



The Development Pattern of the Lasolo Riverbank Settlement in Kendari, Southeast Sulawesi- Indonesia

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ABSTRACT

This study aimed to explain the pattern of development of settlements on the banks of the Lasolo River, and the factors affecting it. This study was located in a riverbank in Kendari, Southeast Sulawesi-Indonesia. It was conducted using a qualitative descriptive approach with observation, naturalistic, and phenomenological methods to reveal phenomena that occur based on observations and information obtained in the field. The results of this study indicate that the development of residential areas on the banks of the Lasolo River started from the north (residential area 01) to the east (residential area 02) along the banks of the river. The pattern of development of residential area 01 vary. The pattern of settlement group 01 in settlement A is linear, also regular and street-oriented; settlement B is cluster, irregular, street and river-oriented; settlement C is cluster, irregular, and street-oriented. Meanwhile, settlement 02 that consists of settlement D is cluster, regular, also street-oriented, and river-oriented. The results also found that the pattern of development of settlements is influenced by the number and density of the population, socio-cultural-economic, physical environment, and community empowerment activities.

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INTRODUCTION

The high rate of urbanization in Indonesia is triggered by the huge disparity in economic growth between urban and rural areas, resulting in increased urban land demand for infrastructure and facilities. In addition, the increase in the number of urban dwellers in Indonesia every year has an impact on improving the demand for residential buildings (Surya et al., 2021). Furthermore, urban growth with all its facilities has attracted residents to live close to the city center. This phenomenon results in limited land in urban areas. Many people are found living in areas that are not suitable as residential areas, such as riverbank areas. This residential area generally has many problems. This area is identical as a settlement for the poor, lack of water, poor accessibility, and the lack of quality of housing, sanitation, and several areas of waste disposal facilities. Apart from these physical problems, they often face social and economic problems such as illegal status in their place and low levels of education and income (Sarwadi et al., 2001).

There are several studies on the pattern of riverside settlements in Indonesia. Lusetyowai & Adiyanto (2010) researched settlement patterns on the Musi River, Palembang. The results of the research found that the settlement pattern consisted of linear, cluster, and combination. The houses on the Musi River are generally oriented towards the river and the road. Then, Hamidah et al. (2017) examined physical integration between formal and informal settlements with a case study of Kahayan urban riverside settlement, Palangka Raya City. The research comes up with three typologies of integration of “compact kampung” which are influenced by the spatial, economic, and social conditions of the surrounding community.

Administratively, Kendari City is the capital of Southeast Sulawesi Province. Kendari City topography consists of a hilly plain and is crossed by rivers that flow into the Kendari Bay (*Spatial and Regional Planning of Kendari, 2018*). One of the rivers that crosses the city is the Lasolo River which is located in Sanua Village, West Kendari District (Figure 1). The area on the banks of the Lasolo River is ideally designated as a conservation area and turn into residential areas on both sides of the river. The development of settlements on the riverbank was initially caused by inhabitant growth and activities. The inhabitants began to build without paying attention to land boundaries and ignoring the distance of the river border due to a lack of knowledge and strict supervision from the local government. This condition has an impact on the pattern of settlement development, the level of density and quality of housing.

Based on this phenomenon, it is important to study different types and patterns of residential areas on the Lasolo riverbank. Thus, the factors affecting them in order to increase the knowledge about settlements

on the banks of the rivers in Indonesia and to provide reliable data on settlements on the banks of the Lasolo River so that it can be used to overcome problems that may occur in the future.

LITERATURE REVIEW

The riverside environment is one of the important aspects that should be considered in urban design and planning (John et al., 2013). The pattern of riverbank settlements is caused by the spatial structure, the system of relationships between parts of space that are clear and responsive to human needs, cultural, historical, and local natural contexts (Trancik, 1986). In addition, it is also influenced by the physical conditions of the environment, namely topography, and is related to the arrangement of forms in space, both natural and physical (Hakki, W., et al, 2015). The settlement structure may change from year to year due to population growth and activity, thus increasing housing demand. This condition allows inhabitants to build houses irrespective of the original boundaries of the land, allowing buildings to be compacted (Suwarlan, S.A., 2020).

Settlements will develop in a pattern that spreads or gathers according to the physical conditions of the surrounding environment. The pattern of spreading development is formed in new settlements that do not yet have access. Meanwhile, the clustered development pattern is formed when there is road access as a guide for settlers to develop settlements. The development of settlements also caused the formation of linear patterns on river lines, roads, and beaches. There are also other patterns of settlement development, namely circular, rectangular, and grid. The pattern of settlement development will affect the development of circulation patterns and building orientation and will become a determining factor for the development of further settlements (Triyuly, W., 2013).

