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Morphological Changes in *Kampung* Pahandut of Palangka Raya City in Response to the Cultural Shift of Riverside Communities

***Yesser Priono [1] and Evawani Ellisa [2]**
The University of Indonesia, Department of Architecture Faculty of Engineering Universitas Indonesia, Depok, Indonesia [1]
The University of Indonesia, Department of Architecture Faculty of Engineering Universitas Indonesia, Depok, Indonesia [2]
E-mail [1]: yesserarchupr@gmail.com , E-mail [2]: ellisa@eng.ui.ac.id

Abstract
Palangka Raya, the capital city of Central Kalimantan, Indonesia, had been rapidly transformed and triggered the morphological changes in both the environment and architectural order. The urban growth caused the morphological transformation, and in effect, the city of Palangka Raya continuously displayed symptoms of urban deterioration. Modernization engendered the city to lose the architectural identity of *Rumah panggung* (stilt houses) and suffers the environmental disorder. There has been a tendency in the city orientation to shift into an ordinary "land city". Focusing on the oldest part city in *Kampung* Pahandut, we conducted a field survey to map the situation on the ground. We also generated 3D mapping using the drone to obtain precisely the morphological pattern of the area. The study revealed that the condition of the waterfront environment is constantly changing. The community that lives adjacent to Kapuas River must adapt to environmental conditions by utilizing the strategy of architectural adaptations of adjustable, refillable, and movable. Although the city of Palangka Raya transformed into a land-based city and left behind the riverfront area, in the oldest part of the city at kampung Pahandut, the community still maintains the Kahayan River as the source of people's daily lives.
Keywords: Transformation; morphology; Kampung Pahandut; Culture; Riverside.

1. Introduction

Cities in Kalimantan have unique geographical conditions that grow from the banks of rivers and surround by swamps and wilderness. The cities in Central Kalimantan Province are: Palangka Raya, Kuala Kapuas, Kasongan, Kuala Kurun, Sampit, Pangkalan Bun, Lamandau, Sukamara, Muara Teweh, and Buntok. They are known as "River City" because they are divided by rivers that still hold the role of the community's lifeblood and source of life. The growth of the riverside area organically forms a linear circulation pattern following the river so that it affects the morphological pattern of the cities.

Palangka Raya City is the capital of Central Kalimantan Province, divided by the Kahayan River, one of the longest rivers in Central Kalimantan Province. The Sebangau River and Rungan River are branches of the Kahayan River that meander tributary patterned with a mountain. Bukit Jehan, located on the southwest is an embryo of downtown Palangka Raya. It is unique historically because it became the first city deliberately designed by Soekarno. Its position is at the corner of the Kahayan River and adjacent to the indigenous Dayak tribal settlement, namely *Kampung* Pahandut. In historical records, the first pole of the construction of Palangka Raya City was carried out on July 17, 1957, by the president of the Republic of Indonesia, Ir. Soekarno. This event became the momentum and marked the starting point of Palangka Raya city as the city of *'Modal'* and *'Model'* or a city with sacred meaning because the invaders never colonized it.

However, the development of Palangka Raya city is constantly undergoing a transformation from a waterside city to a land-oriented city. The city experiences symptoms of changes in the natural elements and forms a new type of architectural building. As a result, the city tends to abandon the culture of riverside life. When the function of the river changes, the awareness, and association of Palangka Raya with the river also changes. Like other cities or settlements in Central Kalimantan, Palangka Raya grows and develops into an ordinary city that leaves its identity as a riverfront city and fades its authenticity.

This study will enrich the diversity of urban spatial formation in Indonesia during the periodization of development. Many cities in Indonesia grow and develop as the products of urban struggle adapting to the rapid growth. It aligns with Kostof's theory (1991) that distinguishes the geometric shape of cities into a planned city and an unplanned city.

By interpreting the development of the old city of Palangka Raya in the riverside area at *Kampung* Pahandut, this study aims to reveal the adaptation strategies that affected the configuration of the riverfront settlement as the consequences of the urban morphological changes. This research will enrich the theory of morphological transformation of the waterside area due to economic, social, and cultural changes that affect the way people living and settling in the waterside area.

Figure 1. Location of Study, *Source:* Authors, 2022

2. Literature review

2.1 Special Physical Transformation

Various disciplines of urban planning, regional planning, urban design, urban geography, urban environment, urban buildings, and architecture are mainly concerned with the urban form as the agents responsible for their transformation. Urban form refers to the main physical elements that structure and shape the city; they consist of the streets (and squares), urban plots, and buildings (Olievera, 2016, Aziz Amen & Nia, 2018). Meriam Webster mentioned the definition of transformation as an act, process, or instance of transformation or being transformed. According to Anderson and Anderson (2001), transformation is the radical shift from one state of being to another. Transformation is not synonymous with change or other words, *"transformational change is not constant, but rather starts, cycles, and stops in a somewhat predictable pattern" (*Poutiatine, 2009, p. 5; LUU, 2021).

