



## Global Journal of Engineering Science and Research Management

### DESIGN CRITERIA OF DEVELOPING INFORMAL HOUSING OUTDOOR SPACE IN RAILWAY TERRACE SURABAYA

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#### ABSTRACT

Among the trade and business area, the informal settlements in Surabaya have developed by the low-middle class. Those people try to make an opportunity of their employment. By the economic condition and the limit of legal spaces, they tend to choose their housing location at the empty slots where one is the railway terrace. The limitedness of the space in the housing area makes household activities extend to the outdoor spaces. The purpose of this study was to show the design criteria by analyzing the potential needs and the characters that occur to improve the living quality and the open space itself. So that it would give safety uses for the people around the platform. This research uses character appraisal of the physical condition and behavior observation to see the functional form and record the activities of the people to list the particular characteristic happens in this railway terrace settlement. The result will conclude the redevelopment design criteria of open space areas around the railway terrace.

#### INTRODUCTION

Surabaya is a city of commerce and services inhabited by people with various economic classes. People with middle and upper economic class have the flexibility in choosing a house with adequate facilities and environment. Differ to the middle-class economic class down who has no limit in choosing a home, including the environment and its facility. The people of this class are mostly immigrants who are willing to live in areas that are not actually provided by the government to become a residential land.

Settlements that are not formally designed and regulated by the government, are usually classified as illegal (Davis, 2007). This phenomenon makes informal settlements arise from several parts of the city. Immigrants hope to have a changed fate and adapt to the life and mentality of city life (UN Habitat, 2005). It also becomes a problem that has always been the main topic in improving development (Report of Surabaya City Performance, 2016).

Illegal locations selected as informal settlement areas of middle and lower economic communities are often located in the city area where there are large trading and service center buildings. The informal settlement area has a form and appearance that is not very good and has a lack of safety, security, beauty or other things. The existence of a house is not a product, but as a process that develops according to the economic capacity of the owner. For urban areas such as Surabaya, the availability of land for middle and low-income residents in the center of the city much use the railway area and inhabit the area that became the railway terraces. With the status of illegal land, the occupancy land used as a case study occupies many areas that should be a railway inspection track so that living facilities such as electricity and water are not provided officially from the municipality.

Activities that occur in formal and informal settlements have similarities, related to human needs and activities. Although practiced differently, each has the same residential structure and organization that is the boundary between the indoor and outdoor areas. In the context of the informal occupancy that occupies the railway terrace, the outdoor area is a space that integrates with the railway space doing the movement. These conditions make this outdoor area as a zone that makes the only opportunity to create public space as a social interaction area and green space as a vegetation area.