RESEARCH METHODS

Initially, the survey was conducted as a general survey of urban settlements along the Lasolo River. This study uses a qualitative descriptive approach in the form of words and verbal sentences written or spoken about objects and behaviors that can be observed. This study aims to explain the pattern of development of riverbank settlements using observational and naturalistic research methods, with phenomenology being used to reveal phenomena that occur based on observations and information obtained in the field. Phenomenology is an interpretive study of human experience, aimed at understanding and explaining human situations, events, and experiences “as things that arise and are present

every day” (von Eckartsberg, 1998). This approach is one innovative way to look at the relationship between humans and the environment and explore the complexity of their relationships. A major challenge in the phenomenological approach is the description of the closeness of the human world that is liberated from the formal subject-object dichotomy. Phenomenological research is often used to understand human experience, the physical environment, and people-world relationships (Seamon, 1983). Furthermore, Seamon (2000) concludes that behavioral researchers interested in the environment put forward three ideas, namely: lifeworld, place, and home, because these three aspects have an interest in making a person live in activities, and all three have a visible impact, namely physical, space, and environmental aspects of human life.

The implementation of the study consisted of several methods and stages of the research process, including preparation techniques, data collection methods, data presentation and processing methods, map and object digitization and editing, as well as data analysis methods. The stages of this activity are intended to obtain the required data, carry out the analysis, and finally get the desired results, or outputs, in accordance with the research objectives.

DATA ANALYSIS

This research is qualitative research. The following are the stages of research data analysis:

1. A qualitative descriptive analysis of the riverbank settlement area's development pattern using GIS software to describe the physical condition of the research area. The development of the housing group in 1950–1980, 1980–1990, and until now, the coordinates have been taken and overlapped with the image map of the residential area.
2. A descriptive method with a phenomenological approach was used to explore the factors influencing riverbank utilisation. Physical characteristics include the population's size and density; the community's sociocultural conditions; economic conditions; and land ownership. While the physical aspects include environmental conditions and topography, building density, settlement layout, facilities and infrastructure, and open space, the non-physical aspects include environmental conditions and topography, building density, settlement layout, facilities and infrastructure, and open space.
3. The implications of riverbank settlements on the natural environmental conditions of rivers were evaluated using descriptive methods and data collection techniques. Riverbank conditions, riverbank settlement use, riverbank narrowing, and river

pollution were all documented through interviews, observations, and documentation of riverbank conditions, riverbank settlement use, riverbank narrowing, and river pollution.

RESULTS AND DISCUSSION

A. OVERVIEW OF RESEARCH AREA

The Lasolo River is located in the West Kendari District of Kendari City. The Lasolo River is one of the two largest rivers in Southeast Sulawesi Province. This river flows through several regencies before its flow passes through Kendari City. The upstream of the river is located in the North Kolaka Regency, and one of its estuaries ends in Kendari Bay. In Kendari City, the river passes through two urban villages: Sodouha Village and Sanua Village. Sanua Village was historically an expansion of Sodouha Village in 2004.

Based on Kendari Municipality (2020), the population of Sanua Village is 3,243 people from 786 households, with a composition of 1,546 men and 1,697 women. The number of inhabitants in this village classified as productive (age 16–21) is 1,563 people. The village is included in high-density areas based on the ratio of population and residential areas. Furthermore, based on data from BKM (Non-Governmental Organizations) Sanua Mandiri in 2020, the number of household heads and the number of houses, it is found that one house can consist of more than one household due to the fact that the number of houses is 799 units while the number of household heads is 917. Furthermore, the education level of inhabitants in the Lasolo riverbank residential area varies. The average of the inhabitants' latest education is elementary and high school. Some have undergraduate education and some do not attend school. As for the condition of houses on the banks of the Lasolo River, many were built illegally of their own volition.

