Change of Element Settlement in Musi Riverside Palembang

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Abstract. The development of the city in the modern era has had an impact on the culture of people living in the riverside. The river-oriented settlement culture is transformed into a land-based settlement culture. In this development, changes in the form of a settlement environment depend on the position of environmental elements in cultural systems such as nature, man, society, shells, and network. Changes in the form of environment affect the elements of the settlement. Some of them are repaired in building structures but material changes and others change following the development of the settlement orientation process. These changes undermine the identity, character, and potential of river architecture and settled cultures that were originally in harmony with river life. The purpose of this study was to explore the incidence and explanation of changes in the settlement elements in the Musi River and the architectural aspects of the house and residential type through a qualitative approach. Data collection is done qualitatively by using data collecting technique that is field observation, depth interview, and literature study. The analytical technique used is through qualitative approach of case study with a combination of strategies that identify elements of rural community settlements with triangulation. This study found the change of the settlement elements of the Musi River Palembang River from the river-oriented to the land-oriented. This study concludes that changes in the architecture and building system of river settlements that include changes in the orientation of buildings to rivers, the addition of space under the stilts, material changes, changes in the function of house space, and changes in river environmental infrastructure caused by the influence and development of land-oriented culture settlements, based on the elements of settlement on the banks of the River Musi Palembang.

Keywords: Architecture; Element; Settlement; Change; Riverside.

1. Introduction
The existence of a river precedes human settlements with its activities. Further human development uses rivers to support life activities in life, transportation, carrying out work, fishing, sanitation, and drainage networks. Riparian settlements can be understood as settlements that have agricultural life, economic life, and social life depending on rivers, creeks, or canals where the location and placement of settlements are closely related to river geography (Davis in Oliver, 1997).

In this development, changes in the form of a settlement environment depend on the elements of settlement within the cultural system of man, society, shells, network, and nature (Doxiadis, 1968).
Changes in the form of environment affect the elements of the settlement. Some of them are improvements in the structures of building construction but undergoing material changes and functions that change following the orientation of the settlement on the road. This change in the orientation of shapes and patterns of settlements leads to a change in the pattern of life, from the people who originally made the river the most important element unimportant, as the rear and the elements began to be abandoned. These changes undermine the identity, character, and potential of river architecture and settled cultures that were originally in harmony with river life.

The development of the city in the modern era has had an impact on the culture of people living in the riverside. The river-oriented settlement culture is transformed into a land-oriented settlement culture, which builds houses by raising the land by hoarding or reclaiming to anticipate wetlands, lowlands, swamps, floods and tidal water (Siswanto, 1999). To build a house on stilts means no need to do reclamation that can damage the groundwater surface and make some permanent floods to existing lower environments. On the other hand, building a house on stilts does not require cutting the ground, which can damage the topography and landscape, where it also causes erosion, and landslides.

Construction of road infrastructure since 1930 people on the banks of the Musi River began to leave the river with the construction of connecting road Palembang to other areas in South Sumatra built by the Netherlands (Figure 1). Santun (2010) took an interesting approach in analyzing changes in the city of Palembang, from the 1930s to the 1960s. The ecological improvements and development of the city itself - land, rivers, roads, buildings and finally, the Ampera Bridge - not only seen as physical construction, Palembang is a city with many identities that flows in and overlaps with each other. Water and soil have always been a major element in defining the identity of urban fluids and their inhabitants. When transportation is still using the Musi River as its infrastructure, the stilts house is built built with river-oriented. The inhabitants of the raft house can be closer to the workplace so it is more efficient to reduce transportation costs and time. Today, new houses erected on the banks of the river no longer anticipate and adapt to the riverside environment. The pyramid house and the stilts house warehouse provide the right picture that the stilt house is perfectly adequate for swampy, tidal and lowland areas.

Figure 1. A settlement map before 1930, when it began to build road infrastructure. Sumber: KIT MAP Library of Leiden.

Figure 2. Overlay result map of change element settlement in 2004 and 2017.