The building transformation deals with the process of adaptation. Schmidt et al. (2016) defined building adaptation as postponing the demolition phase of a building while increasing its excellent or desirable life span through its "ability" to change and adapt itself to different circumstances. In the adaptation, there are three essential elements: (1) differences or a feature seen as the embodiment of a transformation, (2) an element of characteristic or identity as a reference in the transformation process, and (3) a historical element bound to a different unit of time. The physical and spatial transformation can be seen in the transformation of land use and the characteristic of buildings and streets (Schmidt et al. 2016, Amen,2022). Urban transformation expresses entire strategies and actions to improve the economic, social, physical, and environmental conditions of damaged and collapsed urban areas (Carmona, 2021). Diverse processes of transformation, which lead to altered urban functions and new local needs and opportunities, constantly influence cities.

Urban land use comprises activities in certain places and a certain level of spatial accumulation, which is indicated by their density, intensity, and concentration. Urban land use historically formed through the transformation process due to the accumulation of activities. For example, the road network is developed through the transformation process of the design and function of the road (Gallion, 1988, Amen & Nia, 2020). Changes in activities trigger the transformations of the land use pattern. Changes in connectivity trigger the transformation of road and street patterns (Buchanan, 1988). Finally, the change in building function and density generated the transformation of settlements.

The level of transformation consists of three types (Gordon 2012): (1) major transformation that occurs on a broad scale-and changes the spatial pattern of existing regional space, and the transformation dominates several areas. (2) Minor transformation is a form of transformation on a small scale or transformation that occurs in only a few parts

and does not change the initial condition of space or the surrounding environment. Finally, (3) fully transformation or a form of transformation that radically and totally changes the whole. In the latter case, the original form of the space pattern or the initial condition of the area can no longer be recognized.

2.2 Riverfront as the City Determinant Factor

Many cities consist of four natural determinants (1) waterfront, (2) hilltop and ridge, (3) the flat, and (4) open prairie (Morris, 1994). However, the waterfronts have a solid link with the water in the early settlement of many cities. The birth of the cities cannot be separated from the existence of rivers, canals, and watercourses in the urban space. Morris (1994) highlighted three topographical characteristics of cities established in the waterfront area. They are (1) the seafront, (2) island and peninsular origins, and (3) riverbank origin. Kostof (1991) recognized the seafront as the natural harbour and the riverbank as the riverine settlement. During the early days of many old cities, water was the primary mode of transportation. The strategic location of the waterfront is situated at an intersection between the land and the water. It provides high accessibility to the traders and their customers. As a result, the waterfront has become the centre of commercial activities and cultural concentration. Trading activity boosts the economic function of a place, and consequently, the waterfront becomes one of the determinants for a city to grow. These phenomena are common in Western, Middle Eastern, and Asian countries (Rafferty and Holst, 2004; Hoyle, 2001; Morris, 1994). According to Hoyle (2002), due to the immediacy of the water since ancient times, many cities use the waterfront as a 'window on the world' and the city's 'front door' in the competition for commerce and trading. However, the glory of the waterfront in many cities does not last long. Many of them soon experience a decline in their response to water dan shift their orientation to the hinterland. The decline of the waterfront is a worldwide phenomenon that occurs in many cities. It is caused by the industrial revolution, technological changes, the introduction of the land-based transportation system, de-industrialization, and flooding.

2.3 Urban Kampung

According to Wiryomartono (1995), the Urban *Kampung* is a settlement that grows in urban areas without infrastructure planning and the city's formal economic network. According to Wijanarka (2001), kampungs are settlements in urban areas spatially formed over a very long period and resided by the community who are predominantly indigenous and homogeneous. Kampung settlements in the context of urban areas have long been endured as part of urban development. Their development is always influenced by various factors, namely socio-cultural, economic, political, technological, and natural factors. These factors can drastically erase kampungs and thus eliminate the characteristics of the city. On the contrary, the existence of kampung can enrich the characteristics of the city. The rise and fall of kampung can display the cultural characteristics of the city from time to time.

Back (1998 in Setiawan, 2010) explains that urbanization triggered the process of *kampungization*. It occurs because the local government failed to manage the urbanization process properly. People from rural areas who migrated to cities have not been able to enter the urban industrial and formal sectors. Urban kampung is generally characterized by relatively dense settlement and sometimes overcrowding. The population earns a living in the informal sector. They spontaneously built their shelters in the absence of urban service facilities, such as clean water, sanitation, and drainage (UN Habitat, 2006: 30).