The basic infrastructure is available on the banks of the Lasolo River residential area, such as road, pedestrian and bridges, water and sanitation network, and electricity network. The condition of the accessibility network, such as roads, pedestrians, and bridges, is partly poor. Potholes on the road surface and dirt roads interfere with the comfort and safety of road users. The drainage network is also uneven, so when it rains there are puddles of water in several areas, which cause roads and houses to be flooded. The source of raw water for local residents comes from mountain water, which is channeled to homes through pipelines of distribution. The quality of water for daily needs is not up to standard, sometimes it has color, smell, and taste. The water discharge also does not meet the daily needs of the residents. It is found that not all households have good sanitation facilities such as toilets and septic tanks. There is no house-to-house waste transportation service as well as a centralized waste disposal site, resulting in

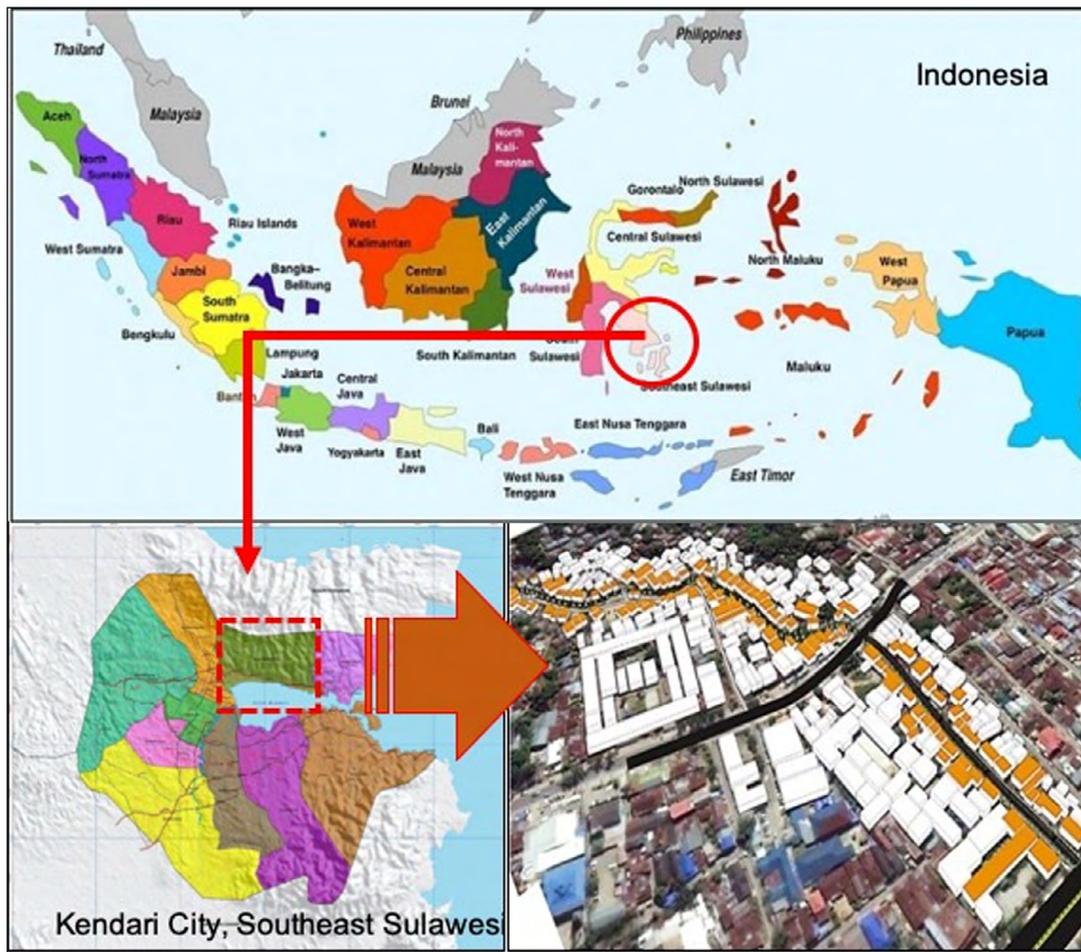


Figure 1 A location map of the Lasolo riverbank settlement area.
 Source: Adapted from *Spatial Planning and Regional Planning of Kendari City* (2018).



Figure 2 The community empowerment model of the Lasolo riverbank settlement area.
 Source: *Profile of BKM Sanua Mandiri* (2020). Reproduced with permission of the photographer.

people still littering, for example in rivers. In addition, there are still many houses that have not been electrified, even though the electricity network and street lighting have long been available. However, there are still some basic infrastructures that have not been available, including fire protection, disaster mitigation, and green open spaces.

The management of residential areas was carried out with a community empowerment model after the flood disaster hit the area. The parties involved are the

inhabitants, *BKM*/NGOs, and the government through the *KOTAKU* (city without slums) program. The general objective of this program is to increase access to basic infrastructure and services in urban slums and prevent the emergence of new slums in order to support the realization of livable, productive, and sustainable urban settlements. The implementation of this program focused on flood prevention by increasing the river embankment height, normalizing the river, repairing roads, and launching a creative village program (Figure 2). The

empowerment program also includes the management of clean water sourced from springs upstream of the river to be distributed to the community. The liquid waste disposal system uses an infiltration system, while the solid waste disposal system uses a septic tank. Another program recycles trash by processing plastic waste into handicraft items worth selling. In addition, buildings located on the banks of the river were rearranged without losing their function as residential areas.