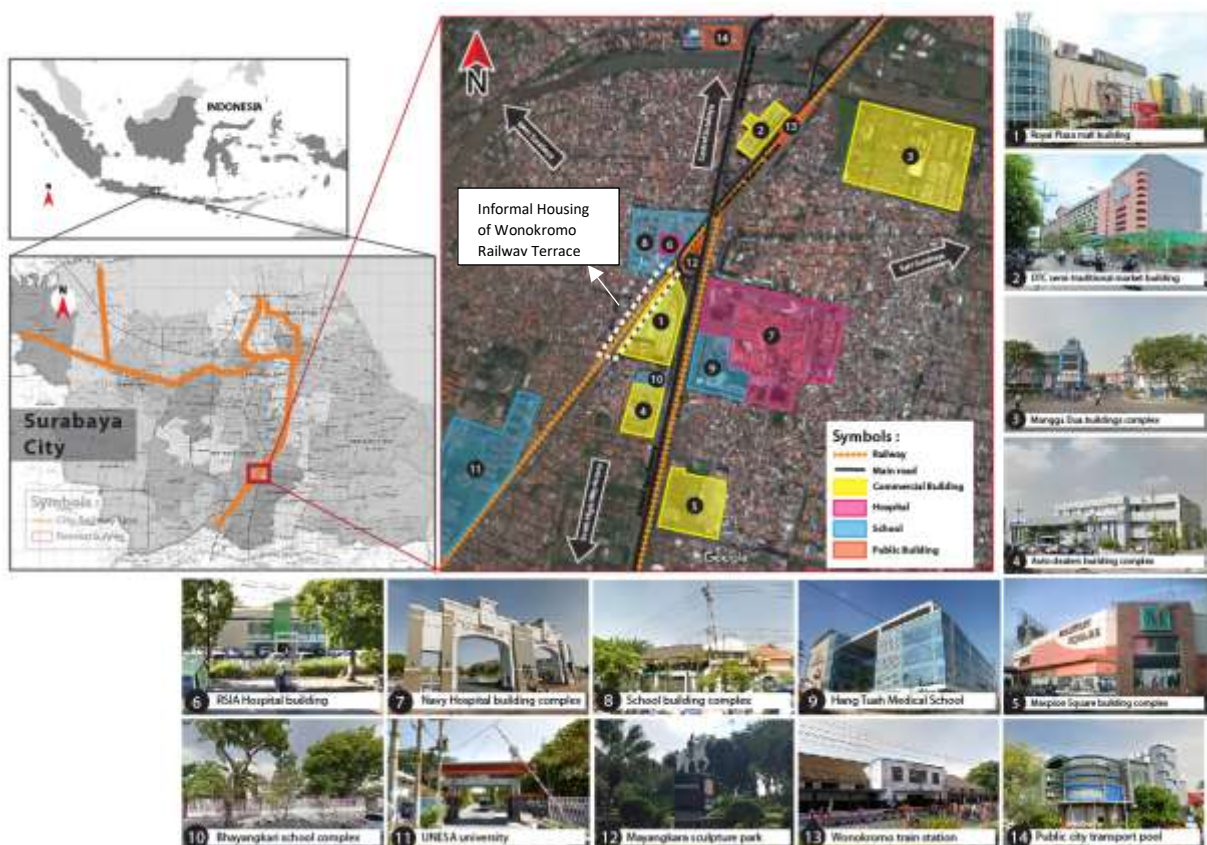
## Global Journal of Engineering Science and Research Management

Outdoor space is also a visible part of the settlement so we can understand the growing phenomenon in the informal settlement on the railway terrace. For this reason, there needs to be a review of the outdoor space character of the informal settlement located around the railway area. With the goal of achieving design criteria, this research can be a viable solution to the provision of public space guidance with special needs and unique characteristics. It is hoped that it will provide insight to set policy in regulating the area around the track as part of the mission to achieve a sustainable city.

### MATERIALS AND METHODS

#### Research Area

In general view, the study area is informal settlements that named Kampung Wonokromo located beside or around the railway line located within a commercial area in the city of Surabaya. Specifically, the study area is located in the southern trading area of Surabaya, which is around the Royal Plaza Mall and Darmo Trade Center Mall. Both Mall buildings are the shopping centers closest to out-of-town access in the southern part of Surabaya. In this area, there is Ahmad Yani Road as the main way of East Java province and also the Wonokromo Train Station as a railway station that becomes gate access to connecting Surabaya with other cities after the south border of the city. As a residence of the city's entrants, Kampung Wonokromo can also be viewed as a social space with various activities that utilize the outdoor spaces. The various opportunities that offered by utilizing the limited indoor and outdoor space make this informal housing environment as a complex visual and functional set.



*Figure 1. The location of the research area with some of commercial building around there.*



## Global Journal of Engineering Science and Research Management

### Theoretical Approach

Traditionally, spaces have been classified as being located either indoors or outdoors. On closer inspection, however, this distinction is not as clear-cut as usually assumed. Such transitional spaces share properties with both indoor and outdoor spaces but so far have not been analyzed more thoroughly. This kind of space remained fragmentary, often concentrating on only one or two aspects of space (such as visual quality or functional requirements) and excluding others (such as social, cultural and political aspects of space). But if we inspect closer to this kind of space, we can classify spaces as one another (Kray et. al, 2013).

Outdoor spaces allow people to meet planned and unplanned, within the community or outside. These include family relations, cultural groupings, local social connections, and group meetings through same interest. This kind of activities should be facilitated, as a contribution to the cohesion of communities (Holland et.al, 2007). Meanwhile, Nijman (2010) confirms that identification of public spaces in an informal settlement is examined by viewing the social structure and the condition of the space itself. This kind of non-physical condition is very important to occupy and being the criteria of designing the place.

