

The Morphological Characteristic of the Salt Factory Former Heritage Area in Kalianget, Sumenep

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Abstract— The term of morphology is widely used to describe the physical form of urban areas based on the historical city. The salt factory former heritage area in Kalianget is a modern industry that was built as the salt briquette factory area during the colonial period in 1899. This study aims to identify the characteristics of urban morphology in the salt factory former heritage area in Kalianget. The deductive qualitative method is used from the beginning of identifying the area problems, field survey and data analysis. This study uses the urban design theory by Roger Trancik. The urban design theory identifies morphology through figure ground analysis, linkage theory, and place theory. The study shows the land was dominated by the factory area in 1947 and has been dominated by the residence and abandoned buildings nowadays. Moreover, the road structure is formed with a grid pattern with the intersections between roads and dominated by T-junction. The center of the salt factory former heritage area in Kalianget is an open space in the middle of the area characterized by the plots building. It closes to the open spaces and the main road has the larger size than the next layer.

Keywords— Morphology, Heritage-Area, Figure-Ground, Linkage, Place.

I. INTRODUCTION

Each city has different urban morphological characteristics. The morphology of the salt factory former heritage area in Kalianget is interesting to be discussed to find out the city development based on the historical aspects. The salt factory former heritage makes Kalianget city is identical as the Old City of Sumenep. This study describes about the characteristics of urban morphology of the salt factory former heritage area in Kalianget, arguing the area is the center of salt briquette factory in Madura. The salt factory former heritage area in Kalianget was successful in the 1900s when the salt production in Sumenep filled the national needs to imports scale.

The historical development of the salt factory former heritage area in Kalianget has several experiences affected its urban morphology. Starting from the beginning of salt was traded as the ingredient of fish processing industry traditionally in the 9th century in Madurese. Up to the 17th century, salt as the main commodity used in Java (Syafi, 2013). In 1870 Madura Island became the main area of salt support for the entire Dutch territory. The glory of Madura Island as the largest salt producer was also supported by rail transportation used for the salt distribution. *Madoera Stoomstram Maatschappij* (MSM) was a private railway company supported the railway infrastructure development program in Madura Island. From 1899 to 1913, the

construction of the railway connected the Kamal harbor of Bangkalan to the Kalianget harbor of Sumenep (Farizi, 2020).

Along with the railway construction, the Dutch East Indies government built the first modern salt factory in Kalianget to strengthen the government economics and political position. The salt factory in Kalianget was built with the complete urban facilities and infrastructures such as salt storage warehouses, power plant buildings, water reservoirs, laboratories, mess for employees, and entertainment facilities including cinemas, swimming pools, and parks.

The salt factory former heritage area in Kalianget was developed as a modern urban area with various urban facilities and infrastructures. Since the Indonesian Independence, the salt factory had been managed by the government through *State-Owned Enterprise* (BUMN). The factory former had been used as the head office of PT. Garam up to 2000. From 2000 - 2018, the head office of PT. Garam had moved to the Surabaya. Since the office moved, for 18 years, the salt factory former heritage area in Kalianget had loosed its main activity center. It has the impact on decreasing the vitality of the area.

Currently, the salt factory former heritage area in Kalianget condition is in a low vitality area or in a dead condition (Nuurlaily R, Antariksa dan Sari, 2011). This condition is caused by three things. First, the lack of the government funding and the old building managers called the economic factors. Second, the building physical factors which is caused of the decreasing of the use ancient buildings. The last, the social factors which is caused of the low community participation in the historical areas.

The discussion of the salt factory former heritage area in Kalianget morphology aims to describe the historical content in the spatial design process of the area in the future. The reason for choosing the research topic is to identify the morphological characteristics of the salt factory former heritage area in Kalianget through the form of a modern colonial city residence that was built in a planned manner.

II. LITERATURE REVIEW

Morphology is defined as the pattern of land use within the area (Helm & Robinson, 2002; Kropf, 2009). In simple terms, morphology relates to the physical form and the land use in a spatial scale. Urban morphology is an approach in the urban design. It aims to strengthen the characteristics, protect the building environment, and preserve the area based on the history and the city pattern.