The stilts house which was originally the most important part of the tradition settled on the banks of the Musi River is no longer in use. Raft houses are getting smaller, stilts houses are made non-stilts, and land houses become dominant. The condition of the Musi River and the Musi River is narrow and closed due to the use of community to live. Initially people still use the pole above the river body to expand the space of his house, in the subsequent development of the river body was dumped, made space and became part of the house. The river also developed into the back of the house with the existence of the road. The function of the river as a drainage network also narrows, consequently if the flow is not accommodated in the river body will overflow up to the community settlement. Another river problem is pollution and garbage disposal. The community settlement that originally faced and adjacent to the river shifted back to the river. Houses that originally anticipated the tide of river water...
with the construction of the pole of the stilts also turned into a non-stilts construction that begins by hoarding into a type of land-patterned house. Changes in river orientation are also caused by the limited raw material of wood for boat making and the construction of a house supporting pole similar to ungen and tembesu which is becoming increasingly scarce. (Kompas, 2010).

Figure 2 shows changes in the settlement elements in 2004 and 2017 that indicate the reduced response of riverside houses to river environments. Furthermore, the use of stilts pivot can prevent unnecessary reclamation and may cause flooding. Based on the formulation of the problem, there are things that become research questions are: What are the elements of settlements on the banks of the River Musi Palembang that changed? The purpose of this research is to reveal the change of settlement elements of Musi Palembang River with qualitative approach of case study with combination of strategy and studying aspects of man, society, shells, network, and nature. The objective of this research is to explore the change of settlement elements of Musi Palembang River qualitative multi case study approach purposively with combination of strategy in terms of man, society, shells, network, and nature during 2004-2017 at 7 Ulu and Kuto Batu Palembang.

2. Review Riverside Settlement

Several studies relating to river settlements have begun and at least insights on the study were conducted. Change is something that must happen, not least in the world of architecture. Artificial environment (built environment) from the smallest scale / unit, residence to the city scale must have changed. Changes in the built environment (built environment) can be caused by various factors, such as; technology and information, knowledge, environment, demands of life. Individual change is a natural thing to see as an attempt to find a new balance with the changes that occur is the negative impact of change or inability to predict it. (Mentayani, Nuryanti, Prayitno, & Sarwadi, 2010). Taal (1997) sees changes and diversification of functions at the Limas house in Palembang. Under the influence of building materials and functions, the pyramid house is always changing. The impact of social change on cultural aspects. The pyramid house is getting less special and important in expressing the owner's status. Siswanto (1999) writes vernacular settlements in South Sumatra such as pyramid houses and raft houses in the corner of the building and system structure. Some elements of the house, especially building materials and structural systems proved to be suitable for traditional and modern settlements.

According to Doxiadis (1968), human settlements consist of contents and containers that are physical and man-made physical settlements as a place for human life and activity. Settlements cover the entire surface of the earth as the largest container for humans, as the whole human cosmos, cosmos anthropos. These settlements cover the aspect of space and the people who live in it. The container aspect as space is the man-made environment or the natural environment including the physical elements of abiotics, biotics and creatures within them in ecological unity. The purpose of Ekistics is to achieve a balance between the elements of human settlements to ensure happiness and safety for humans. Two basic elements of human settlements, contents and containers, can be divided into five elements (the Ecumenical Elements). The fundamental difference between Shelter and Network lies in the fact that Shelter provides temporary protection. The relationship and dynamics of the combination of settlement elements according to Doxiadis contain more than 33,000,000 (Thirty three million) combinations.

2.1. Category of Musi Palembang Riverside Settlement

In general, there are 5 (five) settlements in the water environment, Bale (1994) describes the most important settlements in the most important waters of Indonesia in coastal waters or above river waters. Some of these settlements are at once in the swamp and marine environment. Conditions of such waters encourage settlers to build houses on stilts, not to avoid sea tides, but to avoid overflowing river water in the wet season. This type of settlement is found at the base of a large river in the lowlands of the east coast of Sumatra. Settlement centers can be on the edge of the land, on the waters edge, and over the river water. Types A, B, C, D, and E are found in Sumatra and Kalimantan. Based on topography, settlements in Palembang, located in water, rivers or rivers and land, Rivers grow very naturally, depending on tidal conditions and river water flows. To avoid the tide is always changing,
and affect the surrounding area, the embankment is used as a barrier (Figure 3). Elements of settlements on the banks of the changing Musi River Palembang are the physical elements of settlements and community activities that change from the base river to the base ground are: orientation buildings, residential / building functions, materials for use, environmental infrastructure, and day to day (Wicaksono, 2017).