B. CHARACTERISTICS OF SOCIO-CULTURAL AND ECONOMIC INHABITANTS

Inhabitants on the banks of the Lasolo River consist of various ethnic groups, i.e. Bugis, Makassar, Muna, and Buton. Their habit of living close to city facilities and workplaces, as well as the limited economic level of the inhabitants, are the reasons for living in the area along the Lasolo River. These inhabitants have lived in residential areas on the banks of the river for long time, until the present. But some of them have sold their land to other people in search of a better living environment or to move to the latest urban development area. The original inhabitants and migrants demonstrated motives to live near their families, whether living in a residential space inherited from parents or building their own house. Inhabitants on the banks of the Lasolo River adhere to a kinship system, such as birth and marriage. The desire to live close to and gather with family has resulted in people building their houses not far from their families' houses. The main houses of the parents were built on land, whereas the children set up secondary houses of their own along the riverbank. This phenomenon shows the tendency of suburban inhabitants to live in a group with their family and relatives, thereby developing a family kinship within the neighborhood (Michiani et al., 2019).

Based on data from BKM Sanua Mandiri in 2020, most of the economic condition of the inhabitants is classified as low-income people. It is recorded that the number of low-income people in riverbank areas is spread across 6 Community Associations (*Rukun Warga/RW*) and 12 Neighborhood Associations (*Rukun Tetangga/RT*). Meanwhile, their occupation are mostly categorized as informal workers, such as merchants and laborers. In addition, the number of low-income households (*MBR/Masyarakat Berpenghasilan Rendah*) is 191, with an average income of Rp. 1,500,000.00 (\$105,36), whereas the number of non low-income households is 109.

C. THE DEVELOPMENT OF RESIDENTIAL AREAS

Humans are social beings. They do not live alone, but together and form groups. Thus, the houses where they live will be built together so that they can be grouped or clustered in an area that is equipped with the infrastructure and facilities needed by their inhabitants. This group of houses and all their facilities are called

“settlements”. The beginning of the settlement on the Lasolo riverside began in the 1950s (1st period). In the 1950s–1960s, several people initiated riverside settlements. Those people were Kasaming, Semmauna, and Becce. They built a house near the upstream bank of the Lasolo River. In addition, settlements in the 1960s–1970s became increasingly developed because their descendants also built houses near their parents' houses. Eventually, settlements that originally consisted of only a few houses increased in numbers. Some of the houses were built in a different pattern from the early period houses. Houses include Suparman's house, which was built in 1965 following the road orientation, as well as Peno and Toha's houses which were built in 1967 and 1965, and have also been oriented to the road and river. Until the 1960–1970s and 1970–1980s, settlements began to develop in cluster along the riverbanks oriented to rivers and roads (2nd period). From the 1980s until present, the development of the group of houses has begun to spread regularly to the east and is oriented towards the river and the street (3rd period). The stages of settlement development can be seen in Figure 3.

According to Figure 3, settlements developed from the upstream of the river in the north, consisting of groups of houses in the settlement in the 1st period, to Kendari Bay in the east, which consisted of settlements in the 2nd period and 3rd period. The geographical condition of the area is partly hilly and flat. This area stretches from the north direction of the Nipa-Nipa Forest to the east of Kendari Bay. This condition is slowly changing due to land use, construction of infrastructure, and the occurrence of landslides and floods. Generally, Indonesia is influenced by the rainy season and the dry season. During the rainy season, the potential for flooding and landslides in this residential area is quite high.

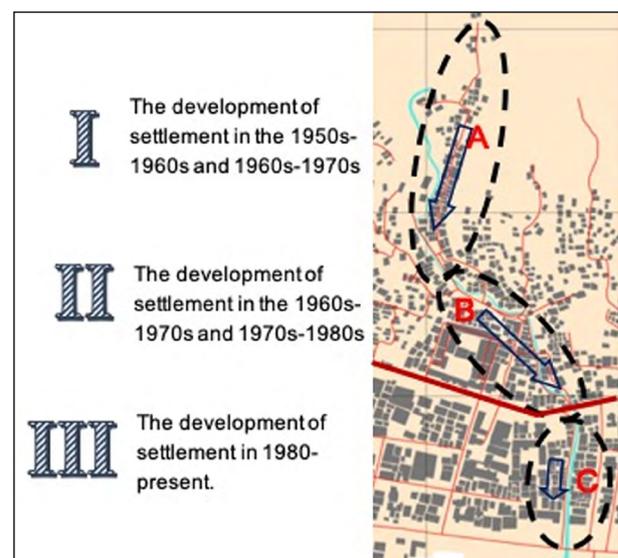


Figure 3 The development of the Lasolo riverbank residential area from 1950–present.