Urban morphology refers to the city pattern including architecture, street layout, and residence density (Kropf,

2009). They are three components of urban morphology according to Conzen:

- Ground plan (road pattern or building block).
- The shape of building (the type of building).
- Land or building utility.

According to Zahnd, 1999, the components of urban morphology include:

- The elements of road use.
- The road patterns.
- The type of building.

Urban morphology is an approach to study and design an urban forms by considering the physical and spatial components based on the urban structure of plots, blocks, roads, buildings, and open spaces as the part of the city development process (Sanders, 2008; Arsiya Ravari dan Mazloomi, 2015).

Morphology is the basis for managing the area based on its history (Whitehand, 2001). Morphological studies need to be carried out in historical areas, or so-called heritage areas. In the study of architecture and urban design, morphology is a science that studies the shape, structure and formation of a place in an urban setting (Primayudha, 2015). Information about to morphology is useful for determining conservation actions to be carried out in heritage areas

III. RESEARCH METHOD

This research approach uses qualitative. Qualitative research is a multi-method that studies several things with a naturalistic approach, in other word the researchers try to understand or interpret the encountered phenomena (Groat dan Wang, 2013). The type of the research is qualitative deductive. This qualitative deductive method uses theory from the beginning of identifying regional problems to conducting field surveys and data analysis. Theory is used as a measuring tool to answer the research questions. The first step identifies the research variables and indicators that have been compiled based on a theoretical review of regional morphology which is adapted to the existing conditions of The salt factory former heritage area in Kalianget. The second step is processes the data obtained and analyzes based on the city design theory. This method is expected to answer the research question of the morphological characteristics of the salt factory former heritage area in Kalianget.

The data was collected through the primary surveys including interview and observation, as well as the secondary surveys regarding to the literature studies and the agency surveys. The research unit of observation is all the regional objects located in the delineation of the salt factory former heritage area in Kalianget. The object includes the physical units such as buildings, open spaces, and roads. Below are the data needed to determine the morphological characteristics of the salt factory former heritage area in Kalianget:

TABLE I. The Type of Data.

Type of Data	Required Data	Source of Data
The Road Physical	<ul style="list-style-type: none"> • The name of road • The dimension of road • The orientation of road 	<ul style="list-style-type: none"> • The measurement of road dimension • Field observation

Type of Data	Required Data	Source of Data
Data	<ul style="list-style-type: none"> • Permeability • The circulation direction and park 	
The Building Physical Data	<ul style="list-style-type: none"> • The function of building • The style of building • The direction and orientation of building 	<ul style="list-style-type: none"> • The archives of building • Interview • Field observation
The Land Physical Data	<ul style="list-style-type: none"> • The name of open space • The spread of open space • The wide of open space • The active and passive activities • The function of open space 	<ul style="list-style-type: none"> • Photos by digital camera • Field observation
The Region History	<ul style="list-style-type: none"> • The map of briquette factory in the colonial era • The age of building • The spread of urban facilities and infrastructures (the location of activities center) in the colonial era • The history of region development (the regional history) 	<ul style="list-style-type: none"> • The archives of PT. Garam (Persero) area

IV. RESULTS AND DISCUSSIONS

The morphological characteristics of the salt factory former heritage area in Kalianget area is organized based on the morphology elements. They are roads, buildings, and open space which is still existing. In the beginning of the salt factory former heritage area in Kalianget was built in the 1890s, the city shape function was as an industrial area with its rectangular city pattern and it was linear with a coastline. Over time, there was a decrease in salt productivity caused the factory building as the main function of the salt factory former heritage area in Kalianget was taken apart. It caused the operational area of the Kalianget salt factory left the wide and unmaintained open space. Nowadays, some residential facilities have found such as mess that has the coupling house with an Indisch style as its characters. The roads of the salt factory former heritage area in Kalianget are interconnected. It is crossroad in the form of a T-junction as its characteristics.

A. Figure Ground

The development of figure ground shows the domination of building in the salt factory former heritage area in Kalianget. In 1947, it was dominated by large buildings with salt processing and storage function. Along with the decreasing of the national salt productivity after the Indonesian Independence, several factory buildings were sold and destroyed. At the present, there are only factory building which is used as the head office of PT. Garam and the neglected salt warehouse.

