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SPATIAL MORPHOLOGICAL ANALYSIS: DEVELOPMENT OF THE NORTH KREMBANGAN AREA, SURABAYA, INDONESIA

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ABSTRACT

The North Krembangan area is an old city area in Surabaya, right next to the Kalimas River. This area has experienced several changes from time to time, both in terms of natural context, roads, blocks/lots, and buildings. These changes were influenced by several factors and actors, both from the Dutch government and from the Surabaya government due to the existence of several new needs that were no longer relevant in the conditions during the colonial era.

Objectives: To identify the morphology of urban tissue in the North Krembangan area which consists of permanent, non-permanent elements and street front quality

Methodology and Results: This research uses the urban tissue methodology by Romice et al as a theory that helps to analyze this area.

Conclusion, Significance and Implications: This research found that although the North Krembangan area has relatively low street front quality, this area is still busy and active as a commercial center. Suggestions to improve the area were also made at the end of this research.

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1. INTRODUCTION

The city of Surabaya, the second largest city in Indonesia [1], boasts many historic buildings in its old city area located in Krembangan. However, this area faces several problems, including slum settlements, traffic congestion, and a lack of green spaces. In particular, the Krembangan area requires a significant increase in green space to meet the recommended standard of 30% coverage. Currently, only 9.6% of the area consists of green open spaces, which are mainly concentrated along the river [2]. In addition, the area contains several historic buildings that could serve as focal points, such as the Stoomvaart Maatschappij Nederland Surabaya Building. Historical records indicate that Surabaya developed into a bustling port city as early as the 14th century during the Majapahit era [3].

North Krembangan is the oldest area in Surabaya with a lot of history. The Krembangan area used to be an important area in the city of Surabaya because it was the city center where there was a port on the Kalimas River. Although it used to be the city center and an important area, currently the aesthetic condition of this area is no longer good [4]. This area is still relatively busy during the day, but quiet at night because there is little human activity at night. Even with these conditions, the Krembangan area is still considered an important area because it contains the historical value of the city of Surabaya, so this area is often referred to as the Old City of Surabaya.

Jalan Rajawali is one of the main roads in the North Krembangan area which plays an important role because it is the main arterial road connecting Tanjung Perak Port with various commercial areas and buildings. During the Dutch colonial period, the Jalan Rajawali corridor was a loading and unloading center for goods from ships traveling along the Kalimas River [5]. Several important years include the era of the industrial revolution in 1906, the city of Surabaya experienced an increase in the field of trade [6], where one of the trade and service centers in Surabaya was located on Jalan Rajawali. Although the colonial impression of this street has diminished due to changes and destruction of buildings, there are still several buildings that have retained their original form [7].

The morphology of a city can be analyzed through its urban tissue. The urban tissue of an area is not static, but can change with the dynamics of the time. The urban tissue includes elements that change or persist over time. Continuously changing human activities and population growth are one of the causes of changes in the urban tissue in the colonial area [8]. In the theory of persistence by Rossi (1982) [9], there are two elements of urban tissue, namely propelling and pathological. Propelling elements are buildings that are still in use today and have vital functions in urban elements, although some of these functions have shifted. Propelling elements are usually characteristic of the city in which the building is located. The pathological element, on the other hand, has no contain particular value and is no longer used due to changes and shifts over time [9]. Elements in a city that are considered persistent are those whose shape does not completely change and still have the same function [10]. Although this area may not be as visually appealing as the downtown area, it is suggested that the propelling and pathological elements in this area are quite evenly distributed to this day, which makes this area even more interesting to analyze.

This research aims to identify the morphology of urban tissue in the North Krembangan area which consists of persistent and non-persistent elements.

2. RESEARCH METHODOLOGY

The research used is a qualitative descriptive method. This research was conducted through literature review and observation. The research included three stages of research, namely: 1) literature review to determine periodization; 2) urban tissue analysis in each period, and 3) analysis of persistent and changing elements.

