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Visual and Spatial Characteristic of Informal Housing in Railway Terrace at Surabaya City, Indonesia

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***Abstract* — Certain inhabitants in the city centre tend to choose their housing location near high employment opportunities area. They occupy the land eventough the chosen site is illegal. With priority on location and limited construction funding, the lower-middle class occupy railway terrace. They built high-density housing with little regard on visual aesthetic of their facades. This research attemps to identify visual and spatial characteristic on spesific illegal area of railway terrace and housing for lower-middle class people at Surabaya. By using typological-morphological analysis, visual and spatial reading will focus on building variety. These are represented with facades and front yard as outdoor spaces. It is discovered that visual aspect of informal housing are dependent on materials used. Moreover the development scheme based on building ownership and building use also. Meanwhile the spatial aspect shows that various front yard will emerge and correlate with railway position. The research result will conclude the most frequent classification of facades and front yard that located at the railway terrace area.**

Keywords—Railway Terrace; Spatial; Typologica-Morphological; Visual.

I. INTRODUCTION

According to Warner statement on social classes, there are three stratum model on society: upper, middle, and lower class with each class further subdivided into upper and lower segment. People from lower-middle class (lower-paid professionals but not manual laborers) and upper-lower class (blue collar workers and manual laborers) which live in urban environment tend to have limited choices in regard of the place to dwell (Warner in Levine, 2006). Various employment opportunities and higher productivity are usually found in city centre. For this reason, it is necessary for them to dwelling on those area rather than in suburban area. The lower class are willing to inhabit in illegal and high density area. For those people the important things to consider are basic structure and shelter, regardless of comfort and standard personal territorial dimension. The sub-living standard makes their houses appear crowded and in chaotic fashion. It is referred as "slum" and unattractive in term of visual aesthetic. These conditions are often found in part of the city which the houses are built by self-help technique and occupied illegal area. The chosen location is usually on undesirable part of the city and lack of safety, security, beauty or other things. Consequently the existence of their houses aren't viewed as a final product, but as a process that developed in accordance with the owner's economic capability. So that a row of houses could give various visual impression because of each development histories. The process of housing construction in cities can be illustrated as follow:

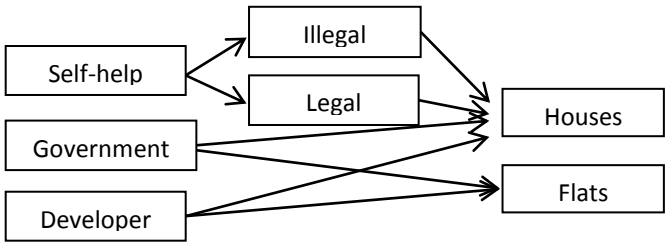

Fig 1 Housing process in Surabaya. Describing stakeholders whether by direct owning or rental

Further, Turner (1972) stating that lower-middle class or bridgeheader will have different prioritize of three basic values: opportunities (proximity to jobs), security (ownership status), and identity (quality of housing). They will try to occupy city area that provide economical opportunities eventhough those area deemed unfit for middle and upper class. For lower-middle class and below, the capability to choose their own residential site is restricted overtime due to urban crowding. Therefore many site near industrial area and other area with high employment provides housing for working-class immigrant in form of high density and monthly rental rooms. Immigrant hopes to have a changed fate and adjust to the life and mentality of urban life (UNHabitat, 2005). This condition leads to different visual appearance typologies for family-housing and worker-housing. For metropolitan city like Surabaya, the availability of housing site for lower-middle class in city center often

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utilize railway tracks, riverbank or abandoned space that spreads around the city. On those illegal lands, the chosen research site occupies area that supposed to be inspection lane of railway track. Therefore the standard living facilities such as electricity and clean water are not officially provided by the city municipal. Specifically, the research site is located in one of old town-trading area of Surabaya with shopping centres namely *Dupak Grosir* Surabaya, *Pasar Grosir* Surabaya and *Pasar Turi* Surabaya. This area provides ample opportunity of employment for lower-middle class. Figure 2 shows research site that is located at 3 railways intersection and forming "railway-island" terrace near *Pasar Turi* railway station and container terminal.