This time, the land function is dominated as the residence, it is 36 percent. The function of the land has not much changed from the beginning construction of The salt factory former heritage area in Kalianget. The urban morphology is very influenced by the local culture that has a long history. The map of figure ground shows the residences in the salt factory former heritage area in Kalianget have planned shape. This can be shown from the regularity of the land plots and the geometric shape of buildings.

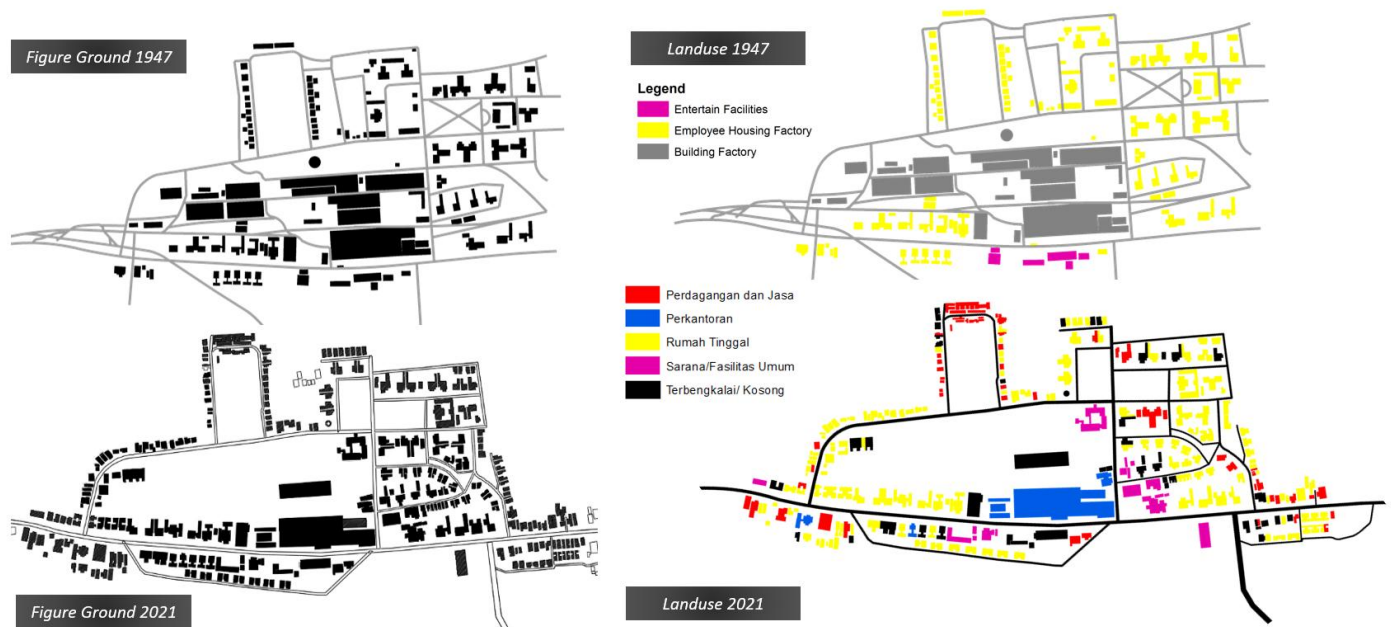


Fig. 1. Figure Ground Comparison of the salt factory former heritage area in Kalianget

Fig. 1 shows the function of the building in 1947, it was discovered that there were at least 10 large factory buildings and other supporting buildings of the salt factory former heritage area in Kalianget. The building consists of a salt storage warehouse and a salt processing building. As salt production decreased, these buildings began to stop operating. Until now, only 3 main buildings are left in the factory area. The 3 buildings currently function as the head office of PT. Salt, research buildings, and salt storage warehouses are also used as badminton courts.

The domination of the building currently has a function as a residence or official residence for PT. Garam with a proportion of 58%. The rest are buildings with 20% trade and service functions, 3% office functions, and 3% public facilities/facilities. Identified 55 buildings or 20% as abandoned or empty buildings. The empty building was left neglected and gave a spooky impression. Generally this empty building is the official residence of factory employees during the Colonial period.