After collecting data from various journals and searching for old maps of Surabaya, changes in the morphology of the area were identified. After that, the year to be analyzed is selected based on important events that occurred. The year 1905 was chosen because the construction of the highway had not yet begun in that year, as the construction of the highway only began in 1906 [6], and the year 1945 was chosen because Indonesia had just become independent from the colonial period. The analysis of the quality of street frontages in the North Krembangan area was carried out in four stages according to the Urban Tissue methodology [11]

Urban Tissue analysis can be done by making a ground figure diagram from an old map and then analyzing the network [8]. The history behind the development and character of an area can be found through morphological theory [12]. Urban tissue is formed by the activities and culture that occur in an area [13] [14]. Urban tissue consists of several elements, including natural context, streets, building blocks, and buildings. Natural context is a place where a city is located in a certain landscape that includes mountains, rivers, seas, etc., while roads are access to land in the area [15]. A block is an area with a specific function that is bounded by a road that was formed after the road existed [15]. After the formation of the road and block network is formed, buildings are formed, which are also part of the morphological elements of the city where the characteristics of these buildings also form the identity characteristics of the city [15].

The analysis of persistent and non-persistent/changing elements is carried out by analyzing old maps from different time periods in terms of which elements have survived from the past to the present, and which elements have changed, both physically and functionally.

3. RESULTS AND DISCUSSION

Area Morphology

1. Transformation of the natural context

Through the analysis carried out, there are several changes such as the disappearance of ditches from the city walls, but the Kalimas River as the main natural context remains intact.



Fig 1. Kalimas River 1905 , 1945, and 2022

Source : Febe et al., 2023

In 1905, the North Krembangan area was one of the areas around Tanjung Perak Port, which is one of the most important ports in Indonesia because it is on the side of the Kalimas river. The Kalimas River serves as a trade route and water source. The Kalimas River has continued to be revitalized in the last decade and has become a tourist attraction [16]. The development of this area was carried out by the Dutch government to be used as a port for trade transportation purposes. In 1945, the Dutch government started to build railroads to support trade and transportation activities for agricultural products. There are rivers that are also used as roads as the need for land transportation begins to increase. This development was carried out by the Dutch government due to changes in the function of the port so that the Dutch built trains and land routes [17]. The Kalimas River is still maintained. Today, although it is no longer used as a transportation route for trade, because the government has revitalized the Kalimas River for recreational purposes. The development of this area was carried out by the government of Surabaya due to the change in the function of the river into a source of water and recreation.

2. Road Context

Through the analysis conducted, there are changes in the roads from the Dutch colonial period until now, such as the addition of roads at several points due to the increasing need for land transportation. However, there are roads that are still maintained because they are arterial roads in the area, such as Jalan Rajawali.



Fig 2. Streets at North Krembangan 1905,1945, and 2022
Source: Febe et al., 2023

In 1905, transportation activities in Surabaya shifted from river transportation to land transportation such as trains and trams as economic activities also increased [18]. In this year, Jalan Rajawali serves as a transportation road that connects the city center with the Tanjung Perak port. In addition, this road also provides access to various commercial centers, offices and residential areas in the surrounding area. The construction of these roads was led by the Dutch government because of the importance of Jalan Rajawali as one of the main access points connecting the port with the city center of Surabaya. In the era of independence, Jalan Rajawali continued to function as a vital artery in Surabaya's transportation system and became an important access to connect the Tanjung Perak Port with the city center and industrial areas. Jalan Rajawali also received additional public transport routes, improved drainage systems, and upgraded sidewalks and pedestrian crossings. The Dutch government continues to lead the development of these roads, making Jalan Rajawali an important access point to connect the Tanjung Perak Port with the city center and industrial areas. Currently, more roads are being built in the Krembangan area. Jalan Rajawali is still an arterial road as it is a large road that connects to the surrounding commercial buildings. The government of Surabaya is leading the construction and development of roads in this area. [19]

3. Block/Plot

Through the analysis conducted, there has been a change in the function of the block from a Dutch settlement to a residential settlement. There were also layout changes, renovations, and additions of public facilities such as commercial areas and shopping centers. During the Dutch colonial period in 1905, the construction of blocks/lots in Krembangan followed the typical Dutch village layout. In this case, the blocks/buildings may be designed in the Dutch architectural style and have an orderly structure. There are also some lands in this area that are still green lands and not yet used for housing. The construction of this block was done by the Dutch government to be used as a Dutch settlement. After the period of struggle and independence in 1945, the North Krembangan area experienced a period of post-independence development. During this period, there was an expansion of infrastructure, housing development of commercial centers in the area. This development is still carried

out by the Dutch government due to the increasing need for housing. The transformation of the block/lot development in North Krembangan until 2022 may include further development, layout changes, renovations and additional facilities. Recent developments may also include the development of commercial areas, shopping malls, or other development projects. The development was carried out by the government of Surabaya due to the increasing need for housing.