In a specific way, the outdoor spaces physically form as the outer perimeter or urban dwellings, precisely as public spaces. This kind of public spaces varies, by their typology or morphology. By using term physic, outdoor space of the dwellings mostly contain open space. This kind of open space includes public plazas, vacant lots, and also the most important is green space. Heinze (2011) explained that healthy properly maintained green space provides significant benefits to the environment in terms of water and air quality. The simple distinction between indoor and outdoor spaces may not be sufficient to describe all areas found in complex urban environments. Arcades, transportation hubs, foot tunnels or partially roofed open spaces are examples for areas, which illustrate that this dichotomy might not quite suffice to adequately capture all phenomena found in urban areas. By occupying specific and suitable activities, character appraisal used as an analytical tool to record the physical condition and also behavior conditions.

As already told in the introduction, Turner (1972) stating that lower-middle class or bridge header will have different prioritize of three basic values: opportunities (proximity to jobs), security (ownership status), and identity (quality of housing). Neuwirth (2005) states that some of his observation show some proofs about squatter area that are created by the density of both building and the occupants of the residential area which has been developed at illegal land without taking permission from the relevant authorities.

Using all of this criteria, this paper concludes that outdoor space contains 3 key elements. First, is urban space as a public place by its function as a social meeting point and social interaction area. Second, outdoor space forms an open space, includes a proper green space. Third, outdoor space also contains a transitional space, from indoor space inside a house and outdoor space outside.

### Research Method

The research method uses character appraisal of the physical condition and behavior observation to see the functional form and record the activities of the people to list the particular characteristic happens in this railway terrace settlement. The result will conclude the redevelopment design criteria of open space areas around the railway terrace.





**RESULTS AND DISCUSSION**

At the early observation, the neighborhood of the informal settlement Wonokromo area is very close to the railway movement path. The rows of building blocks are on either side of the railway line.

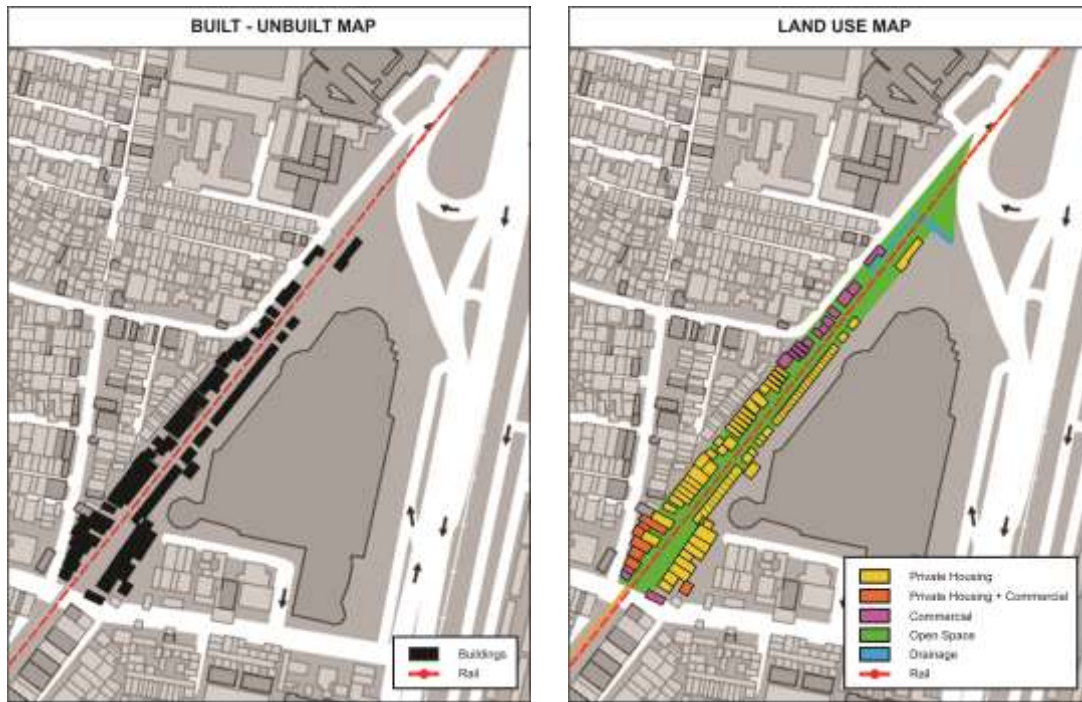









Figure 2. Map of built and unbuilt (left) and Map of Land Uses (Right)