Setiawan (2010) defines the establishment of kampung as a dynamic formation process by a group of people who are generally poor. They provide their own houses, control their environment, and work together to improve their living condition. The urban kampung in big Indonesian cities is widely recognized as part of urban settlements forming a high population density with the social dynamics and vulnerable to changes due to the urban development.

According to Tikson (2005 in Latif, 2011), the urban kampung transformation can be interpreted as a deliberate economic, social and cultural transformation through top-down policies and strategies toward the desired direction decided by the local authorities. The kampung transformation also continually occurred along with the city's growth and development. Therefore, transformation at kampung can be included spatial, demographic, and socioeconomic transformations.

2.4 Architectural Adaptation

Schmidt et al. (2016) explain that there are six strategies or types of transformations in the process of building adaptation. Since they applied for building, the adjustment should be adapted concerning the group of buildings. They include:

(1) Adjustable

In this section, adaptation is in the form of rearrangement of furniture in a room to accommodate different functions. In other words, in the form of changes to processes and users. In this case, the main change is what is

the content in space. Changes in filler elements, in this case, can be physical elements that make up the space, whereas physical characteristics can be fixed elements, semi-fix elements, and informal elements.

(2) Versatile

The application of adaptation changes the spatial layout in space for variations of activities. In this case, the design of both the filler and space-forming elements should be adjusted to accommodate the new activities. Changes concern the filler elements (stuff) and the spatial planning (space plan). The change of filler element consists of the fixing element, the semi-fix element, and the informal part. The spatial changes can be observed through changes in shape and factors that can be defined as the element of space, such as horizontal and vertical elements.

(3) Refillable

Refillable adaptation is the ability of the building to change, consisting of space, service, and building skin. It will usually affect the aspects of building legality, environmental conditions, technology, and materials (change of performance). The changes that occur are: (1) the layout (space plan), (2) functions that are served by the space, and (3) the skin/façade. The modifications can be viewed from the physical elements. They form the emergence of spatial room and the activities that occur in the area concerning the function and usefulness of the observed site.

(4) Convertible

They adapted buildings by changing spaces according to market demands, social demands, and new ownership. Changes in this adaptation are related to the layout (space plan), functions served by space, and the skin/ facade. However, unlike the previous form of transformation, which is refillable, this convertible is more of an extended change. It occurs in buildings or on larger scales instead of buildings' elements where changes are the usability over a more extended period.

(5) Scalable

Adaptation occurs by changing the size of the space or changing of size in existing case studies. It often occurs due to market conditions, budget changes, and social conditions that require a smaller or larger room. Changes are included the layout (space plan), the function served by the space, the skin/ facade, and the structure. This change occurs because the area needs to accommodate new activities that are larger or more varied so that it needs to be changed structurally, and the skin needs to change in size.

(6) Movable

Movable is the rarest adaptation because it concerns the change in location of the building. It has principles such as easy establishment and rapid dismantling. It relates to the components' refillable, structural solution, access, and scale and affects the structure (structure) and the site (site). The changes are viewed on a structural system that supports infrastructure and accommodates activities.

3. Methods

This research will reveal the causal relationship between the morphological form of the *Kampung* Pahandut waterside area and changes in local people's everyday spatial usage triggered by economic, social, and cultural factors. The arrangement and diversity of the urban form of Kampung Pahandut are principally examined through analyses of two aspects: the pattern of streets and the typology of building using the strategies defined by Schmidt et al. (2016). The outcomes of these morphological studies highlight the importance of the built environment of the riverfront and provide opportunities for defining the local identity of Palangka Raya. Furthermore, recognizing the meaning and formulation of urban morphological changes in the riverfront area also will be helpful for the government before enacting the program of improvement, especially for the waterfront cities widely found on the island of Kalimantan.

4. Result and Discussion

The initial settlement of Kampung Pahandut

The history of the Kahayan riverside settlement area dates back to the 18th century, before establishing Palangka Raya as the capital of Central Kalimantan. " *Kampung/lewu* Pahandut" was the name of the initial settlement located at the Kahayan Riverbank area. Pahandut originates from the word Pa-Handut, meaning Handut's father. He was known as one of the Dayak settlers who opened the wilderness site for building temporary residences. The local inhabitants mention that the embryo of *Kampung* Pahandut is now at the location of the Rambang port pier. To the southwest of *Kampung* Pahandut, there is an area called *Danau Seha* (Seha Lake) that used to be a lake-front settlement consisting of stilt houses. However, the water had disappeared, and now the area had transformed into an ordinary landed housing. A transcribed record of the Dayak Tumbang Anoi Peace meeting in 1894 mentioned that the initial settlement in *Kampung* Pahandut consisted of eight longhouses called (Betang or Dayak traditional houses) of which five families inhabited each house. The number of residents was estimated to be 40 families living at the

longhouses facing the Kahayan River (Palangka Raya City Government, 2003: 20). Report in 1957 mentioned that there were about 21 houses with about 250 people who lived in the *Kampung* Pahandut area (Usop, 1996 in Wijanarka 2001). The history of this riverside settlement area is also recorded in the report of Zacharias Hartman, an official of the Dutch East Indies Government, who was traveling down the Kahayan River and Kapuas River in October 1823. His notes become references in the History Book of Palangka Raya City (Palangka Raya City Government, 2003: 20).