Typology of the Musi River River House occurs from (Budiyuwono, 2016): floating house on water that can move because it has no foundation; floating houses on water that can not move because it has a foundation that is embedded in the ground at the bottom of the river. Palembang has a character as a water city. Statistics from 1990 show that the physical condition of Palembang city, consisting mostly of water that is close to 52.24%. This can be seen from the many great rivers and tributaries in the city. The river in Palembang is heavily influenced by tides, with effects as far as 60 km from the mouth of the river. The highest wave occurs from October to April, with fluctuations in water levels reaching 2.50 - 3.50 meters at high tide. As a result, buildings in the stilts area of 2.50 - 3.50 meters with the height of the river bed, located above, or on the surface of the tide. Based on topography, settlements in Palembang, generally located in three locations, namely directly on water, river banks and land. Rivers grow very naturally, depending on the state of tidal and river water flow. To avoid pairs always changing, and affecting the surrounding area, the embankment is used as a barrier (Figure 4). The house of people on the banks of the Musi River - Palembang by location and condition is divided into 3 categories (Dwinasari in Iskandar, 2010): (1) The house is located in the river body, which is always floating on the water, called the raft house, (2) on the banks of the river whose condition depends on the location of the tidal water called the stilts house. (3) Houses located on the banks of rivers located in relatively dry areas with soft and watery soil conditions during seasonal floods, called stilts houses.

2.2. Change of Element Settlement
Historically, the settlement of the Palembang River River is located on the stilts above and along the river bank. Conditions there are neatly arranged still standing strong but some are rickety because the wood is weathered. The residents live at the top, the bottom is filled with pillars of home construction. The buffer pole averages more than two meters from the ground so that it is safe from water entering the house. The river stream flows at the bottom, while the top remains secure.

Stilts houses are built because they respond to wet conditions of river or swamp water, and less dry soil conditions. Besides working for the safety of wild animals. Settlements are built in wetlands, especially on the banks of rivers, because rivers have natural resources that can meet basic needs such as fish, besides rivers can be used as means of transportation with the surrounding area in marketing plants and others. Supply of suitable wood type to be a buffer home with durability of several decades of ungen and tembesu wood.

Nur'aini, C. (2010) in this paper entitled Environmental Design Theme in the River Region: Learning from the Banks of Southeast Asia is trying to explain the theme of environmental design on river banks in the region, especially Southeast Asia. People living by the river have a unique culture
with unique water and river perception. For people living on the banks of rivers, water and rivers are not only important contexts in their lives but also contain spiritual values. Humans and water have been linked since the beginning of man. Important lessons from this study relate to two main themes 1). Water and River 2). Water area. The theme of water and river is related to five points, namely: a) water as a source of living water; b) the spiritual value of the river; c) local wisdom; d) based on traditional waters; and e) community participation. The theme of the water area is related to seven points, namely: a) the pattern of space; b) Building Style; c). Building structure; d) Material Use; e) Change of Transportation System; f) Public Space Functions; and g) Residence Changes. Khaliesh, Widiastuti, & Budi, 2012 writes Kampung Beting River Settlement Characteristics in Pontianak writes that settlements are the environment formed based on the relationship between natural elements and artificial elements. Settlement as a form of environment is closely related to the setting or hue of human behavior and the prevailing social environment (Rapoport, 1977). Meanwhile, according to (Doxiadis, 1968), the formation of settlements is influenced by several factors that can be seen as ecology, ie man, society, shells, network, and nature. To determine settlement changes on the banks of the Musi River, the researchers applied the five elements of Doxiadis ecology and observed changes in "stilts houses" and "non-stilts" settlements.