Source: Author's analysis.

D. PHYSICAL CHARACTERISTICS OF THE RIVERBANK SETTLEMENT

The residential area on the banks of the Lasolo River is divided into two areas (Figure 4). The residential area located on the left side of the main road, Jl. Dr. Muhammad Hatta, is residential area 01. Meanwhile, the residential area located on the right side is residential area 02. The development of residential areas on the banks of the Lasolo River starts from the north (residential area 01) and extends to the east (residential area 02). Based on observations, the residential area on the banks of the Lasolo river, which is the object of the research

study, is divided into 4 settlements. In residential area 01, which is on the left side of the main road, there are 3 settlements, namely A, B, and C. While in residential area 02, which is on the right side of the main road, there is only one settlement, namely D (Figure 4).

The division of this settlement is based on the shape, layout, and composition of the houses in the settlement. The form of the house is in the form of building placements, namely stilt houses or landed houses. Some traditional houses in Indonesia are stilt houses. Nowadays this form is commonly found in waterfront settlements. In addition, the shape of the house is also influenced by the

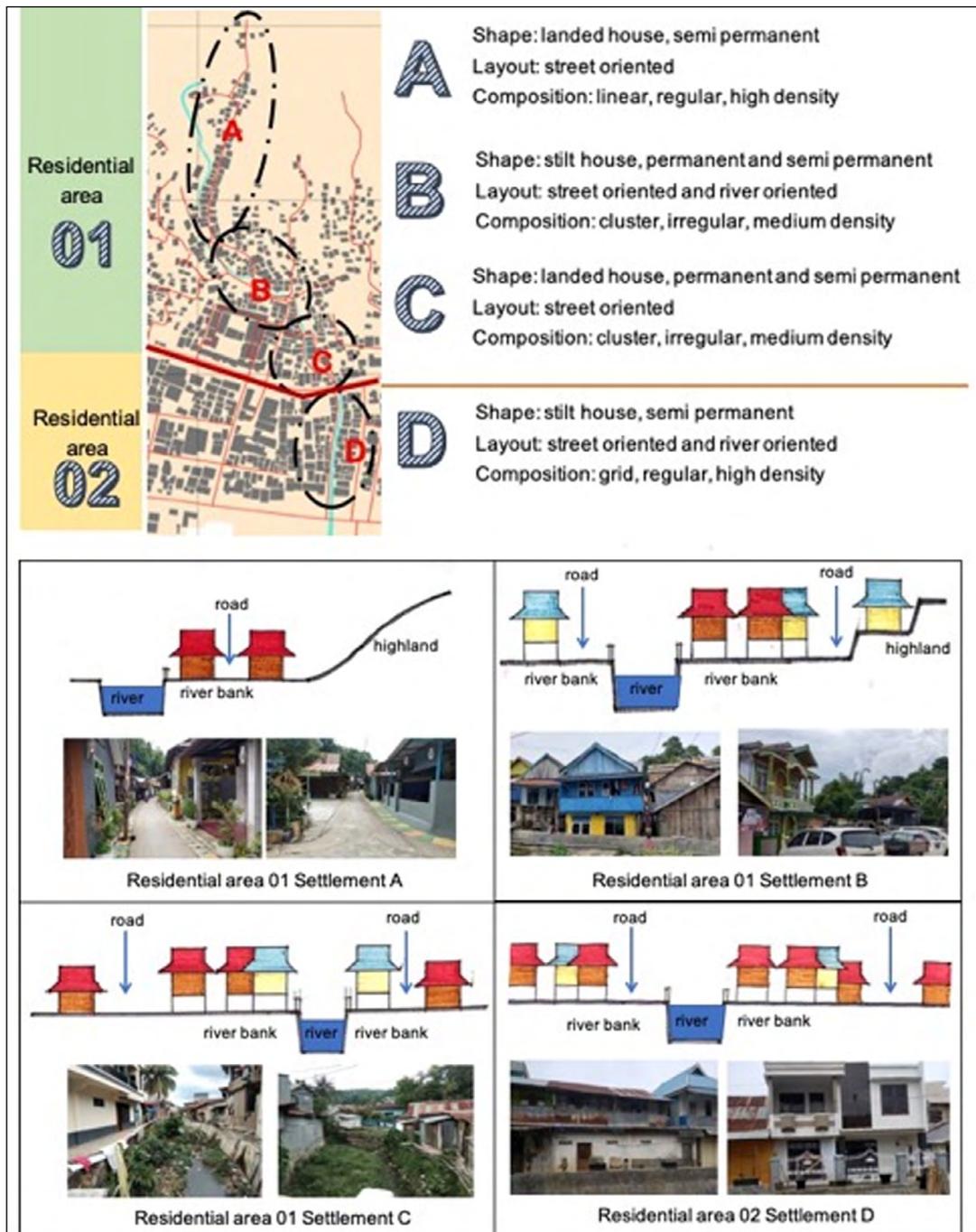


Figure 4 Physical characteristics of the Lasolo riverbank residential area. Source: Author's analysis.

type of building construction; namely non-permanent, semi-permanent, and permanent. The initial form of the house was on stilts and semi-permanent from local wood materials, which were built by themselves or assisted by craftsmen. The houses were then renovated and rebuilt into permanent houses with brick or wood materials and simple construction. In stilt houses, the owner adds space under the floor so that it functions as a public or semi-public space and a supporting space, while at the top it is a private space.

House layout is defined as the orientation of the house or the direction of the house. In this residential area, there are 2 orientations, namely towards the Lasolo River and environmental roads. Furthermore, the composition of the house is defined as the arrangement of houses in settlements. The composition consists of 3 indicators, namely the pattern of houses (linear, cluster, and grid) forming a settlement pattern, the building layout of these patterns (regular and irregular), and the density of buildings (low, medium, and high), which reflects the distance between one house and another.

From Figure 4, it can be seen that the forms of houses built in residential areas 01 and 02 have different shapes, layouts, and compositions. The characteristics of the settlement include the shape of the house, layout, and composition as shown in the sectional cut. Based on the sectional cut illustration of the picture above, houses in settlement A are landed houses, semi-permanent, oriented toward the road, thus the river is located behind the houses. Furthermore, the composition of the house is low density, single-layered, and regular. The composition of settlement B consists of stilt houses, permanent and semi-permanent. The layout facing the street and river is medium-density and irregular, and the pattern of development is clustered. In settlement C, the houses are landed houses with permanent and semi-permanent construction oriented to the street. The composition of the houses is irregular, medium-density, and the pattern of development is clustered. Meanwhile, settlement D consists of stilts and semi-permanent houses. These houses are oriented toward the street and river. The composition of houses is grid like, layered, and regular, with high density.