Fig 2 The location of railway island near shopping centres in Surabaya. Yellow triangle shows chosen research area.

The capability of lower-middle class in developing their housing is reflected on their house facades. Moreover, shelter is one of basic human needs other than food or clothing and the housing facade characteristic could be seen as embodiment of their owner, which shows the owner's income level and self-actualization. Housing as process shows physical changes and generate aesthetic values overtime. The housing forms could generate visual richness in city-scale. It is necessary to acquire knowledge from inhabitant's perspective about the major component of housing facades. Thereby the urban aesthetic and characteristic of lower-middle class could be reflected. Types of existing housing facades will depend on building typology and uses in general: as family-housing, worker-housing, home-industry housing, or commercial-housing. Each owner will reflect their ideal condition and capability in dwelling on their housing facades. The majority of buildings are trying to maximize footprint and have close proximity toward railway. But these area doesn't meet railway regulation by government (Government Regulation No 23 Year of 2007). This research strive to find information of physical condition and building visual formed on the basis of owner's requirements, and aesthetic taste for lower-middle class, and make building facades as part of unique dwelling culture found in railway terrace of Surabaya. The definition of "railway terrace" is research area that consist of perimeter area/structures directly adjoining the railway. As stated by government regulation (PU No 05/PRT/M Year of 2008), railway terrace classified as green public space, functioned for specified order, and should have clear border.

Fig 3 Railway terrace of informal housing. Perimeter buildings are observed as research objects

Fig 4 Aerial view of railway island dominated by low-rise buildings

II. METHODOLOGY

This research will discuss visual and spatial pattern formed inside the perimeter of railway island and comprehend building orientation influenced by railway curve that confined it. The research theories will refer to Loeckx's (2004) typological-morphological analysis. It based on reading and analyzing the site characteristic or structural grounding. The main activities of this analysis are as follow: (1) to find persisted original themes and to discover the stable underlying features that constitute a type; (2) to define the typological belonging of major urban artifacts (street, buildings, square, etc); (3) to identify the structural interrelationships between those parts; (4) to study the formation and dynamism of urban types and structures. (Darjosanjoto, 2006). Moreover, Pfeifer (2007) states that "A type belongs to a group of objects of the same formal structure. To differentiates between types means to sort individual elements of the same structure into a certain group" are considered also. Therefore the observed building facades will be broken down into several components to find the persisted visual features among the houses located along railway terrace.

In order to understand the architectural spatial form with typology-morphological analysis, the figure-ground technique can be used. According to Trancik in Zahnd (1999), this technique can help identify the texture and pattern of physical form of the city (urban fabric). Therefore the typology-morphological analysis stages that can be conducted in the research site are as follows : 1). Observing the development process of the study area within some period of time. To see the changes taking place, it takes the data in some period of time. Maps, photos, sketches, and other information obtained will be grouped by period and year. 2).

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The data were grouped by period and year, and analyzed. Physical data is presented using the figure ground technique to help understanding the shape and development process. 3). Analyze the building shape by finding the simplest form as nature or geometry. The sought typology form are the building blocks and the streets surrounding it.

In short, this research method will use descriptive-qualitative research based on typological-morphological analysis. The primary data collected by direct site-observation, taking photograph of building facades and interviewing the inhabitants of railway terrace near Pasar Turi Surabaya. Secondary data acquired by drawing map, tables, and any archival news or information. This research will try to identify visual and spatial characteristic on specific illegal area of railway terrace and housing for lower-middle class people.