3. Methodology
Research method of change of settlement elements of Musi Palembang River side by qualitative approach of multiple case study with aim of combination of strategy in terms of man, society, shells, network, and nature in 2004-2017, in-depth interview and triangulation to get information about change of river settlement elements. Data are collected from various sources or at least from six main sources, ie documentation, archive archives, interviews, and field assessments. This research seeks to enrich research by collecting many cases and drawing conclusions on each case. This study will also describe things as they are and try to understand diversity according to the interpretation of the cultural supporters themselves. This study will look at the effect of the reduced existence of the Musi River on changes in riverine settlements. Data collection is basically done qualitatively in the form of observation on the role of river to settlement, in the form of in-depth interview and literature study. The observations focused on the settlement of the banks of the Musi River at 7 Ulu and Kuto Batu. In general, these houses have been in existence from 50 to an average of 100 years ago, and even some homes are nearly 200 to 300 years old.

4. Results and Discussion
The data were collected at two areas of Musi river Palembang, Kuto Batu and 7 Ulu. In the area of kuto Batu found changes in the element of shelter (shell). Type changes that occur are changes in function and material changes. In the region of 7 Ulu found changes in the elements of Man and Society, Network. The types of changes that occur are changes in orientation to land and changes in land-patterned shelter. Table 1 shows descriptions of changes occurring in both areas. The results of field observations on the response of residential buildings with riverside land in kuto batu and 7 ulu areas showed a change in the use of river banks. Table 2 shows that in 2004 most of the river banks were river bodies. In 2017 there is a change of river body into a land-based settlement.

| Area         | Photo | Owner        | Age House | Change Element | Type of Change               |
|--------------|-------|--------------|-----------|----------------|------------------------------|
| Kuto Batu    |       | Habib Abdullah | More than 300 year | Shells       | Changed of space function physically unchanged one year twice used for Eid prayers |

Table 1. Types of Changes to the Architecture of the Riverside
Kuto Batu

Habib Dulah, Lr. Kenduruan

More than 50 years
Shells

Changed from wood house to brick masonry house building material, still form stilt house

7 Ulu

Kenduruan Riverside Settlement (Tributary Musi)

More than 200 years
Man and Society, Network

Changed from water area to land area

7 Ulu

Table 2. Identification of Change Settlement Element 7 Ulu and Kuto Batu in 2004-2017

| 2004                  | 2017                  | Change of 7 Ulu | Change of Kuto Batu | Amount (Hectare) 7 Ulu | Amount (Hectare) Kuto Batu |
|-----------------------|-----------------------|-----------------|---------------------|------------------------|-----------------------------|
| Body River            | Body River            | Unchanged       | Unchanged           | 7.92                   | 7.81                        |
| Body River            | Settlement            | Changed         | Unchanged           | 0.03                   | 0.00                        |
| Body River            | Swamp                 | Unchanged       | Unchanged           | 0.00                   | 0.00                        |
| Body River            | Settlement            | Changed         | Unchanged           | 0.03                   | 0.00                        |
| Settlement            | Settlement            | Unchanged       | Unchanged           | 5.71                   | 7.47                        |
| Settlement            | Swamp                 | Changed         | Unchanged           | 0.21                   | 0.00                        |
| Swamp                 | Settlement            | Changed         | Changed             | 0.04                   | 1.12                        |
| Swamp                 | Swamp                 | Unchanged       | Unchanged           | 0.22                   | 0.00                        |
| Bushes                | Bushes                | Unchanged       | Unchanged           | 0.12                   | 0.28                        |
| Swamp                 | Green Space           | Unchanged       | Unchanged           | 0.00                   | 0.00                        |
| Bushes                | Settlement            | Unchanged       | Unchanged           | 0.00                   | 0.00                        |

Community activities that were originally associated with river life became oriented, such as using land routes or streams in activities, not using boats to go to other areas. This is because the road is permanent and travel time is shorter. The use of motorboats takes longer with vehicles and vehicles to transport goods to the warehouse. Changes in culture, buildings and building systems occurred on the site of the Musi River at 7 Ulu and Kuto Batu. Orientation of the trash can situation to the trash. This change has an unharmonious and non-adaptive effect between settlements and river environments.