**Public Space**




Table 1. Character Appraisal of Outdoor Space as a Public Space

Criteria of Observation	Figures	Character Appraisal
Socio-Cultural		<p>Physical adaptation is done to accommodate the need for social space for local residents. The positive relationship between place and individual satisfaction is related to social communication. One of them is the built of “saung” or shelter which is spread at some point along the rail track.</p> <p>The formation of this space is an indication of the closeness between individuals living in Wonokromo by creating a bond between the residents of Wonokromo. In the kampung, the main social activities that are carried out together mostly take place on the terrace which also serves as the access road in and out of the residents. Some residents also take advantage of the Railway Post as a gathering area and avoid the scorching sun</p>



Criteria of Observation	Figures	Character Appraisal
Behavior	 	<p>The resident has various activities to utilizing space. On the north and west side of the township, many residents collect flea goods and sort the goods. Several wheel drive carts are also visible and parked to form a collecting area.</p> <p>In the draw well area near the Railway Station was also found citizens who wash themselves, bathing and washing dishes. This indicates that the well is a public area and a regional public facility affecting user behavior.</p>
Properness	 	<p>Some residents of Kampung Wonokromo said that the distribution of facilities is uneven, such as clean water. Drainage that does not flow well also often cause a sense of discomfort because of the unpleasant odor that often appears.</p> <p>This often encourages people to get out of the environment, but those who choose to stay due to economic limitations.</p>
Activity	 	<p>Proof of the activity factors can also be done through the interaction between human - place; and also between humans. The most visible activities taking place in Kampung Wonokromo are raising livestock, stockpiling of flea goods, as well as cultures of raising and trading pigeons.</p>



Criteria of Observation	Figures	Character Appraisal
Survivalness		<p>The existence of physical factors is evidenced by the desire of individuals to seek to improve the physical environment in the village, starting on the private part of their dwelling and the surrounding environment.</p>
Satisfaction		<p>Kampung Wonokromo has fairly complete facilities but the lack of clean water facilities and good drainage leads to poor health conditions. This is also coupled with the presence of places - the place of flea goods popping so as to create the unpleasant and disturbing aroma.</p>
Comfortableness		<p>Part of the area that is considered private (residential) and public (railroad) trying to be limited by the existence of material differences as well as by specifically setting up the fence as a security reason also encourage the fence of buildings</p> <p>The use of tarpaulins and bamboo blinds as a form of physical adaptation is used to reduce the disturbance of sunlight, rain or dust when the train passes. Limitations of land built out by the residents in the presence of additional space formed from non-permanent materials</p>

Efforts to improve the physical environment is quite thick and the high satisfaction of place leads them to form a culture based on behavior, cognitive and emotional shows that in the level of attachment to the place, village and community Wonokromo reside in the attachment of place where according to Shamai (1991) this is defined as a place to be meaningful and important for each group because the place has a unique identity and character.





Figure 3. Behaviour Mapping of Kampung Wonokromo

From the figure above can be seen a behavioral mapping of the community Kampung Wonokromo. On the north side more plants are found (2) and recycling or flea goods collectors (3). This indicates that the majority of community activities in this area are buying and selling of used goods, which is in accordance with the livelihood of the inhabitants thus affecting the use of space pattern.

At the south side, the majority use space as a means of raising pigeons (1). This is because the inhabitants of the southern kampung area are not having a job as a local “flea goods” collector and having more variety of jobs, such as opening workshops and stalls.

Communities are able to identify the purpose of the place so that together the people achieve that goal by integrating their abilities. Therefore they have a strong attachment to each place. In Kampung Wonokromo obtained the level of belonging to the place where the population has a strong sense of ownership in the village, caring about the development of the village for their own convenience.