III. RESULT AND DISCUSSION

Fig 5 Segmentation of research area based on the adjoining railways

The research area consist of 141 buildings with or without front yard that formed the railway terrace. Through top-down view of the area showed on figure 5, those buildings are known to formed block pattern that aligned with the railway. Since site observation process until analysis process, area segmentation are used to simplify "reading" process of the area. Those segmentation are influenced by railway shape and direction. East and West segment have curved railway, meanwhile north segment has straight railway. Thus the segmentation are classified into three segments as follows:

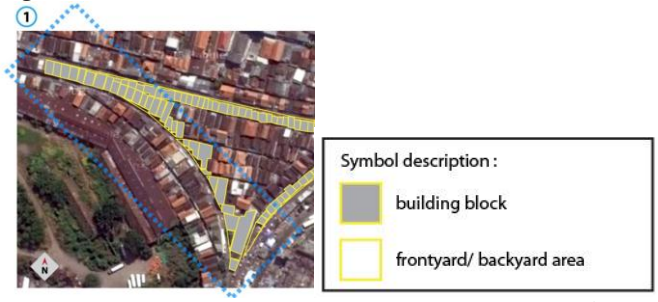
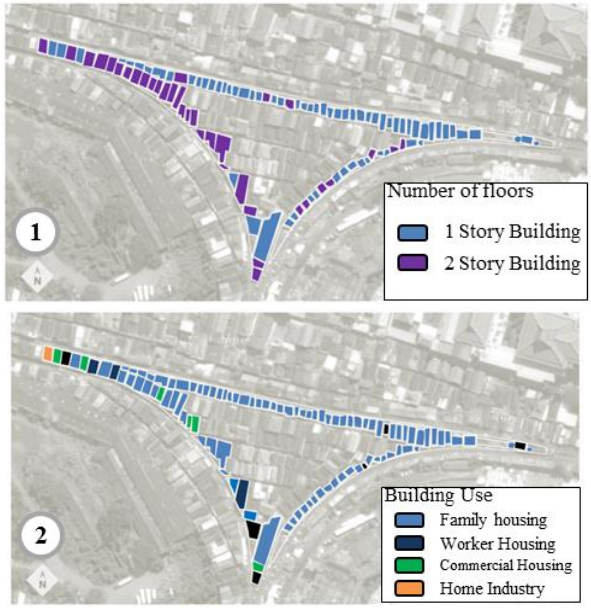


Fig 6 West segment with curved railway and buildings orientation facing south

Fig 7 North segment with straight railway and buildings orientation facing north

Fig 8 East segment with curved railway and served as buildings orientation

In light of typological assessment, the facade components will be listed depend on types of form and materials. Every combination will show the majority of facade typologies and the overall characteristic from housing rows. The analysis also provide mapping of railway terrace housing by the categories of visual aspect which consists of number of floors, building use, building orientation, and additional structures on building facades. For spatial aspect consists of availability of front yard and the connection with building orientation. The following figure 6 shows visual aspect categories and mapping of railway terrace buildings.



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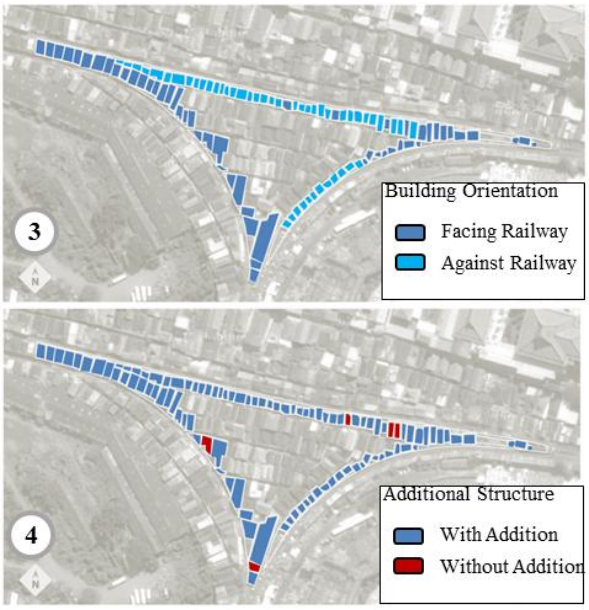

