easy to understand and ensure the community is livable. Meanwhile, livability is currently found only in public spaces as observed in J City Estate.

This means the development of commercial public space in gated housing has been affected by some factors over the last four decades and they include building intensity factors such as density and height, and road dimensions while the commercial public space of gated housing has changed in line with the lifestyle of the occupants.

## Conclusion

Commercial public space is important to the formation of a sense of community and opportunities for social interaction. It also adds significance to the visual aspect of the community and provides existing stimulants. Therefore, public spaces need to be planned in parallel with the community and their distance to residential units is significant in determining the success of the community. Meanwhile, not all public spaces are classified as linear or overlapping with the ratio of length and width to obtain a strong sense of enclosure was found to be 1:1 and 1:3 respectively and this means space can be in the form of a square which is limited by rows of houses, roads, or trees.

Road networks and accessibility to and from public spaces need to be connected between one community and another due to their ability to increase social integration and improve the traffic system. It is better to have a clear hierarchy when planning a road network to reduce the number of vehicles cutting through the housing area. Moreover, the linear space was found to be more fluid with the length significantly exceeding its width.

The changes in public spaces' characteristics, especially with commercial functions, are influenced by changes in lifestyle and patterns of activities of the users. The element of building density was observed to be reducing with the flexibility of public space and space while the residential environment's density increased with the addition of landed houses which are one, two, and three stories high.

There were limitation to this study. One of the limitation is the absence of past public space map data of the housing in study, particularly from Deli Indah Estate. The map shown before were from field

observation therefore representing current representation the housing itself which would be different from when it was built 43 years ago due to gentrification. Future research should include detailed description of public space's morphological processes in gated housing with periodic pattern, i.e. every decade, to determine the pattern of public space transformation in order to achieve livability.

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## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Human of animal participant** The article does not contain any studies involving human participants performed by any of the authors.

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