All buildings of the salt factory former heritage area in Kalianget during the colonial era were designated as residential houses, but since the glory of the salt factory faded and many factory buildings were demolished and offices moved to Surabaya, official houses became abandoned. When compared with the function of the building on the colonial road, the difference is very visible. That is, the area that was originally dominated by factory buildings has now disappeared, replaced with open space that is left without utilization.

The solid areas that exist today are the mess buildings for employees which was built during the glory of the salt briquette factory in Kalianget. Several void areas in the salt factory former heritage area in Kalianget are the open spaces which have been planned as a forum for community activities and some are formed because the former factory area was demolished. It was identified that there are three open spaces

have existed since the colonial era. The field is located at the west, middle, and east through Brawijaya Street. The buildings and plots around the western and central field have the larger characteristics than other buildings. However, the plot surrounding the western field is the smallest plot in this area.



Fig. 2. Percil in 2021.

This finding indicates the area around the eastern and central part of the field was the elite Europeans residence during the glory of the salt factory but in the western part of the field was the indigenous residence who worked at the salt briquette factory. In terms of salt control by colonial, the Dutch government needs a salt business organization to ensure the smooth production and distribution of salt. At that time, the colonial salt production staff was filled by Dutch and natives. Jobs in lower positions were assigned to private employees, while the highest positions were assigned to Dutch personnel. There are foremen and native workers. This job

desk division system affects the laying of space lots in the factory area. supporting facilities for employee houses built based on factory job positions

TABLE II. The Wide Classification of Plot Area in the salt factory former heritage area in Kalianget

Type	Wide Plots (m ²)	Total of Plots	Percentage
Small Type	100-400	156	52%
Medium Type	400-800	72	24%
Large Type: A	800-1200	27	9%
Large Type: B	1200-2000	28	9%
Large Type: C	More than 2000	18	6%
	Total	301	100%

The buildings located at the Primary Streets, such as Kalianget Highway and Gajah Mada Street, have the larger land plots than the secondary functions roads. The distribution of these large plots are related to heerenstrat (main road) occupied by the salt factory director. The buildings development in this area ran accordingly to the factory’s glory before Indonesian Independence.

The buildings in the salt factory former heritage area in Kalianget are the solid elements which forms the morphology area. The characteristics of the morphological elements of the building are grouped based on the function, style, direction, and the type of building. They are:

1. The current function of the buildings in the salt factory former heritage area in Kalianget is as the residence, service and trade, office, public facilities, and the abandoned or empty buildings. Based on the observation data, it is known the most dominant function is 58% of residence. The second dominated building is 20% services and trade buildings. The number of abandoned or empty buildings in the salt factory former heritage area in Kalianget is 17%. This fact is due to the lack of building utilization and the changes of building function used as the factory area.
2. The characteristic of the building style in the salt factory former heritage area in Kalianget is a colonial nuanced building. Up to now the Indisch building can be found even though the buildings condition is abandoned. Besides the Indisch building, there are also the traditional Madurese buildings and the modern buildings built after Indonesian Independence. The dominance of the building style is an Indisch building with a percentage of 66 %. The modern building style is 33%, moreover the traditional Madurese building is only 2%.
3. The types of buildings found in the salt factory former heritage area in Kalianget are residential buildings, row and coupling buildings. They are 145 buildings or 49% of the total buildings are single buildings. Several types of single building in the salt factory former heritage area in Kalianget have the character of a larger building area than other buildings. And the last, the coupling building is 47% and the row building is 49%. It becomes a unique characteristic finding. This unique characteristic finding relates to the house construction with the front view of one building but consists of two plots. This one-roof building with two plots can be found in many residences

around Brawijaya park. This building has different characteristics with the building in the Hereenstraat which is characterized by a single building.

4. The building direction and orientation in the salt factory former heritage area in Kalianget follow the road direction. Based on the observation result, it is known that 37% of the buildings face to the south (sea direction) and 33% of them face to the north whereas the buildings face to the west and east are 16% and 14%. In addition, it is also known that the buildings face to the south and north dominated the salt factory former heritage area in Kalianget . It means, the architects built the house in avoiding the direct sunlight. Thus, the buildings in Kalianget city avoid the sunlight direction. The building faces to the west has a higher temperature than the building faces to the east. It can be concluded that the buildings layout in the salt factory former heritage area in Kalianget pay attention to the sunlight direction and the region geographic.

