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Exploring the Spatial Potential of Loose Space as Urban Pores in Tunjungan Street

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Abstract

The phenomenon of urban canyons, characterized by narrow street corridors flanked by dense vertical building masses, has emerged in many city centers, including the Tunjungan (CBD) in Surabaya, resulting in a decline in environmental quality and pedestrian comfort. This study aims to explore the spatial potential of loose spaces, defined as remaining or underutilized urban spaces, as potential urban pores in the context of dense urban canyons. A descriptive qualitative approach was used through direct field observations and visual documentation. Six loose space locations along the Tunjungan corridor were selected and analyzed using six qualitative parameters derived from the theory of loose spaces and urban porosity, adapted to local conditions. The findings indicate that several loose spaces possess spatial characteristics that indicate ecological and social potential, particularly in relation to spatial openness and opportunities for social interaction. This study positions loose spaces as an initial spatial resource that can inform future urban strategies that help address urban canyon conditions in urban areas.

INTRODUCTION

Rapid urban development has driven intensive exploitation of space, particularly through dense vertical development, thus not only triggering changes in the physical urban landscape but also giving rise to various problems. One of the most obvious consequences is the formation of urban canyons (Santamouris, 2015). Conceptually, the urban canyon phenomenon describes a narrow street flanked by rows of tall buildings, closely spaced as "walls" that form a canyon. This is contributed by the dense spatial configuration of the city, dominated by impermeable surfaces such as concrete and asphalt, and low vegetation in the surrounding area. This configuration creates a unique microclimate that worsens the thermal conditions in the urban environment (Toudert & Mayer, 2006), where the air flow coming from outside the area (mean wind) is obstructed by the mass of the building and forms an air vortex (primary vortex) at the pedestrian level, a heat trap occurs (little evapotranspiration so that the building traps solar radiation and reflects it in irregular directions) and traps pollutants on the road (Garau et al., 2018). As a result, hot air, dust and pollutants are trapped in the road corridor (Johnson & Hunter, 1999), resulting in increased temperatures, reduced thermal comfort, especially for pedestrians, and increased negative health impacts. The characteristics of urban canyon formation are also seen from the ratio between building height and road width, sky view factors, and road orientation, including solar radiation intensity, air circulation movement, and surface temperature distribution (Lachir, 2025).

Currently, urban canyons can be found in Surabaya, particularly in the Tunjungan area, which has developed since the colonial era, with relatively narrow streets, minimal distance between buildings, and minimal vegetation. This has resulted in the Tunjungan area deteriorating, forming an urban canyon, exacerbated by high solar radiation throughout the year (Bowler et al., 2010). This also has social implications because it impedes airflow, which can worsen human health due to direct exposure to air pollution from the road surface due to atmospheric stagnation and the formation of low-lying air vortices (Rakowska et al., 2014). This discomfort can certainly reduce the appeal of open spaces as places for social interaction, weakening social connectivity within the city. Amidst the importance of

preserving an area, issues such as urban canyons also arise, presenting new challenges due to their potential negative impact on public health (Aliabadi et al., 2024).

Several studies have shown that loose urban spaces can be revitalized through adaptive and ecological approaches. For example, the Above Grade: On the High Line project in Manhattan, New York, transformed a discontinued railway line into a public linear park that enhances the surrounding environment (Song et al., 2023). In Lisbon, there is also a case study, "From Maximum Urban Porosity to Urban Disaggregation: Evidence from the Portuguese Case," which emphasizes the importance of spatial porosity in improving air circulation without compromising the value of the area. Focusing on responses to dense spatial conditions, this case can help encourage the recontextualization of sustainable design for a dynamic and adaptive city for its inhabitants (Castel'Branco & Ricardo da Costa, 2024). The Green Alley Program: Planning for a Sustainable Urban Infrastructure in Chicago also demonstrated that residual spaces can be transformed into multifunctional green infrastructure that supports social and ecological sustainability, with its primary focus being transforming alleys into multifunctional green spaces through the application of bioswales, permeable paving, and adaptive vegetation. This demonstrates that sustainability can start from small interventions but have a systemic impact on a city scale (Newell et al., 2024). Despite the growing body of international studies on loose space and urban porosity, similar discussions remain limited within the context of Indonesian urban corridors, particularly in dense commercial and historic areas. In Surabaya, research on the urban canyon phenomenon has predominantly focused on traffic congestion, visual density, and environmental discomfort, while the spatial potential of remaining or underutilized spaces receives less attention. This gap indicates the need for exploratory spatial studies that examine loose spaces not as leftover areas, but as potential urban pores within dense urban areas. Therefore, from this context, this research aims to improve and optimize the remaining space / loose space, especially in the Tunjungan CBD area, so that it can help overcome the urban canyon phenomenon at a micro level, becoming a more adaptive public space, supporting thermal comfort, ecological balance, and social revitalization of the historic area. It is hoped that it can become a basis for the development of urban space that is more sensitive to the urban canyon phenomenon while strengthening the connection between architecture, ecology and urban life in the center of Surabaya for a more sustainable city.