Fig 9 Top-down mapping of visual influence on railway terrace based on number of floors, building use, building orientation and presence of additional structure

The difference elevation of each railway track causing many houses to develop different access into each floor. This condition is found at west segment in which the buildings are two storey: the 1st floor entrance is facing south railway, and the 2nd floor facing north railway that goes higher. It is often for two different families to dwell on each floor of a house. With the high demand of additional household member, majority of building on research site are developed upward. This condition are also commonly found on informal housing found on city centre just like riverbank area (Darjosanjoto, Nugroho, Widya 2014). Many buildings on north segment considered as one story building by the eye-level perspective but actually registered as 2nd floor due to higher elevation of north railway.

Most of the observed buildings are used as family dwelling for lower-middle income class and the duration of inhabitation are reflected on their building forms. The longer they occupied the area and met many economical opportunity, their house develop into more permanent and sturdy materials. House made of brick are typicaly owned by long-time inhabitant, and for the others only the original 1st floor are made of brick while the recent development of 2nd floor are using lower quality material such as plywood or galvalum board. Rental room for workers are typicaly identified with outdoor stairs in the facade, while home industry and commercial houses are prioritizing transparency and more direct access to their wares.

For west segment of research area, the building orientation are mainly facing south with railway as their access. The orderly fashion are also found at north segment which the main facade of buildings are either facing towards railway or against it. Different condition is found at east segment which the majority of houses are following railway's curve as orientation axis but the main facades always facing towards alley in west and minimal exposure towards railway in east. Additional structure are used as extra space for storage and the addition always visually detach from the main mass of buildings. Sometimes those addition appear with different materials but with simillar color scheme as the main building.

Building facade typology found at railway terrace covers the combination of:

Table 1 Facade Components of Buildings on Railway Island

Component	Type of Material	Number of Building(s)	Percentage
Floor	Cement Mortar	97	68.8%
	Ceramic tile	40	28.4%
	Paving block	3	2.1%
	Gravel	1	0.7%
Wall	Brick (painted)	70	49.6%
	Brick (plastered)	25	17.7%
	Galvalum board	25	17.7%
	Brick (unfinished)	9	6.4%
	Brick (with ceramic tile)	7	5.0%
	Plywood (painted)	4	2.8%
	Wood	1	0.7%
Door	Plywood	42	29.8%
	Ornamental wood	30	21.3%
	Plain wood	29	20.6%
	Galvalum board	29	20.6%
	Plastic	1	0.7%
Balcony	Wood	27	19.1%
	Brick	14	9.9%
	Galvalum board	2	1.4%
Roof	Gable form with tile	77	54.6%
	Gable form with galvalum sheet	51	36.2%
	Shield form with tile	12	8.5%
	Shield form with galvalum sheet	1	0.7%

It is found that the majority of facade components are used as combination of typological aspect shows the persisted theme of progressive housing process although most of the building still ignores visual values as main aspect of better housing quality. As a subtitute of usual railway fence, the unofficial barrier for railway are lines of concrete slab adjacent with the train track. This lead to many bordering houses to use concrete as flooring material and trying to integrate the railway component as part of their houses. Meanwhile the settlement dating back to 1962 are reflected by the condition of the buildings majority which using permanent material such as brick and made effort to painted it as a manifesto of their process of occupying illegal site of railway terrace. The practical aspect of doors are found with plywood that separated horisontally so the inhabitant can open the upper side of their door and transform it into ventilation. The majority of buildings are having more solid

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area than void area on their facade and make it to appear bulky but not performing well in term of ventillation comfort. As the houses grow into 2 story building, the materials used are less durable than 1st floor as a result of unplanned future development, therefore majority of the balconies are made of wood. Meanwhile the stairs are mostly located indoor unless the building is intended as worker-housing which the outdoor stair provide more direct access. The main buildings are mainly equiped with tile-gable roof, while any extension of the building are always using galvalum board as roofing. And due to land limitation, every building trying to maximize their footprint and only few are furnished with proper front yard complete with constraining fence wall. Those are the characteristic and visual aethetic condtion found as persistent theme of the railway terrace.