E. THE DEVELOPMENT PATTERN OF RESIDENTIAL AREAS

The previous explanation explained that the Lasolo River has an important role in determining the development of residential areas on the banks of the river. The river initially influenced the formation of settlements on the banks, the emergence of houses on vacant land near the river, and the emergence of irregular (spreading) houses. The pattern of settlement development on the banks of the Lasolo River also affects land use and river water quality. The initial pattern of settlement development is linear, following the flow of the river. The most common

form of urban space in riverside settlements was a linear structure. It is also often found in several traditional settlements (Hamidah et al., 2017). A linear pattern followed the path of roads and lanes. This pattern has been used in practice for a long time in swamp settlements because settlement growth has taken place along or connected to existing roads (Lussetyowai & Adiyanto, 2010). This settlement pattern is not formed by itself but through a process and is influenced by several factors, such as: security conditions, mutual needs, culture, and the physical form of nature. The development of settlements on this riverbank occurred due to the increase in urbanization. This also causes the area along the Lasolo River to become dense and transformed into a slum area.

The pattern of settlement development on the banks of the Lasolo River is also influenced by environmental physical factors such as topography. The surrounding topography consists of hilly areas that follow the contours of the land. In addition, there are areas that are relatively flat and have a relatively regular pattern, such as a linear pattern with the layout of the buildings on the left and right of the river. The next development is that the orientation of land or roads is increasing. For security reasons, residents tend to build houses on stilts to avoid having their house overflow with river water in the rainy season. The orientation of the building is generally facing the land or road and the river because it considers the functional and accessibility aspects more. This has an impact on settlement patterns. Another thing is that the banks of the Lasolo River in the past few years ago closed to the city center of Kendari City. However, most people prefer to live close to their workplaces, so this is a triggering factor for the formation of settlement patterns on the banks along the Lasolo River. Most of the residential areas there have been neatly arranged since the empowerment program with the concept of a creative village was implemented in Sanua Village. This village uses the concept of a converging pattern with linear elongations parallel to the road line and the river.