LITERATURE REVIEW

Urban Porosity

Urban porosity is a theoretical approach that emphasizes the importance of creating open spaces and connectivity pathways that allow the free flow of people, air, light, and information through the urban fabric. In "The Possibility of an Absolute Architecture," Aureli views the city as a construction that reflects relationships, ideologies, and collective life within a spatial structure that allows for movement (Aureli, 2015). This can address the problems of density and spatial fragmentation in urban environments (Bellido et al., 2024). This theory fundamentally emphasizes openness, connectivity, and accessible public spaces. However, within its framework, empty open spaces always have meaning because they can open up space for collective activities, fostering "spatial porosity." A formal, empty form is created as a space with ecological and social potential.

"Porous" doesn't mean empty, but rather provides gaps for extreme urbanization strategies such as air circulation, social interaction, and microclimate mitigation. Porosity in urban areas can be divided into four archetypes: enclaves, tightly enclosed spaces without connectivity; mat-buildings, horizontal structures with the potential for interblock connectivity; voids, potentially empty spaces; and boundaries, porous building boundaries for human and air circulation (Aureli, 2011). By creating open spaces and dynamic connectivity pathways, urban porosity serves as a bridge between humans and the environment, as well as between public and private interests, supporting urban biodiversity and improving the microclimate through the creation of green infiltration zones and open interaction spaces. Thus, urban porosity can strengthen social cohesion, improve environmental quality, and foster awareness of the importance of living harmoniously with nature in a constantly evolving urban context (Panayiotou, 2016).

Loose Space

Loose space is a public space formed from leftovers and used freely, creatively, or unpredictably by the community outside of its planned formal function. Such spaces often appear in the form of road edges, empty lots, or gaps between buildings that are then reinterpreted and generally activated into more dynamic social areas. The basic principles include flexibility so that the space is not rigid and is open to various activities, non-binding functions, namely the space can be used in ways different from its original design, and encourage creativity and adaptation of users in expressing themselves socially, culturally, and politically. Conceptually, loose space is rooted

in the idea of reappropriation or reuse of space by the community to suit their own needs (Koch, 2024). It also emphasizes the importance of temporary spaces that continually change according to context and act as a form of resistance to a city that is too homogenous, structured, and controlled. By opening up space for collective living, gap spaces can contribute to the formation of more inclusive, adaptive and sustainable cities because they are supported by formal community engagement (Franck & Stevens, 2007).

Parameters for Analysis

Formal Functional Disengagement (Directed Dysfunction)

Remaining spaces often lack a formal function from the outset of planning, making them unaffected by the function of their surrounding environment due to their free and open nature. Several studies have shown that spaces without a function can become dynamic platforms for social expression, as in Surabaya. In the context of residual and unprogrammed spaces, they can open up opportunities for social spaces to act as pores in the city (Covatta & Ikalović, 2022).

Connectivity & Human Flow (Urban Flowlines)

Spatially, a good city must have an open network of connectivity, with spaces between buildings serving as shortcuts that strengthen pedestrian areas and public spaces. A study of urban street networks emphasizes that flow capacity is a key indicator of urban vitality because it acts as a social and ecological circulation system within the city's porosity (Jiang, 2008).

Social and Re-Appropriation

Loose spaces are more than just empty spaces; they have the potential to become flexible spaces for social interaction. The conversion of space can also create social dynamics in an area. Meanwhile, the conversion of public spaces by a local community can create a more dynamic form of urban life (Oostrum, 2022).

Visuals and Aesthetics

If urban spaces are arranged with regular vegetation elements, they can provide a visual quality that enhances the psychological well-being of residents, enabling a comfortable and natural visual "rhythm." Loose Space: Possibility and Diversity in Urban Life emphasizes that the remaining gaps in space can create a more vibrant visual diversity because they are flexible, spontaneous, and open (Franck & Stevens, 2006a).

Identity and Memory

Remaining spaces often retain specific traces. Several studies have shown that community involvement in the reuse of areas can potentially revive collective memory and strengthen residents' emotional ties to their environment (Tunggadewi & Sharfina, 2025).

Porous Zones

Loose spaces can provide "breathing space" amidst dense vertical buildings, helping to reduce temperatures, provide natural light and air, and reduce the urban heat island effect. The pores that form urban porosity are a key concept in creating a more adaptive and ecological city. In the context of an urban canyon, interventions in loose spaces have the potential to create a healthier microclimate and improve thermal comfort and natural air circulation in street corridors (Pessôa et al., 2019).

METHODS

The study used field observations to identify the spatial potential and characteristics of loose space within the Tunjungan CBD corridor area, Surabaya. This approach was selected because the research focuses on spatial, social, and visual interpretation, without conducting quantitative microclimate measurements or environmental simulations.

The research object includes six loose space points selected based on spatial potential, accessibility, proximity to main pedestrian corridors, historical value and observable physical indications of urban canyon conditions. These locations were chosen to represent various types of residual and interstitial spaces found along Tunjungan Street. Data were obtained through field observations, visual documentation, sketches and literature studies relevant to the theory of urban porosity and loose space. The analysis was conducted qualitatively using six main parameters: directed dysfunction, urban flowlines, social re-appropriation, visual aesthetics, memory identity, and porous zones. Each location was analyzed based on these parameters to evaluate its spatial capacity and potential for reactivation as an urban pore. This research is positioned as an exploratory study, therefore, the analysis focuses on identifying spatial opportunities relevant to urban canyon issues for further study.