B. Linkage

The roads structure in the salt factory former heritage area in Kalianget is grid-pattern with a field as its center. The structure pattern of the salt factory former heritage area in Kalianget is a grid-pattern and linier to the coastline.

The dimension of the road structure shows the tiered level classifications based on the road function. At the region scale can be classified into primary and secondary road. The higher function of the road namely primary road has the wider road dimension than the secondary road. Linkage examines the relationship among the activities center in the region. Based on the characteristics of the main activity of the salt factory former heritage area in Kalianget as a factory area, it is known that settled is the activity has been carried out until present.

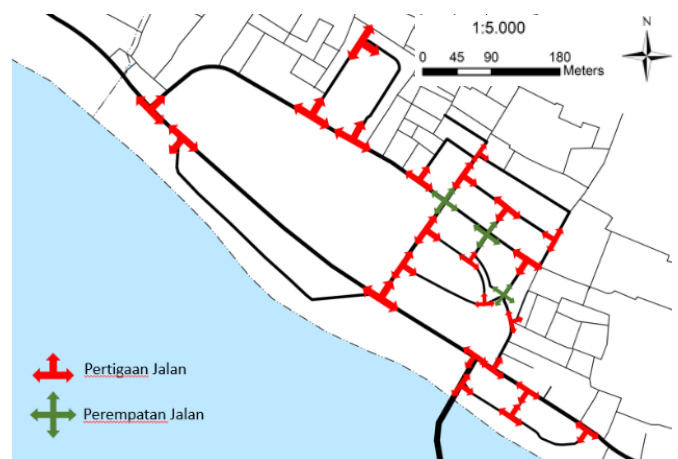


Fig. 3. The Road Structure of the salt factory former heritage area in Kalianget

The activity center as the salt factory along the main street of Kalianget closely relates to the Kalianget harbor. Based on the result of analysis, the region linkage is identified into some routes, they are:

1. The road structure totally found 15 roads space.

2. The railway of the salt factory former heritage area in Kalianget was crossed by the railway which was connected between Kalianget harbor and Kamal harbor, Bangkalan. However, this railway was demolished in 1939. This train picked up the passengers and the commodities from the station in the Kalianget harbor to the Kamal harbor as the final route. The railway in the colonial period crossed along the north side of Kalianget Highway.
3. There was the lorry track in the salt glory era. The briquette salt factory had the salt transportation mode from ponds or harbor to the factory area. The lorry train used the railway former that was closed in 1939. Unfortunately, all the railways are removed. The lorry coach only has been displayed as the monument in front of PT. Garam office.

Below are the detail characteristics of the road in the salt factory former heritage area in Kalianget:

1. The road orientation was built based on the geographical coast in the southern part of the salt factory former heritage area in Kalianget. The road in the salt factory former heritage area in Kalianget is dominated by the road that is parallel with the coastline. Thus, the road orients to the east and west.
2. The road length of the salt factory former heritage area in Kalianget ranges from 100 – 1000 meters. The longest road is Kalianget Highway which is stretching for 1 km whereas the shortest road is Cakraningrat street which is stretching for 90 meters. The length of this road forms a convenient block size to find out a branch of the road as an alternative road in the area.
3. The width of the road in the salt factory former heritage area in Kalianget is identified between 3 - 7 meters. The widest road is Kalianget Highway which becomes a provincial road. The average of width road in the salt factory former heritage area in Kalianget is 4 meters or it has two lanes for vehicles.
4. The distribution of road structure in the salt factory former heritage area in Kalianget is branched in parallel lines and establishes an angle of 90° or t-junction. There are three existing roads used for accessing and exiting from the salt factory former heritage area in Kalianget. The roads are Brawijaya Street, Gajah Mada Street and Hayam Wuruk Street.

C. Place

The region physical identity can be identified based on the distinctive form of building in the salt factory former heritage area in Kalianget. Some of the existing old buildings can be a potential identity of the heritage element of this city. This potential was a wealth of colonial heritage architecture of the salt factory in the past, and it has been an office area of PT. Garam employees.