The composition of settlement development follows the physical condition of the environment. In general, the settlement pattern established in the Lasolo riverside residential area consists of 3 patterns, namely linear, cluster, and grid (Figure 5). These patterns also affect the orientation of houses. The pattern in settlement A is linear along the road, while the river is located behind the houses. The houses are arranged in an orderly manner. But the distance between one house and another is very close. The more it leads to the north, into the high area, the further the distance between houses. The houses also only consist of one row on the left and right sides of the road because the location of the settlement is between the river and the highlands. Settlement patterns in settlements B and C tend to be identical. The houses are arranged in irregular clusters, following the pattern of

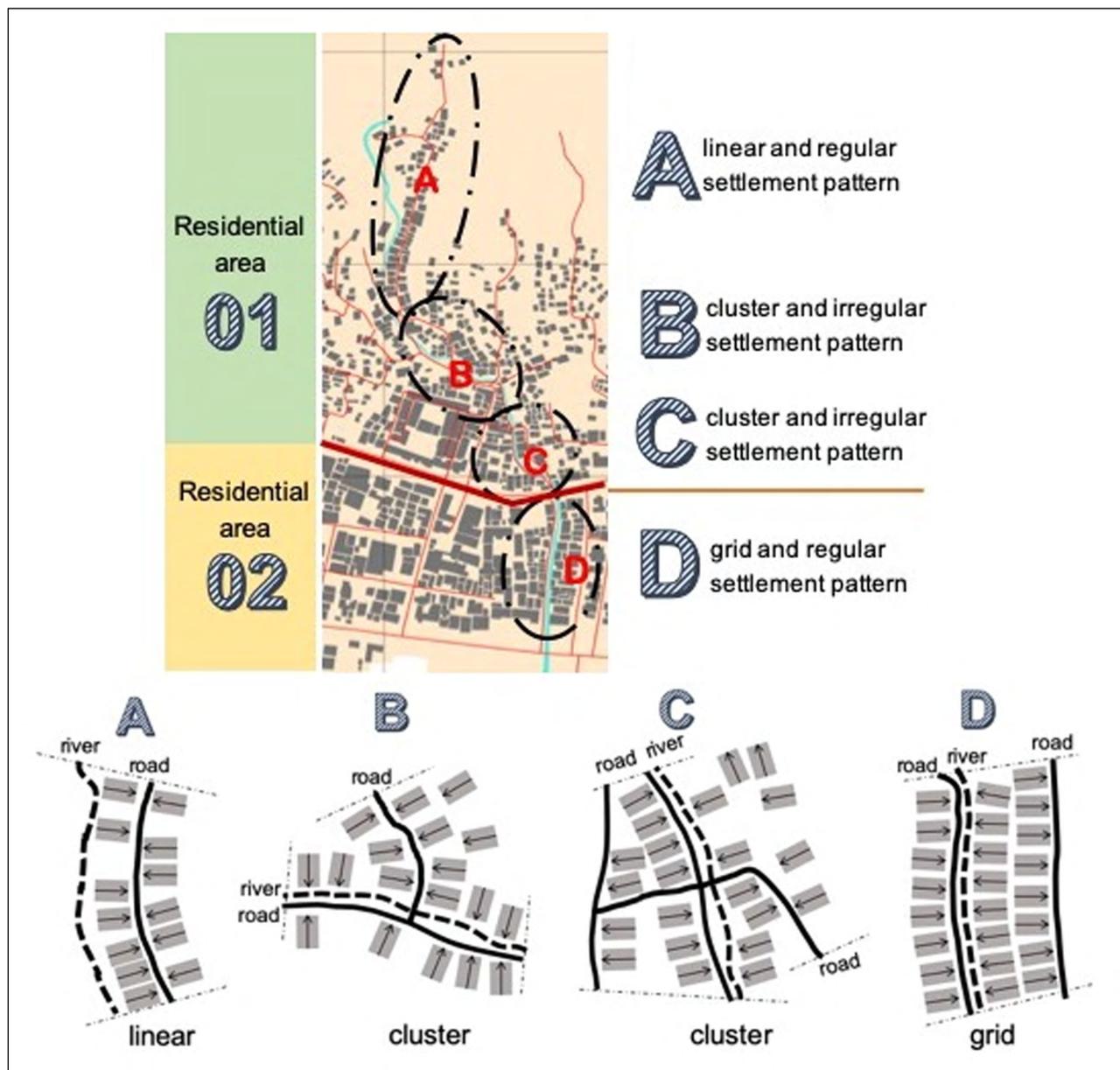


Figure 5 Patterns of settlement development of the Lasolo riverbank residential area.