RESULTS AND DISCUSSION

Qualitative analysis and observation were conducted to understand the urban canyon that occurred in the Tunjungan Street area which was chosen as an object that reflects the mixture of modernity and traditional culture, characterized by the dominance of two to three-story shophouse buildings that function as residences and small business areas. In the Tunjungan Street corridor, traces of colonial architecture that function as lodging to commercial spaces are still clearly visible, although it was once known as a busy and comfortable pedestrian shopping street for pedestrians, the transformation of the city towards a metropolitan area has caused changes in function and a decrease in social interaction along this street.

Fig. 1. Illustration of the Existing Condition of Buildings on Jalan Tunjungan (Source: author)

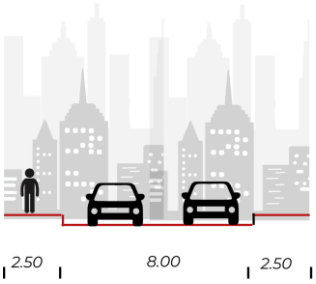


Fig. 2. Width of Tunjungan Street (Source: author)

The visual character of the area shows the diversity between old and modern buildings that still try to respond to the historical context as in Figure 1, while maintaining distinctive elements that in some parts are also considered shabby due to being covered by vines. Jalan Tunjungan has a corridor width of approximately 7 to 8 m and a pedestrian width of approximately 2 to 3 m as in Figure 2. Some areas have been provided with shade trees, pedestrian paths with reflective ceramics, and public facilities such as park benches and classic-style lamps that reinforce the historical context. The arrangement of these elements is still not optimal in considering the thermal aspects and space efficiency due to the urban canyon configuration. Therefore, in this context, loose spaces that are considered as urban gaps spread along Jalan Tunjungan play an active role as a mitigating element against the urban canyon.

Fig. 3. Loose Space Location Position on Jalan Tunjungan (Source: author)

As in Figure 3, loose space comes in various forms such as a narrow gap between two buildings that currently only function as a service lane or are left empty, open land used as an unmanaged parking area, to rear areas that are not visible from the main road but have the potential to be reactivated as part of the air and light circulation system. If integrated strategically, these spaces can be utilized to provide cross ventilation and other passive interventions that contribute to temperature reduction, improving air quality and increasing thermal comfort which have a significant impact on the Jalan Tunjungan corridor.

Condition of Existing Loose Space at Location 1

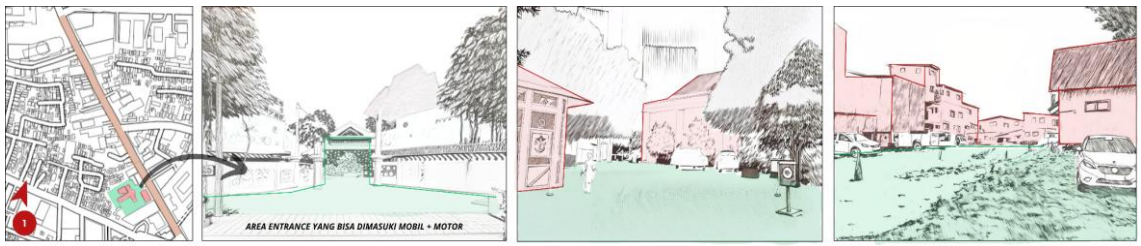


Fig. 4. Illustration of Existing Loose Space Conditions at Location 1
(Source: author)

Based on Figure 4, the loose space at location 1 is in the form of an open yard that is used as a parking lot. With an estimated land area of around 5418 m2, but in the middle there has been a building with an area of around 1206 m2, then the remaining space area is around 4200 m2. So the remaining space volume is 33600 m3. The surrounding buildings that surround the remaining space at location 1 have a maximum height of 8m and are a mixture of residential and small commercial areas. Located to the west of Jalan Tunjungan when coming from Jalan Embong Malang. Currently, the location is easily accessible by pedestrians or cars, and in some areas (entrance areas to the land) there are also trees.

Condition of Existing Loose Space at Location 2

Fig. 5. Illustration of Existing Loose Space Conditions at Location 2
(Source: author)

Based on Figure 5, the loose space at location 2 is a corridor alley that ends in a yard. With a total area of the remaining space (calculated from the corridor) of approximately 370 m2. Flanked by shophouse buildings that are approximately 10-12 m high, so the volume of the remaining space can be estimated at 4440 m3. The condition of the corridor here is quite shabby and poorly managed, there are some parts that are not paved so the condition of the road for access is quite poor. In addition, it is also used for illegal motorcycle parking, the placement of unused items that are not properly managed. The back yard has also not been paved so it is still just dirt.

Condition of Existing Loose Space at Location 3

Fig. 6. Illustration of Existing Loose Space Conditions at Location 3
(Source: author)

Based on Figure 6, the loose space at location 3 is an unkempt corridor alley, used only for illegal motorcycle parking. With a width of approximately 4.5 - 5m, this corridor is quite dry and hot because it is flanked by buildings that are quite tall, approximately 12m. It is located on the east side of Jalan Tunjungan. With a total remaining space area (calculated from the corridor) of approximately 150.2 m2, the remaining space volume can be estimated at 1802.3 m3. This corridor allows access for pedestrians, motorcycles, and small cars. Its condition is also very poorly maintained and there are no trees to accommodate this area.