Based on the figure-ground analysis technique, the type of physical characteristics and functions of outdoor space in the form of front yard can be read through the segmentation of the three segments of the research area. Each of segments can be summed up as different types of outdoor space with varied large front yard or backyard.

In analyzing the typology-morphological at research area, the initial stages are to register, observe, and share the types of outdoor dwelling area coupled with the building blocks. Based on preliminary observations, there are various forms of front yard which refers to the physical character of spatial area at the research area. Associated with the reading of those three segments, the building pattern can be analysed according to the front yard differentiation that grouped by physical characteristics and function of their uses. The various types of physical front yard are based on physical character and based on one of the physical elements that form the flooring material or other elements that built the front yard area. Based on observation, flooring material have the typical look and do not influence the front yard unique differences. While the physical elements that stands out the most during the field observation are fairly diverse wall separators between the front yard of each residential house. The fence is a physical element that is built personally by the owner of the dwelling in order to determine the boundary between the private area (front yard or building) and the area of railway lines.

In general, front yard differences can be divided into two classification. First one are based on different materials used for the private front yard. This classification utilize spatial character analyzing to shows how different front yard materials can affect inhabitant activities. The second classification are based on wall separators. This was intented to comprehend how every type of front yard with certain separator can generate different spatial character in accordance of building access for everyday uses. Most of the building uses are influenced by daily activities, but not affected by the size of land area. These two classification can be seen through following top-down view maps:

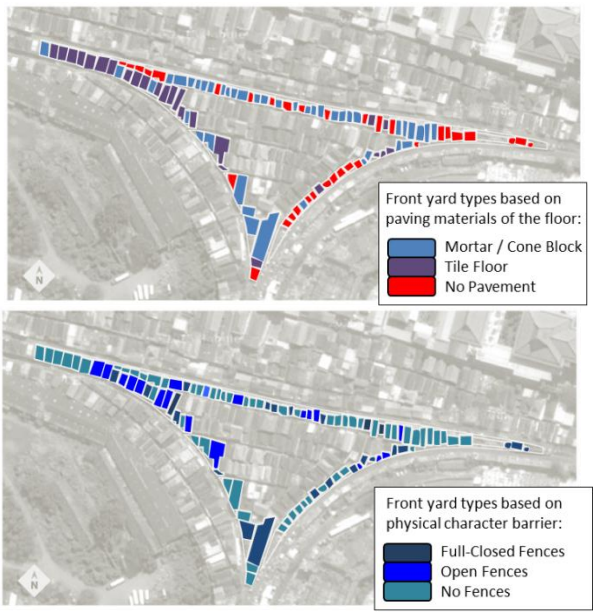

Fig 10 Top-down mapping of spatial Influence on Railway Terrace

Table 2 Front yard Material and Characteristic

Types of Front yard	Physical Description	Spatial Characteristic
1. Pavement of cement mortar or cone block flooring	Front yard with cement mortar or cone block as a pavement material mostly have a grey colored grainy or rough surfaces.	Front yard which is using mortar cement floor pavement characters tend to have less clean in appearance. Texture of cement mortar were a little rough, grayish color and indirectly directing the use of the front yard area as the area is dirty or wet areas.
2. Pavement of tile flooring	Front yard which is use traditional pavement tile floors tend to have the appearance of a clean and tidy enough.	Slick texture and colors that can be combined as desired, capable of adding aesthetics value that support color or shape of the facade of the house.
3.Without pavement of flooring	Front yard with no pavement flooring mostly use the gravels or dry soil that same materials which is use at the railways area.	Front yard which has no pavement on the edge of the residential houses these rails may look confusing when front yard is not used to move or store goods. Front yard without pavement with a very small area tends to make it look residential homes do not have front yard. Front yard without pavement tends to direct the use as dirty or wet areas.