Fig 3. Blocks at North
Source: Febe et al., 2023

4. Building Context

Through the analysis carried out there are changes in the building context, in terms of buildings in this area. There are several buildings that still exist today but have been abandoned or have changed their function, such as the Kalisosok Prison. The harbor no longer exists.



Fig 4. Location of Colonial Buildings before 1945, 1945, and 2022
Source: Febe et al., 2023

Before the independence era, there were still few buildings in this area. Most of the land is still green. There are forts, harbors, commercial and residential areas. The International Building (1926), the House of Sampoerna (1862), and De Javasche Bank (1864) already existed at that time. Much of the

development was carried out by the Dutch government due to its strategic location for port, office, residential and warehouse functions. In 1945, the infrastructure changed and the development continued to be carried out by the Dutch government, so there are many Dutch heritage buildings in this area. North Krembangan developed into an important trade and commercial center. Many new buildings were constructed as shops, shopping malls, restaurants, hotels and other business facilities. The Dutch government did this because of the increasing trade activities. The transformation of building construction in North Krembangan continues to this day. New projects continue to emerge, including the construction of office buildings, residential buildings, shopping malls or other infrastructure projects. The International Building, House of Sampoerna, Hotel Arcadia (1962) and De Javasche Bank are still preserved, although some buildings have changed their function. The Kalisosok Prison is no longer in use. The Kebon Rojo Post Office building, which previously functioned as the father's house, changed its function to the regent's office, and finally functions as a post office to this day [20]. At present, the port function no longer exists. Current development projects are led by the government of Surabaya, as trade activities and housing needs continue to grow.

Persistent Elements of the Urban Tissue in the Area of North Krembangan

Period of Development			Descriptions	
Elements of Urban Tissue	1905	1945		2022
Natural Context	Kalimas River	Change in Function	Persistent	The Kalimas River, which used to be a means of transportation for ongoing trade activities and a water source, is now only a water source and a tourist attraction.
	Small Crossed Rivers	Extinct		There is a part of the Kalimas River that is lost and used as a road because of the increasing need for land transportation.
Streets/square	Main Road		Persistent	The main road in this area serves as the main arterial road connecting Tanjung Perak to various commercial areas for trading activities.
	Red Bridge	Change in Function	Persistent	The Red Bridge is a link between the 2 sides of the Kalimas River. This bridge still exists today although there is a change of material.
	Railway		Extinct	The railway line that was once built to optimize trading activities is no longer in use and has replaced by

			other means of transportation.
	Tram Line	Extinct	The tram lines, which were also used for the benefit of the community trade, have also been removed due to the development of the times.
Blocks	Settlement	Persistent	The residential areas, which used to be Dutch settlements, are now a local settlements.
	Commercials	Persistent	Trade activities still exist, especially wholesale trade. This can be seen in the warehouses still standing on the banks of the Kalimas River.
Building	Shops	Persistent	Shops have also survived in this area to this day.
	Government	Extinct	Government buildings in this area still exist, but there are some that have been damaged, abandoned, or changed functions.
	Malls	Persistent	Malls and other shopping centers are still present in the area and have gone through various developments.
	Hotel	Persistent	Hotels that were once Dutch relics, such as the Arcadia Hotel, have also still survived and continue to operate as hotels.
	Market	Persistent	Traditional markets that have always existed in this area until now are still widely found in this area.
	Entertainment ts	Extinct	Lost entertainment centers in this area, such as Schouwburg Surabaya, which is a theater located on the border between North Krembangan and downtown Surabaya.
	Offices	Change in	Some of the office buildings

		Function	built during the colonial period have disappeared or changed their functions.
Concept of Urban Tissue	Residential Area	Persistent	Several traditional settlements still exist in the area.
	Trade Area	Persistent	The North Krembangan area is still full of commercial activities, although the commercial activities on the banks of Kalimas River have been lost.
	Historic Area	Persistent	In Jalan Rajawali, there are many historical buildings that are still in use although their functions have changed.