**Green Space**

Table 2. Character Appraisal Design of the Green Space

Criteria of Observation	Figures	Character Appraisal
Type of Vegetation		<p>Type of vegetation that is widely found in the open space of Kampung Wonokromo is mostly shrubs that have a height below 6 m.</p> <p><b>Grass &amp; weeds.</b> The most common shrubs found along the railway line in Wonokromo are grass and weeds. The picture beside is an example of weed plants that exist in the area of the railway crossing. Despite its unkempt state weeds give a distinct impression on the arid surroundings.</p>




Criteria of Observation	Figures	Character Appraisal
		<p><b>Bushes.</b> Plants shrubs and shrubs that exist in the area of public toilets. Small plants in the form of shrubs are present at some point in Kampung Wonokromo but not as much as grass.</p> <p><b>Medium-sized trees.</b> Not many trees grow in the area around the railway due to a large number of passing trains and spatial rules for the area around the tracks. But infrequently encountered medium-sized trees that grow in the Kampung Wonokromo, one of them is banana trees.</p>
Vegetation Conditions		<p><b>The Shrubs as The Curtains of The House.</b> There is some use of shrubs planted intentionally in the front area of the house, can serve as a guardrail, or as a natural curtain to reduce the view and noise of railroads that go directly into the house.</p>



Figure 4. Green Open Space Mapping of Kampung Wonokromo

The pattern of green open space distribution in Kampung Wonokromo can be seen in this mapping. On the north side close to the railway post, many trees are found with a height between 4 - 8m and having wide branches. These trees used as a shelter, therefore some public vehicles such as pedicab and public vehicles take advantage of this shady land to public transportation's base. At the south, the trees were rare and replaced by pavement built of cement as well as some grassy soil. It dominates the open space of the area.





Table 3. Character Appraisal of Railway Rules and Regulations

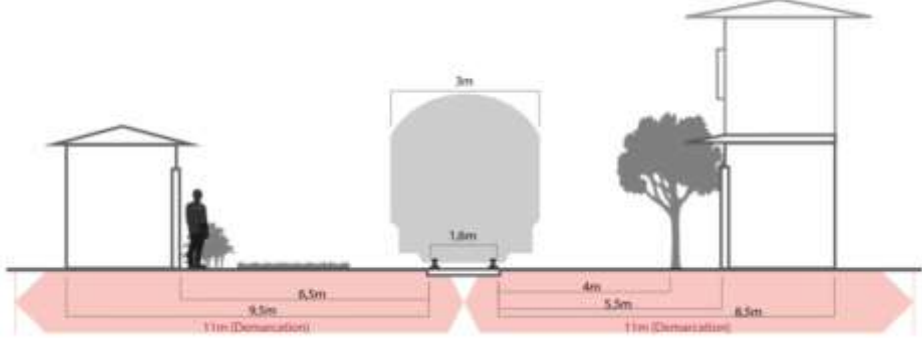
Criteria of Observation	Character Appraisal
Railway Demarcation	 <p>This area is classified as a straight line so that the border is set at 11 meters (UU RI no 23, 2007). The existing conditions showed that the residents built a permanent construction of an access path, the terrace of the house which is also used as a residential street or access in this area.</p> <p>The building setback varies from 3 to 4 m from a distance of 2 to 3m from the railway line as it violates the railway's spatial regulations, ie railroad land beyond the border that can be used by railway permit (UU No. 23, 2007).</p> <p>However, some segments of the settlements have been flattened and will be used for the improvement of railway and environmental facilities and infrastructure</p>



Figure 5. Railway Demarcation Mapping of Kampung Wonokromo



## Global Journal of Engineering Science and Research Management

Kampung Wonokromo area mostly land owned by PT. KAI which according to government regulations should be 11m from the rail distance. However, on the field conditions found borders that there are only 2 - 4m left of the rail and this is against the rules. In addition to violating regulations, it is also very harmful to the people who live in homes in Kampung Wonokromo.

### Design Criteria

After analyzing and understanding the three aspects of the existing observations, it can be concluded the design criteria in designing the area. From the synthesis of literature review can be found general criteria used to provide a reference strategy formulation in accordance with observational aspects based on theoretical studies. The results of this theoretical study were synchronized with character appraisal results in three aspects of observation that existed in Kampung Wonokromo that produced the design criteria.