Table 3 Front yard Barrier and Characteristic

Types of Front yard	Physical Description	Spatial Characteristic
1. Closed Fences	Fences made by brick walls, wooden structure, or also a series of metal with a minimum height +1meter. Barrier of the gate and the fence is blocking access to the movement in and out of the area or a view of railway lines with front yard area.	Front yard with a fully enclosed fence is front yard which has a barrier of fences and gates with restricted access. Front yard which has a fully enclosed fence has private areas that statement is very strong. The fence is covered completely hinder access highly controlled by the owner of the front yard or residential homes.

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2. Open Fences	Fences made by brick walls, wooden structure, or also a series of metal with a minimum height +50cm. A barrier of fences and gates are not overly impede access or movement in and out of view of the area of railway lines with front yard area.	Front yard with open fence is front yard which has barrier of fence without gates with easy access traversed by anyone. Front yard which has an open fence have public access by neighbors or just a certain people are more accessible but still have a statement regarding privacy. Most of the open fences which have a low enough altitude, that fences are used as a seat or as a base to put a few personal items.
3. Without Fences	Front yard without a fence have no barrier of permanent physical building between the railway terrace lines with the front yard area.	Front yard without fences can be said to have no privacy because it have no hitch view or it can't be the obstacle of movement out of the area front yard. To keep showing the boundary between the railway terrace to the front yard areas used elements in addition to the building in the form of plant or just a marker refers to differences floor paving material.

After analyzing the visual richness represented by the appearance of the facade and the consequences of the diversity of spatial forms which represented by a variety of front yard, it can describe the most common forms of the houses of railway terrace area. The picture shows illustrations of the most common facade and photographs of the front yard presented at three tables for three segment area readings. Finally, the these tables can be used as basis of final conclusion regarding the third reading of typo-morphological analysis of the whole segments. Based on initial readings which have been described, the three kinds of grouping types front yard are as follow:

Table 4 Typology of West Segment

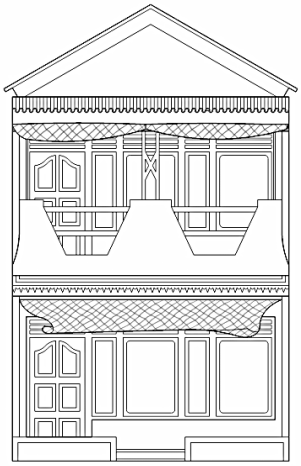
Typology Illustration	Description
 Frequent facade combination	Houses on west segment located between two railways and the main facade facing south with typical typologies of two storey building. Each facade equipped with large windows, supported by balconies or roof as shading devices. Sufficient distances with the railways allowing this typology to have proper shading on the facade. The walls are made of painted brick and the doors are fitted with decoration rather than plain board. The composition rarely show symmetry pattern of the facade components. For mixed use buildings, the first floor facades are dominated by openings or transparent windows for workshop or kiosk. Majority of houses roof are gable with roof tiles. The fences are mainly absent or low separator only for outdoor seating.
The variations of typologies and front yards	

Fig 11 The variations of typologies and front yards at west segment

Table 5 Typology of North Segment

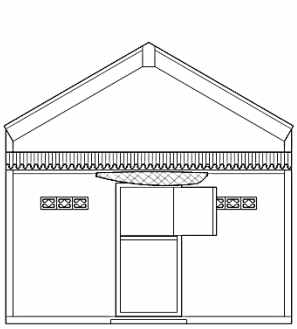
Typology Illustration	Description
 Frequent facade combination	While the north segment facade seems like one storey building due to higher ground, the facades are actually of second floor and displays fewer aesthetical components. The majority of the walls are consisted of unfinished wall such as plain brick, plywood or galvalum board. The windows are integrated with doors as the upper part of doors can be opened separately and act as opening. The ventilation are supported by roster brick also. Rolled tarps are located above doors to reinforce shading for buildings opening.
The variations of typologies and front yards	
	