Table 1. Urban Tissue Permanence Matrix for the North Krembangan Area.
(Source: Febe et al., 2023)

- a. Road network: The long-standing road network is a persistent element in this area. Main roads and neighborhood roads form a network pattern that connects different parts of the area. Persistent main roads include Jalan Rajawali, Jalan Kalimas Barat, Jalan Pesapen Kali, Jalan Nelayan, and Jalan Indrapura. Lanes are still shared with neighborhood streets.
- b. Buildings: Most of the buildings in the Krembangan area are Dutch colonial style buildings located on the edge of the main road, their function is mainly offices, warehouses, hotels. A small part of the North Krembangan area is also characterized by buildings with Javanese and Madurese architectural styles, especially residential buildings. Residential buildings are often located behind the main road.
- c. Traditional settlements: Several traditional settlements still exist in this area. Traditional houses with traditional Javanese or Madurese architectural features provide uniqueness and continuity of local culture.
- d. Trade Center: North Krembangan is known as a busy trading area. Shophouses and shops are an integral part of the commercial network of this area.
- e. Tanjung Perak Port: The North Krembangan area is located around Tanjung Perak Harbor, one of the most important ports in Indonesia. This port is a permanent element that gives unique characteristics to this area.
- f. Modern shopping malls: Along with the urban development, several modern shopping centers have been built in the North Krembangan area. This shopping center is a new element that enriches the urban network in this area.
- g. Public facilities: There are also persistent elements of public facilities such as schools, health centers,

places of worship, and city parks. These facilities provide services to the community and are an important element of daily life in the North Krembangan area.

h. Rivers: Once a means of transportation, now only limited to urban drainage.

Elements of the Transformation of the North Krembangan Area:

- a. Land use change: This area has experienced a change in land use from the agricultural or traditional residential sector to a denser urban area. These changes occur mainly along with economic development and population growth.
- b. Shopping center construction: One of the major changes in the North Krembangan area is the construction of a modern shopping mall. This mall offers a variety of shops, restaurants and entertainment centers that enrich people's shopping and recreation choices.
- c. Transportation infrastructure: The transformation of this region is also related to the improvement and development of transportation infrastructure. Improving the road network, building bridges, and developing public transportation such as buses or trams can influence the movement patterns and accessibility of this area.
- d. Housing development: The North Krembangan area is experiencing a transformation in housing development. There are modern housing developments, both in the form of houses and apartments, to meet the increasing demand for housing.
- e. Construction of public facilities: The transformation of this area also involves the construction of new public facilities or the upgrading of existing facilities. For example, building new schools, health facilities, and improving the quality of city parks.
- f. Building modernization: Several old buildings in the North Krembangan area have been renovated or modernized to meet today's needs. This may include changes to the exterior design, additional facilities, or the use of modern technology.
- g. Increased economic activity: The transformation of the region also reflects increased economic and business activity. Many commercial, service and industrial businesses have grown in the North Krembangan area, resulting in changes in the economic outlook of this region.

4. CONCLUSION

The morphological study related to urban tissue in the North Krembangan area, which is considered in four aspects, namely spatial planning, land use, road patterns and building layout; shows that the persistent elements in this area are the road network, the Kalimas River, several shophouses and modern shopping centers, traditional settlements, Tanjung Perak Harbor, and also several Dutch colonial buildings such as the International Building, Arcadia Hotel, House of Sampoerna, de Javasche Bank, Red Bridge, and Kalisosok Prison, but some of the buildings have been abandoned or converted. This area is still considered one of the busiest in Surabaya and is widely known as an active commercial

center, although this area has relatively low-quality street frontage.

This research only discusses the morphology of the area to determine the persistence of its constituent elements. Further studies are possible to solve problems and issues in the area such as research related to street front quality, infill design, and so on, because this area is a cultural heritage area.

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