*Table 4. Design Criteria of Kampung Wonokromo*

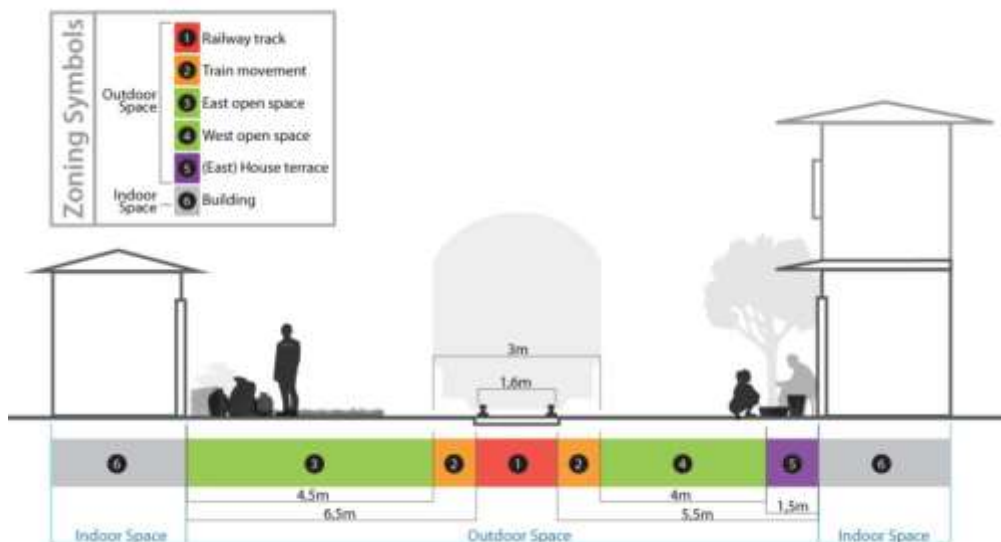
Criteria of Observation		General Criteria	Strategy Formulation	Design Criteria
Open Space as a Public Space	Socio - Cultural	Outdoor space can be used to accommodate social interaction activities.	Organize outdoor space as a place to do various activities that never done in an indoor residential area.	Put some public furniture in the form of chairs in areas of shade that can be used to chat.
	Behavior	Outdoor space can be used as a place to store items that are placed on a permanent basis.		Provide a special area as a place to store flea goods in the dwelling houses inhabited collectors.
	Properness	Outdoor space capable of providing clean water source and drainage		Providing special areas for washing clothes and cutlery, as well as cleaning up sewerage.
	Activity	Outdoor space can be a space to develop activities to earn a living by the residents		Supporting several residential homes that have a shop by providing areas of sale and purchase transactions
	Survival	Outdoor space can be a space where protective façade occupancy.		Placing some pillars as a support for the protective facade in the form of bamboo or cloth curtains
	Satisfaction	Outdoor space can be a space to develop community recreation activities around.		Make the activity of pigeon racing attraction as entertainment of residential society.
	Comfortableness	Outdoor spaces have sub-areas adapted to the type of activities.		Distinguish pavement material according to outdoor space usage
Design of Green Open Spaces	Type of Vegetation	Outdoor spaces used as open spaces should have a variety of plants used as per the function of water absorption and to beautify the environment.	Arrange various types of vegetation that exist in outdoor space in order to functionally use as a protector and	Plant and maintain shade plants (trees), ornamental plants (bushes), and open ground cover plants (grass) of every segmentation by few homes in outdoor



Criteria of Observation		General Criteria	Strategy Formulation	Design Criteria
	Vegetation Conditions	Outdoor spaces used as open spaces should have a variety of plants used as a soft-barrier function.	aesthetic enhancer of a residential area.	Planting bushes on houses with no fences.
Railway Rules and Regulations	Railway Demarcation	Outdoor spaces used for activities, vegetation spaces, and place of placement should observe the principle of the standard of railway moving area safety. Divide and give Outdoor zoning signs between the area of rail movement and the area of use of residential communities.	Arranging zoning boundaries of the area of outdoor space between use as a path of rail movement and the activities of residential communities.	Divide and give outdoor zoning between the area of rail movement and the area of use of residential communities.