Source: Author's analysis.

rivers and roads. As for the distance between one house and another, it is still adequate. Besides that, there are still some vacant lands, so the density of settlements is classified as medium. Furthermore, as a settlement that developed in the most recent period, settlement D is arranged in a regular pattern. The houses are arranged in layers with a grid pattern following the linear direction of roads and rivers. This pattern is also supported by the contours of the land, which are generally flat when compared to other settlements.

F. FACTORS INFLUENCING THE RESIDENTIAL PATTERN IN RIVERBANK AREA

The following are the non-physical and physical factors that influence the pattern of riverside residential areas on the Lasolo River, as determined by a study of the pattern of development and utilization of the area.

Residents' socio-cultural conditions, such as kinship traditions, behavior, and education, have a great influence on the design of the living structure. Residents' economic factors, such as livelihoods and income, have a strong impact on the shape, floor plan, and composition of a house. Stilts and semi-permanent houses on the banks of the river are often built by low-income residents. In addition, the increase in the population's economy has led to changes in the orientation, shape, and structure of houses. The house, which originally faced the river, turned in the opposite direction, facing the street. In addition, the shape of houses, which generally consist of stilts and semi-permanent homes, is changing to include agricultural and permanent houses.

Natural environmental factors such as climate and geography also strongly determine settlement patterns. The formation of a residential area on the

banks of this river has gone through a fairly long and drawn-out process. Shallow water (sediments) narrows the river due to the formation of silt during the rainy season. The new land created by river sediments will be used by the inhabitants to build residential areas on the banks of the Lasolo River. In addition, many immigrants who move to the city of Kendari choose land in the area because it's cheap, even though the government has rules about safety and riverside construction bans.

Accessible infrastructure includes environmental roads, trails, and bridges. One of the factors that shapes the structure of settlements is the availability of network accessibility. The direction of the house is usually towards the road because people build houses on land that already has road infrastructure. Another factor that influences settlement patterns is topography. The terrain of the settlements on the banks of the Lasolo River is hilly and flat. This has resulted in some homes being located in mid and high-altitude areas that can only be reached by concrete stairs or worn-out stone floors such as steps. Residents build houses according to the risk of threatening flat land.

Settlements developed rapidly in the north, south, west, and east of the village. Clusters of houses in the residential area develop from the north, upstream, to the east, along the stream to Kendari Bay. The residential area is crossed by the Lasolo River from Tahura Nipa-Nipa Mountain to Kendari Bay. The development of this area started in the north and then spread out as it was limited by the mountainous terrain of the environment. The settlement development in the South is dense because the available land is quite large. Development in the West is limited due to the mountainous terrain. Meanwhile, in the eastern area, the population density is quite high due to the land area near the main road. The physical environment has a big impact on how residential areas grow on the banks of the Lasolo River.

Activities to improve environmental quality through KOTAKU community empowerment programs are also a decisive factor in the development of settlement patterns on the banks of the Lasolo River. This program builds an integrated system for slum management, where local government leads and collaborates with stakeholders in planning and implementation, as well as promoting the participation of the community. Activities to improve environmental infrastructure and the application of regulations to the development of residential areas make the houses around the riverside settlements more organized. Besides that, the program also encourages communities to be more responsible for the environmental conditions of their cities and towns.

CONCLUSION

From the results of research and discussion, it was concluded that the development of settlements on the banks of the Lasolo River initially started from the north (settlement 01) and progressed to the east (settlement 02) in three periods along the river with a linear, clustered, and grid pattern oriented to the road, the river, and both the road and the river. The following is an outline of how residential areas grow and the factors that affect it:

1. The pattern of development in residential area 01, settlement A, is spread out and elongated along the road line facing each other; settlements B and C are spread out and clustered along the line of the road and river facing each other; the development pattern of settlement D in residential area 02 is spread out regularly in a grid shape, following the road and river lines, facing each other and layered.
2. Settlements on the banks of the Lasolo River grow in different ways depending on how many people live there, how many people live there, how many people live there, and how many people live there.

The results showed that there were differences in settlement patterns in the two settlement zones along the Lasolo river. The differences are founded in building layout, orientation, and construction. The settlement pattern is generally formed by the function of the river as a land barrier, not as transportation access or a source of livelihood as in other rivers in Indonesia. The main factors that influence the settlement pattern are the economic and socio-cultural conditions of the local community.

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COMPETING INTERESTS

The authors have no competing interests to declare.

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