1. Nodes

Nodes are the strategic areas with the several activities that meet each other and can be changed to other directions or activities. Its center is an open space that is used as an activity place by the community. At the

present, this open space is as the children football sport facility. These nodes can be found in the T-junction between Kalianget Highway and Gajah Mada Street, precisely in the head office of PT. Garam. This existing nodes in the salt factory former heritage area in Kalianget need a design to strengthen and clarify the area used as the nodes area in the past.

2. Path

Path is the most important element for an image city. The path in this study is the circulation routes that is used for the mobilization and movement. Generally, it is the roads, pedestrian routes, main alleys, drainage channels, and railway. Path has a better identity if it has a big destination such as to the rail station, monuments, squares, et cetera. Moreover, it has strong enclosure such as facades, trees, and space scales.

3. District

District is an urban area in the two dimensions scale. A district has similar characteristics including shape, pattern, and form and is also distinctive within its boundaries, where people have to end or start. District of the salt factory former heritage area in Kalianget is the salt factory emplacement and the factory employee residence around the factory. The boundary has been examined based on its existence. It is from the Kalianget Islamic hospital to the Kalianget harbor including the old building of colonial heritage.

4. Edge

Edge is a linier element which is not as path. The edge is on the boundary between two specific regions. Its function is as a linier breaker. The edge elements in the salt factory former heritage area in Kalianget is physical boundary between sea and land area. The seashore is emphasized by the mangroves along the the coast whose existence is useful for encouraging the salt factory former heritage area in Kalianget activities.

5. Landmark

Landmark is a reference point such as nodes element and people can see its location from the outside. Some objects can be a landmark in the salt factory former heritage area in Kalianget. They are Japanese heritage bunker in Merdeka Park and the buildings at the head office of PT. Garam.

V. CONCLUSION

A two-dimensional display from the solid and void element in the salt factory former heritage area in Kalianget establishes a planned area. The division of land plots in each building looks very symmetrical and creates the layers based on the area center (the open spaces and roads). The factors of city former are influenced by the coastal geographic in the south and the salt transportation nodes. The colonial government built the salt factory former heritage area in Kalianget closed to the harbor and railway that was as the salt transportation nodes. The formation of the salt factory former heritage area in Kalianget was developed by following the shoreline. When compared with the function of the building on the colonial road, the difference is very visible. That is, the area that was

originally dominated by factory buildings has now disappeared, replaced with open space that is left without utilization. The road structure is the grid-pattern with the form of T-junction in the 23 points and intersection in the 2 points. The center of the salt factory former heritage area in Kalianget is the open space located in the central area with the building plots characteristics that closes to the open space and the main road has a larger size than the next layer.

REFERENCES

- [1] Arsiya Ravari, A. dan Mazloomi, M. (2015) "A Framework for Urban Morphology with Respect to the Form," *Armanshahr Architecture & Urban Development*, 8(14), hal. 91–103.
- [2] Farizi, H. Al (2020) *Melacak Kembali Transportasi Kereta Api di Madura, 1929-1939*. Surabaya: Pustaka Indis.
- [3] Groat, L. N. dan Wang, D. (2013) *Architectural Research Method*. Second Edi. Canada.
- [4] Kropf, K. (2009) "Aspects of urban form," *Urban Morphology*, 13(2), hal. 105–120. doi: 10.1002/9781118747711.ch3.
- [5] Nuurlaily R, S., Antariksa dan Sari, N. (2011) "Vitalitas Kawasan Bersejarah Pt Garam Kalianget-Madura," *Arsitektur E-Journal*, 4(3), hal. 174–184.
- [6] Primayudha N (2015) "Tinjauan Pembentukan Kawasan Pusaka Budaya Kampung Glam di Singapura dengan Pendekatan Analisis Morfologi dan Tipologi Bangunan" *Jurnal Itenas Rekarupa* 3(1) 33
- [7] Syafi, I. (2013) "Competition of Salt Transportation in Madura Strait (in Bahasa)," *Jurnal Sejarah CITRA LEKHA*, XVII(1), hal. 85–104.
- [8] Whitehand J W R (2001) "British urban morphology: The Conzenian tradition" *Urban Morphology* 5(2) 103–109
- [9] Zahnd, Markus (1999), *Perancangan Kota Secara Terpadu*, Kanisius, Yogyakarta.