**CONCLUSION**

Based on the results of character appraisal analysis above can be concluded that the outdoor area of Kampung Wonokromo has various functions and forms. On the first perimeter of the building, outdoor space is a terrace or pavement path, which varies from 0.50m - 1.50m. In the second layer, there are many open spaces in the form of green space consisting of grass, shrubs, and trees.



**Figure 6. The Outdoor Space Zoning of the Wonokromo Railway Terrace Informal Housing**

However, on the west side of the road and pavement is minimal, and the majority is green space. Green space is widely used by residents as a bird livestock area, the area of flea popping, and also hanging clothes or hanging crackers and rice. This indicates that outdoor activity is very high and the outdoor space is also the identity and means of life of the people there. However, if we review the government regulation on railway border, then Kampung Wonokromo including the village that violates the rules, because it is 5-6m from the railway line, which should be sufficient border width of 11m.



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From the results of this analysis, we can draw some design criteria that are expected to accommodate and accommodate the needs both physically and non-physically aspects in Kampung Wonokromo as follows:

1. Put some public furnitures such as chairs or benches in shaded areas that can be used to socialize.
2. Provide a special area as a place to store flea goods in the area that mostly inhabited by collectors.
3. Provide special areas for washing clothes and cutlery, as well as cleaning up sewerage.
4. Support several residential homes that have a shop by providing areas of sale and purchase transactions.
5. Place some pillars as a support for the protective facade in the form of bamboo or cloth curtains.
6. Make the activity of pigeon racing attraction as entertainment of the residential society.
7. Distinguish pavement materials according to outdoor space usages.
8. Plant and maintain shade plants (trees), ornamental plants (bushes), and open ground cover plants (grass) of every segmentation by few homes in outdoor.
9. Plant bushes on houses with no fences.
10. Divide and give outdoor zoning between the area of rail movement and the area of use for communities.

### ACKNOWLEDGEMENTS

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### REFERENCES

1. Darjosanjoto, Endang Titi Sunarti, Nugroho, Setyo, Putra, Dimas Widya, "The Role of Riverbank Area as Community Space in Surabaya City, Case Study: Kampung Jambangan and Kampung Keputran", Great Asian Street Symposium, National University of Singapore (NUS), Singapore. Pp.78-82, 2014.
2. Darjosanjoto, Endang Titi Sunarti, Nugroho, Setyo, Danardi, R. Winton, "Design Criteria in Revitalizing Old Warehouse District on the Riverbank Area of Surabaya City", Journal of Visual Art and Design, ITB Journal Publisher, Vol.7, No.1, 2015.
3. Heinze, John P.hd, "Benefits of Green Space – Recent Research", Environmental Health Research Foundation, 2011.
4. Holland, C., Clark, A., Katz, J., Peace, S., "Social Interactions in Public Spaces". The Policy Press. The Open University, 2007.
5. Janches, F., "Significance of Public Space In The Fragmented City: Designing Strategies For Urban Opportunities In Informal Settlements Of Buenos Aires City", UNU-WIDER, World institute for Development Economics research - Vol, 13, 2011.
6. Kalrsson, Mina, "Informal Settlements: The World Invisible Communities". Agricultural Sciences of Swedish University. Sweden, 2012.
7. Kray C., Fritze H., Fechner T., Schwering A., Li R., Anacta V.J., "Transitional Spaces: Between Indoor and Outdoor Spaces" in Tenbrink T., Stell J., Galton A., Wood Z. (eds) Spatial Information Theory. COSIT 2013, Lecture Notes in Computer Science, vol 8116. Springer, Cham, 2013.
8. Neuwirth, R., "Shadow Cities; A Billion Squatters, A New Urban World". New York; Routledge. NY, 2005.
9. Nijman, J., "A Study of Space in Mumbai's Slums", Tijdschriftvoor Economische en Sociale Geografie, vol,101, pp 4-17, 2010.
10. Turner, J. F. C., "Freedom to Build". Macmillan, New York, 1972.