Condition of Existing Loose Space at Location 4

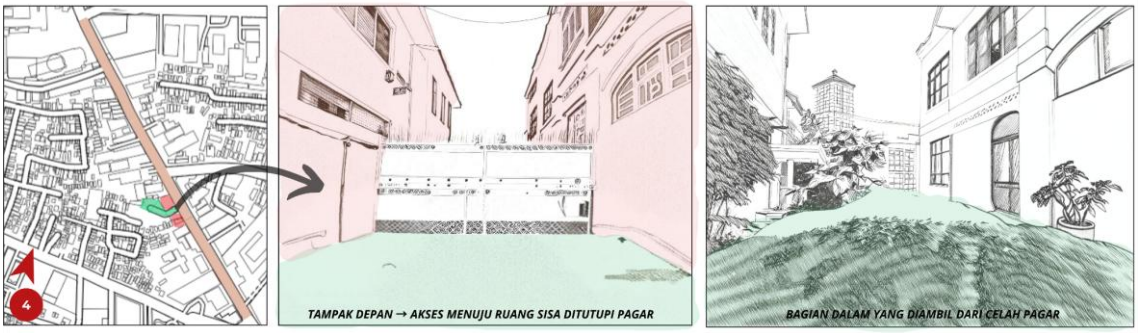


Fig. 7. Illustration of Existing Loose Space Conditions at Location 4
(Source: author)

Based on Figure 7, the loose space at location 4 is an empty, open yard enclosed by a fence. The estimated remaining space is approximately 712 m2, with a building at the front already covering an area of approximately 593 m2. The remaining space volume is 5,696 m3. The surrounding buildings at location 4, with a maximum height of 5 m, are small, historic buildings that were formerly Rabobank. It is located west of Jalan Tunjungan when approaching from Jalan Embong Malang. The location is currently closed and overgrown with undergrowth and wild plants. The walls of the surrounding buildings are also covered in graffiti, making it look very rundown.

Condition of Existing Loose Space at Location 5

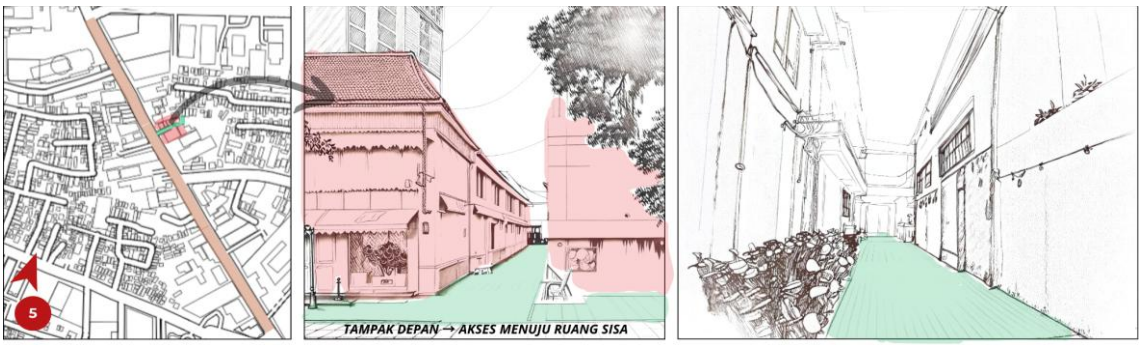


Fig. 8. Illustration of Existing Loose Space Conditions at Location 5
(Source: author)

Based on Figure 8, the loose space at location 5 is an open courtyard used as a parking lot. The estimated land area is approximately 97.7 m2, with the remaining space volume being approximately 488.5 m3. The surrounding buildings surrounding the remaining space at location 5 are approximately 5 m high and constitute a small commercial area. It is located east of Jalan Tunjungan when coming from Jalan Embong Malang. Currently, the location is easily accessible and serves as a shop service area and illegal motorcycle parking.

Condition of Existing Loose Space at Location 6

Based on Figure 9, the loose space at location 6 is an open courtyard used as a parking lot. With an estimated corridor area of approximately 88.92 m2, the remaining space volume is approximately 533.5 m3. The surrounding buildings surrounding the remaining space at location 6 are only approximately 5-6 m high and serve a mix of residential and small commercial uses. It is located west of Jalan Tunjungan when approaching Jalan Embong Malang (which is directly across from the Siola Building). Currently, the location is only accessible to pedestrians.

Fig. 9. Illustration of Existing Loose Space Conditions at Location 6
(Source: author)

Analysis Based on Parameters

Formal Functional Disengagement (Directed Dysfunction)

Directional dysfunction refers to spaces that lack a formal function from the outset, allowing for functional flexibility, such as in locations 1, 3, and 4. Location 1, which is an open area used only for parking, has the potential to become an adaptive public area with adequate space. Similarly, locations 3 and 4 offer high visibility and accessibility to public corridors, allowing for development according to the area's needs. Unfortunately, locations 2, 5, and 6, despite their seemingly functional freedom, have limitations due to the narrow space between buildings. Their small size, combined with their role as service access or rear utility lines, limits their ability to support flexibility and social activation. Location 6 has clearer spatial and programmatic arrangements, such as gardens and boundary spaces, so they do not fall strictly into the directed dysfunction category. Spaces that meet the criteria for directed dysfunction are open to new interpretations and functions because they are not bound by formal boundaries. Spaces in locations 1, 3, and 4 have high potential to be developed as porous pockets, namely micro-cavities within the building network that can improve air circulation, reduce heat stress, and provide adaptive social spaces (Franck & Stevens, 2006b). The importance of intervention in unprogrammed residual spaces, because such spaces can be developed as thermal buffers that reduce the heat trap effect in narrow corridors *(Latasa & Laurenz, 2023)*.