Fig 12 The variations of typologies and front yards at north segment

Table 6 Typology of East Segment

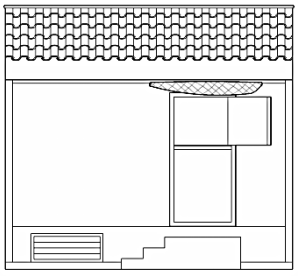
Typology Illustration	Description
 Frequent facade combination	Different typologies are found on east segment as the facades dominated by solid wall with less or no opening at all. It is caused by the buildings orientation which mainly serve as secondary access. The facades are also part of second floor and outdoor stairs are needed below the doors. To compensate the lack of opening, the door are using separate structure also which can act as window while restrict access to building. The ventilation found is tend to be part of first floor room.
The variations of typologies and front yards	
	

Fig 13 The variations of typologies and front yards at east segment

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IV. CONCLUSION

People who choose to inhabit illegal area such as along railway terrace in Surabaya since 1960s are choosing to sacrifice many aspect such as security and poor quality housing to be able to live in close proximity with economical opportunities near downtown Surabaya. With humble beginning, the informal settlement formed at the railway-island and the houses were build over generation and developed as it is today. As upper-lower class seeking cheaper housing and have better chance to seize economical opportunities, over time they can become lower-middle class and able to develop their housing to have better accomodation. But as Turner (1972) shows, the quality of their dwelling, and in turn their attention to aesthetic built is not a priority. Therefore, physical condition of the dwelling could correspond to the income of the owners. Housing are inherited by the next relatives, developed to accommodate more people by building upward as much as possible to maintain the availability of front yard. With a self-help basis on their construction methods, each developed housing featuring various visual richness on each facades and spatial consequences on every front yard can be examined to find the communal characteristic that defines informal housing on railway terrace in Surabaya.

Buildings located at railway terrace are found to have better quality materials for majority lower-middle class and still using lower quality materials for minority upper-lower class people. Although some of the facades are able to indicate proper basic sense of aesthetic such as proportion, rhythm, balance and symmetry, others are merely built to fullfill their basic demand for dwelling. Thus several typologies could be identified by examining facade components. It is found that the well-established lower-middle class are capable to improve thir housing facades past of basic dwelling unit and added sense of distinct from others with different building typology, and shows some degree of self-actualization upon their housing. As the majority of buildings trying to maximize footprint and have close proximity toward railway, many adjustment are found on the facade components in order to declare their status as informal railway terrace housing. They includes: 1). fewer opening for the facades to avoid wind, dust, or splashes when train passing; 2). on west segment of research site, the buildings utiilize balconies to compensate the lack of proper and safe front yard; 3). on north segment the door and window are equipped with rolled tarp, ready to cover the facade opening from heat, dust or rain. It is because the facades are too close with railway and unable to build proper shading devices.

Meanwhile, based on the reading patterns and spatial forms, a residential house on railway terrace tends to maintain a presence of outside space in the form of a front yard that sits between railway lines and building area as space used for various activities or storage for personal belongings. The size of front yard was not influenced by the building. Because basically occupants build their house approaching the boundary area of the railway line as much as possible. The front yard have diversity of shapes that can be grouped based on the use of paving materials; and based on the shape of the floor and the existing fence. Differences in floor paving material is a consequence of different need for front yard area uses. The difference is caused by the fence bordering the access of front yard or affected by owner occupancy also. On the whole area of research, most of the paving material used is cement mortar or cone block with an open fences or no fences that can be used as a multi-function area.

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