There are several scales that allow settlements that include:

a. Physical, Shell, direction of the house from the river to the mainland. The newly built house is no longer commensurate with the old houses built in harmony with the river environment. Natural, tidal rivers and rivers 2-3 meters every day, tidal river houses are conditioned according to the height of the tide up to the 5 year river cycle. The addition of space at the bottom of the stilts house owner through flooding up to 3 times in the warehouse. Network, Building a permanent road since
1930, supported by a network of roads from the back of wood into concrete with a concrete size of 1.2 meters. In its development this path is then discarded and is no longer penetrated. This is useful for river and stream networks. Many river rivers are released for use as roads and settlements.

b. Non-physical, home functions, household needs with appropriate room dynamics of its inhabitants. Social activities People move from river to land. But the river is still the center of settlement activity that became the meeting place of hinterland. Economy, Change of Society under the stilts to increase economic value. Politics, Policy since the Dutch Government built a network of roads connecting Palembang City with cities and piling up rivers along with swamps as inspiration lands.

### Table 3. Change of Element of Musi River Settlement based on land use map of 2004 and 2017

| Element Ekistic | Sub Element Ekistic | Element Riverside Settlement Musi Palembang | Changed/Unchanged |
|-----------------|---------------------|--------------------------------------------|-------------------|
| Nature          | 1. Geologic resources, 2. Topographical resources, 3. Soil resources, 4. Water resources, 5. Plant life, 6. Animal life, 7. Climate. | 1. Geologic resources, 2. Topographical resources, 3. Soil resources, 4. Water resources. | Changed |
| Man             | 1. Biological needs (space, air, temperature), 2. Sensation and perception, 3. Emotional needs (human relations, security, beauty), 4. Moral values, | 1. Biological needs (space, air, temperature, etc.), 2. Sensation and perception (the ‘five senses’), 3. Social cohesive, plural, egalitarian, 4. Abstinence treats the river not arbitrarily | Socio-cultural change: treating the river arbitrarily |
| Society         | 1. Population composition and density, 2. Social stratification, 3. Cultural patterns, 4. Economic development, 5. Education, 6. Health and Welfare, 7. Law and Administration, | From river-based to Land-based social activity | Socio-cultural change |
| Shells          | 1. Housing, 2. Community services, 3. Shopping centres and markets, 4. Recreational Facilities, 5. Civic and Business Centres, 6. Industry, 7. Transportation centres. | From Riverside Settlement to Land Settlement House Stage / Non-Stage, Raft House, Land House / Depok | Architectural change: Non-stage Land House / Depok |
| Network         | 1. Water supply systems, 2. Power supply systems, 3. Transportation systems, 4. Communication systems, 5. Sewerage and drainage, 6. Physical layout (Ekistic plan). | From river, From PLN, Transport Musi River, Tributary Musi, (drainage network), Road Network, wood / concrete / asphalt, Jerambah wood Wooden pier | Building-System change: From PDAM To PLN Jerambah |

### 5. Conclusion

Based on the above discussions and results, it can be concluded that several things as a change in the settlement elements of the Musi River Palembang, among others:

a. Changing elements of the settlement of the banks of the Musi River Palembang from the river-oriented to the land-oriented. Changes in the form of architecture and the system of river settlement buildings that include changes in the orientation of buildings to the river, the addition of space under the stilts, changes in materials, changes in the function of house space, and changes in river environmental infrastructure network caused by the influence and development of land-oriented settlement culture. These changes undermine the identity, character, and potential of river architecture and settled cultures that were originally in harmony with river life.
b. Physically, the newly built house is no longer commensurate with the old houses built in harmony with the river environment. This change in the orientation of shapes and patterns of settlements makes the river an unimportant element, as the back and the elements begin to be abandoned. Non-physically, the function of the house and the needs of occupancy occur the appropriate dynamics of space from its inhabitants in terms of social, economic, and political policies are alternated. Community activities move from river to land.

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