Connectivity & Human Flow (Urban Flowlines)

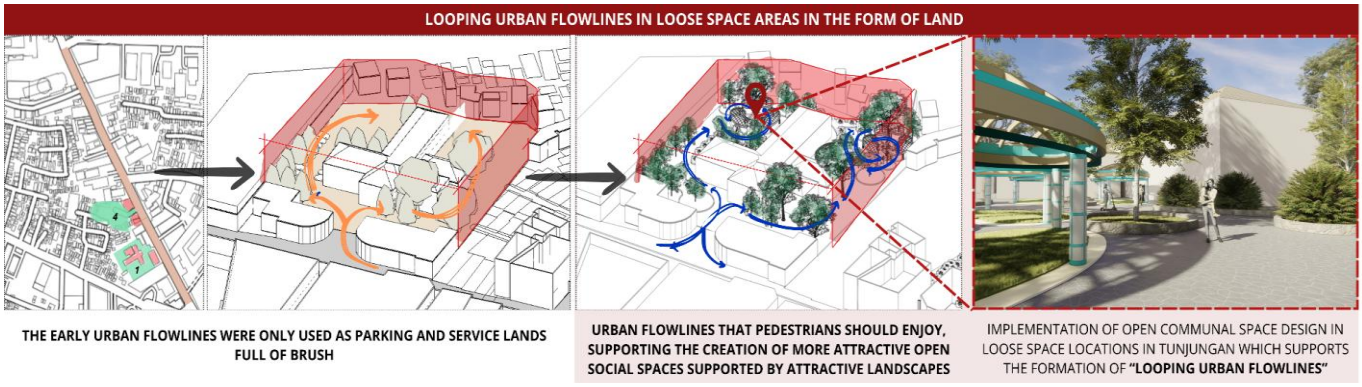


Fig. 10. Illustration of Urban Flowlines Looping at Location 1
(Source: author)

Loose spaces in the Tunjungan Street area can support the formation of urban flowlines (natural circulation paths that connect pedestrian networks and enable micro-breeze flows that are essential to the character of the urban canyon corridor). Among the six locations, locations 1 and 4 stand out significantly due to their strategic positions and their relatively large physical dimensions due to their land forms, thus forming "looping urban flowlines" that create dynamics of presence as shown in Figure 10 by emphasizing non-linear and circulating pedestrian circulation that occurs within the loose space designed to support social and communal activities. This of course also supports the smooth and widespread movement of air circulation from the urban canyon which is able to improve the microclimate and thermal comfort *(Lara-Hernandez et al., 2019)*. By mimicking the natural flow of pathways, loose spaces like these can become open plazas that enhance security, thermal comfort, and support the area's identity.

Fig. 11. Illustration of Linear Urban Flowlines at Location 2
(Source: author)

Meanwhile, at locations 2, 3, and 5, the loose space is in the form of a small corridor between buildings located on the route between the area blocks as shown in Figure 11, and is also able to create urban ventilation corridors (air corridors that help reduce the intensity of urban canyons and accelerate the removal of road surface pollutants) *(Shi et al., 2022)***.** In this type of loose space, "mixed (linear & looping) urban flowlines" occur, which function more as transitional paths that support mobility but generally have minimal social potential. Meanwhile, at location 6, linear urban flowlines occur. This is often found in urban spaces that often experience building development. In Tunjungan, loose space with linear urban flowlines has sufficient width so that it is very possible for pedestrians to enjoy the alley, supported by the social activities that occur, where the alley ends in a fairly large open area like a "backyard", making it very possible to be used as a communal area that supports various other functions.

Social and Re-appropriation

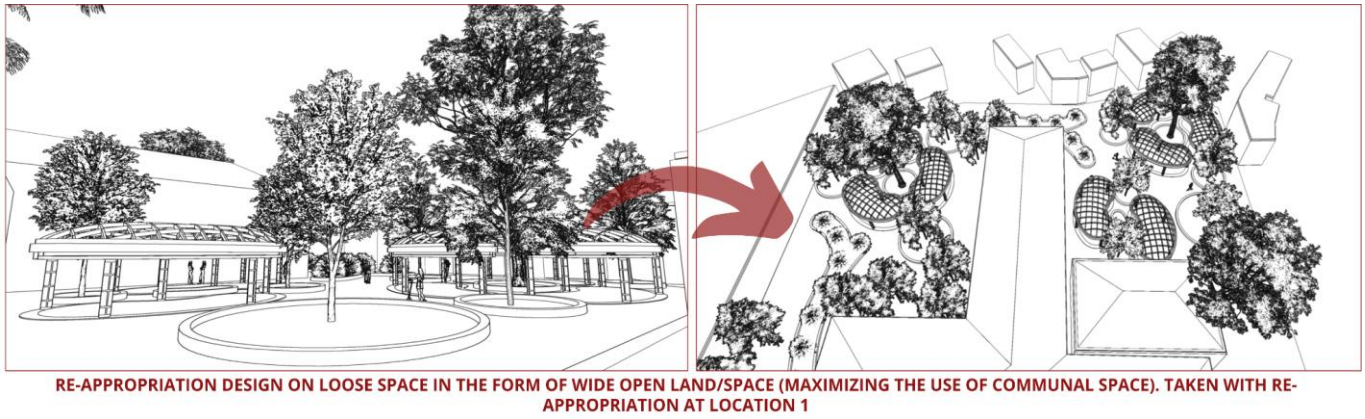


Fig. 12. Illustration of Re-Appropriation Design at Location 1
(Source: author)

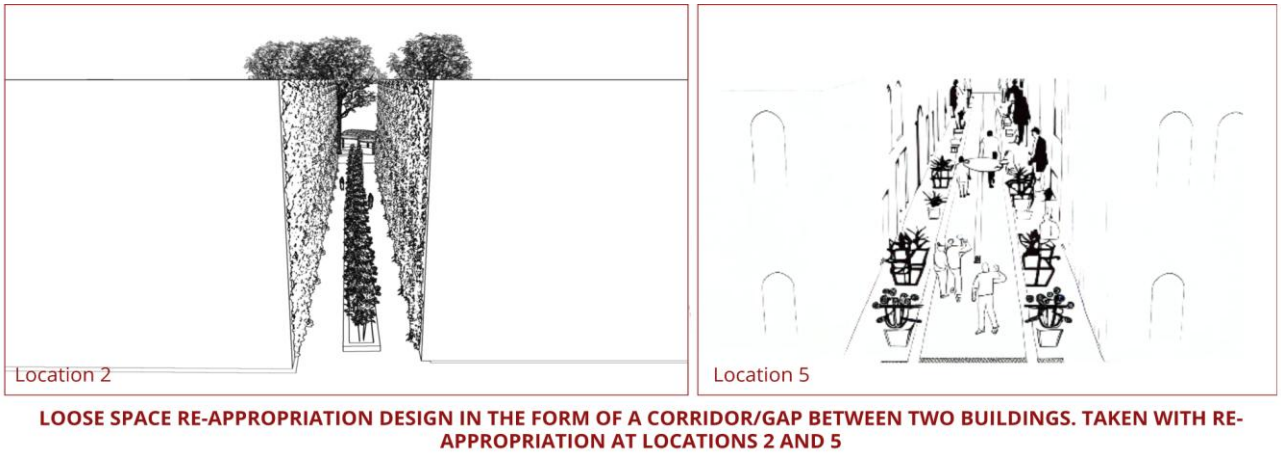


Fig. 13. Illustration of Re-Appropriation Design at Location 2 and 5
(Source: author)

The ability of a space to be reactivated by a community into a social space depends heavily on its accessibility, visibility, and user flexibility. In this context, locations 1 and 4 show significant potential. Location 1 is an open area currently used for parking, but it has direct exposure to the main pedestrian path and a large enough area to allow for redevelopment as a community plaza, public park, or bazaar. Location 4, located at the side and rear of the building, has sufficient access and sufficient size, allowing for further development as an attractive community space, as shown in Figure 12.

In contrast, locations 2 and 5 are narrow enough for medium-scale communal activities. Although they have transit value as flowlines are formed, the linear corridor/alley shape and limited dimensions make their use as social spaces only possible on a micro scale, such as thematic corridors as in Figure 13. Therefore, to support the importance of spatial flexibility and social openness as indicators of successful activation of remaining space, it is necessary to apply the concept of temporary appropriation (Lara-Hernandez et al., 2019)

Visuals and Aesthetics

The visual quality of the remaining space plays a significant role in the psychological comfort of urban users. Locations 1 and 4 stand out in this regard. They have strong potential for aesthetic enhancement due to their expansive areas and open access to the main street corridor. With appropriate vegetation and public furniture, these spaces could become dominant visual elements that refresh a dense urban canyon. Meanwhile, locations 2, 3, 5, and 6, despite their narrowness, have the potential to function as urban stages (micro-visual expression spaces, through murals and artistic lighting, that enhance the walking experience).Limited public exposure makes aesthetic interventions less impactful. This, of course, emphasizes the importance of natural visual patterns as supporting elements of urban spatial quality and as micro-solutions to urban canyons (Taylor, 2006).

Identity and Memory

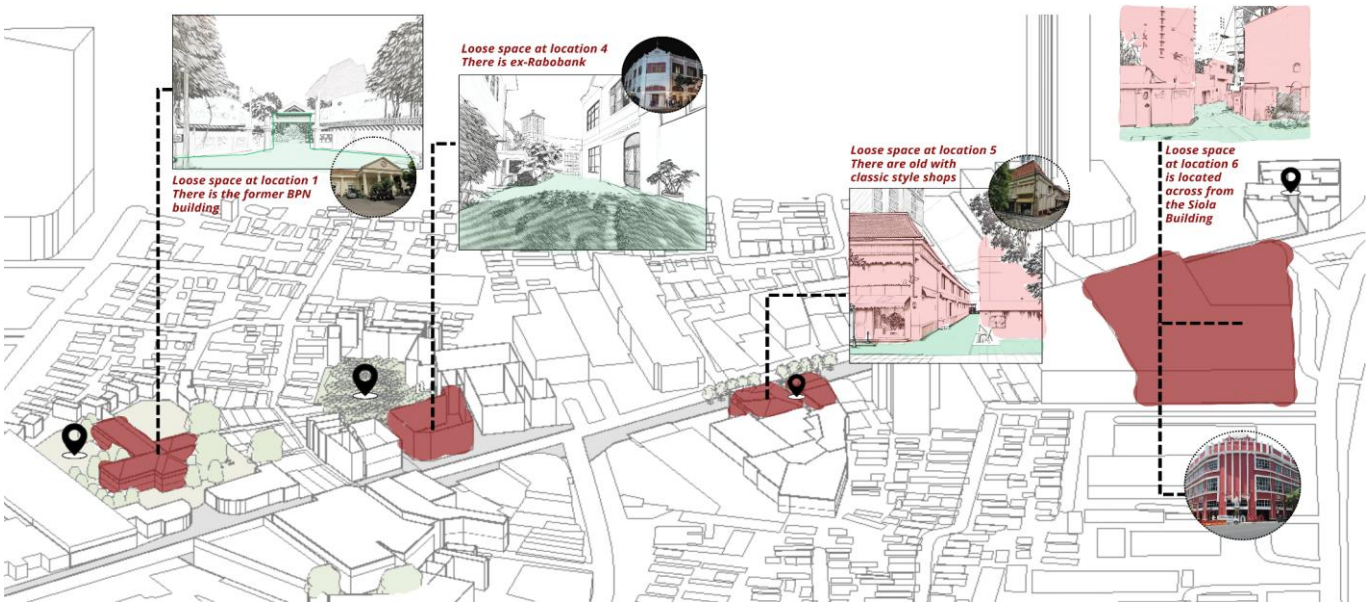


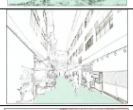
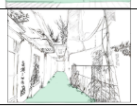
Fig. 14. Loose Space Locations with Historical Value
(Source: author)

Based on the analysis, the Tunjungan area has the spatial capacity to represent identity and memory. In this regard, locations 1, 4, and 5 have strong potential. As shown in Figure 14, locations 1 and 4 are located near old buildings renowned for their history (location 1 is next to the former National Land Agency (BPN) building, location 4 is next to and behind the former Rabobank building), and location 5 is close to an old shop, thus providing opportunities to strengthen historical narratives through signage, historical murals, or outdoor urban storytelling. Meanwhile, location 6, although spatially quite separate, is at the visual termination point of the area and can be used for more narrative functions that strengthen the area's heritage, as it is located opposite the Siola Building. Conversely, several other locations, such as locations 2 and 3, have less direct historical ties because these spaces tend to arise from the functional conditions of modern cities that do not harbor strong narrative value. However, it is still possible to develop them through a semiotic approach imposed through design. Several studies also explain the importance of transforming ordinary spaces into memory sites through narrative and interpretive design.

Porous Zones

As a means of ventilation for the microclimate in an urban canyon context, spaces that allow for airflow and natural light are crucial. All of the loose space locations in Tunjungan meet this category. Location 1, as a large open space, provides significant gaps for vertical air circulation and natural lighting. With materials and vegetation, this location can be quite effective as a micro-scale cooler. Locations 2, 3, and 5, although smaller, also serve as lateral ventilation routes. These passageways help break up heat vortices in narrow corridors and improve air quality at street level (Shi et al., 2022). Location 4, as an open courtyard, can also act as a thermal buffer when combined with vegetative elements and wind openings. Location 6 also contributes because of its position at the end of the block, allowing open air flow to the exterior of the area.

Table 1. Summary of Analysis Results Based on Six Parameters

Loose Space Locations		Analysis Parameters					
		Directed Dysfunction	Urban Flowlines	Social and Re-appropriation	Visual and Aesthetic	Identity and Memory	Porous Zones
	Location 1	Open with detached function (only used as parking)	Looping urban flowlines are formed due to its wide shape	Flexible to be used as a communal space area	High exposure to the road, easy to organize visually	Has a strong history because it is located behind the former BPN Building	It can help air flow and lighting so it is suitable for green spaces
	Location 2	Used as a motorbike parking lot and service lane	Mixed (looping + linear) urban flowlines are formed due to the shape of the alley	It is more suitable to be used as a kind of green pocket that can be enjoyed by pedestrians	Even though it is narrow, it can be used as a living hallway with aesthetic lighting	This location has no significant architectural or historical elements	Its elongated shape means it can function as a micro air duct that supports ventilation in the area
	Location 3	Functions as a motorbike parking area and service lane that does not have a specific program	Formed mixed (looping + linear) due to the fairly deep corridor configuration	It is more suitable to be used as a kind of green pocket that can be enjoyed by pedestrians	It does not stand out from the main road so that visibility is low, it does not have an aesthetic impact on the area so that it needs to strengthen the landscape elements to have visual appeal	This location has no significant architectural or historical elements	Its elongated shape means it can function as a micro air duct that supports ventilation in the area
	Location 4	Open space with a loose function (left filled with bushes)	Looping urban flowlines are formed due to their broad, wide and open shape between the building masses	Flexible and has high potential to be used as a communal space area	Not visible from the main road due to fences and bushes, but has strong visual potential if re-arranged with natural elements	Has a strong regional history because it is located behind the Ex Rabobank	The open space is large enough to support cooling and air infiltration (thermal buffer) which can help with cooling and natural air circulation
	Location 5	Currently used as a motorbike parking area and service lane	Mixed (looping + linear) urban flowlines are formed because their shape resembles a long corridor with a wide end	It is more suitable to be used as a kind of green pocket that can be enjoyed by pedestrians or a linear green space	Can function as a visual corridor that connects building blocks	Located next to the old shops (old buildings) which have historical value for the area	Can be a small air channel that helps the movement of air from outside to inside the building block
	Location 6	It is not specifically used and is only used as a shortcut by pedestrians	Linear urban flowlines are formed because of the elongated shape of the corridor	It is more suitable to be used as a kind of green pocket that can be enjoyed by pedestrians	It's not visible from the main road, so visibility is low. However, it has potential with natural light and vertical vegetation	Located across from the Siola Building which is part of the colonial architectural heritage	Open to the outside winds of the area so that it can become a natural air channel that improves circulation between the building masses

From the analysis of six loose space parameters, in 6 loose space locations along Jalan Tunjungan, it is known that each location has different potentials as shown in table 1. Locations 1 and 4 excel as open social spaces and porous zones because they have good area and access, while locations 2, 3, 5, and 6 function importantly as pedestrian and air circulation corridors. Locations 1, 4, 5, and 6 have high historical value, while locations 2 and 3 as shown in table 1, have less high historical value. Locations 3, 4, and 6 also lack visual and aesthetic appeal. Because no location meets all parameters, the solution that emerges must be tailored to the function based on the characteristics of each loose space.

However, locations 1 and 4, due to their large size, have the potential to be developed as green plazas or communal spaces, such as open social spaces, to help address the urban canyon phenomenon by breaking the ice through the presence of green elements, open spaces, and more fluid circulation. Looping flowlines can certainly help air circulation spread evenly throughout the city, making it easier for natural air to respond. Meanwhile, locations 2, 3, 5, and 6, due to their alley-like structure, can be developed into more visual circulation corridors, as well as ventilation for pedestrians and air, to direct the area to become more collective, flexible, and have a stronger identity. This approach makes each loose space not only have spatial value, but also complementary ecological, social, and cultural values. Thus, by reactivating loose spaces, we can utilize the gaps between buildings as social interaction spaces, rest areas, and recreational areas that improve the quality of life for city residents. Small steps from passive areas to active, inclusive community spaces can demonstrate the great potential of loose spaces in balancing ecological and social needs.

Discussion

Loose Space as Urban Pores in a Dense Urban Canyon Context

The findings suggest that loose spaces along Tunjungan Street possess varying spatial capacities to function as urban pores within a dense urban canyon environment. Rather than being treated as leftover or inactive spaces, several

loose spaces demonstrate openness, permeability, and connectivity that align with the concept of urban porosity. This supports previous theories on loose space, which emphasize flexibility and reinterpretation of unprogrammed urban areas. In the context of Tunjungan, loose space contributes to spatial relief within a dense corridor by providing interruptions in the built mass and opportunities for environmental and social interaction.

Spatial Typologies of Loose Spaces and Their Implications

The analysis shows that the dominant typologies of loose space are courtyards and linear corridors. Courtyard type open spaces tend to exhibit higher potential for social reoccupation due to their size, visibility, and accessibility. In contrast, linear corridor types primarily serve as connecting elements that increase permeability within dense urban blocks. Although limited in scale, these corridors play a crucial role in supporting pedestrian movement and spatial continuity. This typological distinction highlights how different spatial forms contribute differently to urban porosity in dense urban environments.

Implications for Urban Design Practice and Study Limitations

This study highlights the importance of recognizing open space as an integral component of urban systems. By identifying spatial potential through qualitative observations, it provides a foundation for future design-oriented interventions that address urban canyon. However, this study is limited to qualitative spatial analysis and does not include quantitative environmental measurements. Future research could incorporate microclimate data, simulations tools, or participatory approaches to further evaluate the performance and social impacts of open space interventions.

CONCLUSION

Thus, it can be concluded that each loose space point in the Tunjungan Street area has a specific role that supports the city's sustainability values. Locations 1 and 4 are ideal for open public spaces because they are flexible and support circulation, while 2, 3, 5, and 6 are important as ventilation corridors and air routes. Locations 1, 4, 5, and 6 have the potential to strengthen the area's identity through historical context. With each loose space parameter reflecting sustainability aspects where directed dysfunction shows spatial flexibility, urban flowlines support passive ecology and microclimate, re-appropriation reflects social participation, visual & aesthetics strengthen psychological comfort and reduce stress through green fractal elements that align with green design principles, identity & memory maintain historical values and porous zones support the city's ecological system. Thus, loose space is not just a remaining space, but a potential space of "living city pores" that unites social, ecological, and spatial sustainability holistically in the midst of densely built areas. Furthermore, this principle is not only a living part of the city, but can also be applied vertically to high rise buildings through the activation of communal rooftops to create a more open, healthy, and connected architecture with city life.

From an urban design perspective, this study highlights the importance of incorporating loose space as micro scale interventions in dense corridors. Rather than relying solely on large scale redevelopment, the activation of residual spaces can provide low cost, adaptive, and context sensitive strategies to mitigate urban canyon conditions while enhancing pedestrian comfort and social vitality. At the policy level, the findings suggest that urban planning regulations should begin to recognize loose space as strategic spatial assets. Integrating loose space mapping into heritage conservation, pedestrian planning, and urban climate adaptation policies could strengthen sustainable development in historic city centers such as Tunjungan. This research is positioned as an exploratory study, therefore future research may expand these findings through quantitative with simulation-based approaches to further examine the environmental performance of loose spaces.

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