The position and the geographical settings attracted the pioneer settlers of "*Kampung* Pahandut "and they decided to settle there. The area was easily accessed to the water source for daily activities. The navigable river of Kapuas River was also important since the community is still dependent on the river for transportation. The river is the lifeblood of the economy and the source of livelihood. The correlation between riverfront land as a place to live and the role of the existing river as a transportation infrastructure had a massive influence on the community. As a result, it formed unique social and cultural patterns so that the city of Palangka Raya was known as the "City of Water." (RUTRK Kota Palangka Raya 1999-2009). Figure 2 shows old photos depicting some conditions of *Kampung* Pahandut in the past.

Figure 2. *Kampung* Pahandut in the past

(a) Village street in Pahandut in 1929 (This village lies on a sandy hill, a dune, and on the edge of a marshy area).
(b) The village of Pahandut in 1924 (In the foreground is a small hut for bathing, boats, and trading posts). The other houses were provided as logs for strangers who passed through.
(c) The 'Batang' (places for tying up the boats) in Pahandut in 1924. Small houses for bathing were built on the same structures. The motorboat belonged to a Dutch official.
(d) Pahandut (Kahajan) lower part of the village in 1928
(e) Pahandut Landscape (in the background of the Kahajan River) in 1929.
(f) The landing place and stairway led up to the missionaries' compound in 1929.

Source: University of Southern California Libraries
(a) https://doi.org/10.25549/impa-m21636; (b) https://doi.org/10.25549/impa-m21699; (c) https://doi.org/10.25549/impa-m21867; (d) https://doi.org/10.25549/impa-m55972; (e) https://doi.org/10.25549/impa-m21637; (f) https://doi.org/10.25549/impa-m22200

The current situation

Kahayan River has a riverside width of 200 m that becomes the unique setting for the daily activities of residents who live on the riverbank. The site physically formed the settlements that naturally developed into an organic pattern and formed into elongated settlements following the shape of the river. The house's orientation faces the river, indicating that the river becomes the centre of daily activities. Figure 3 shows the conditions of *Kampung* Pahandut in the present.

Figure 3. **Aerial Photo in *Kampung* Pahandut,** *Source: Observation Field, 2022.*

Street Pattern

Based on material usage, streets in *Kampung* Pahandut are divided into (a) asphalt roads, (b) unpaved streets (dirt streets), (c) wooden bridge/*titian*, (d) combination of wood colonnaded and concrete paths, (e) concrete path, and (f) floating path. The formation of the circulation and the environmental patterns are organically and naturally follow the form of the river, which creates linear circulations in combination with the formal road. The government developed the latter to connect Kampung Pahandut with the surrounding area. As a result, the circulation formed a hierarchical pattern as follows:

a. *Jalan aspal* is a formal asphalt road that is immediately accessible to Kampung Pahandut and enables vehicles to approach rivers with road patterns following the topographical conditions of the environment. The road width is 6-8 meters.
b. *Jalan Tanah is* an unpaved or dirt street naturally made to enable people to access the slope area that becomes a transitional zone between the highlands and the wetland. The street width is 1,5 to 2 meters.
c. *Kayu bertiang* or *titian* is a wooden bridge that becomes the primary pedestrian access inside the residential area at the riverside of the Kahayan River. They were formed into the organic linkage that connects one building to others and between the residential area and the other main *titian*. Titian wooden poles were constructed using hardwood/iron materials with varying sizes of 5/10, 6/12, and 10/10 centimetres. The bridges formed into a path with a width of 1.5 to 2 meters. The floor materials use hardwood (*kayu besi/ulin/tabalien*) with the height varies according to the contours of the area ranging from 1.5 to 4 meters.), with the height varying according to the area's contours ranging from 1.5 to 4 meters.
d. *Kayu bertiang lantai beton* is like *kayu bertiang* but the floor was made from concrete.
e. *Cor Beton* is a concrete road that becomes a transition between an asphalt road and a wooden path (*Kayu bertiang/titian*). This path landed on the ground soil with a slope angle ranging from 15 to 30 degree.
f. *Batang* is a floating street that is not permanent and becomes the primary access connecting the floating house (*Huma lanting*) to the titian road.

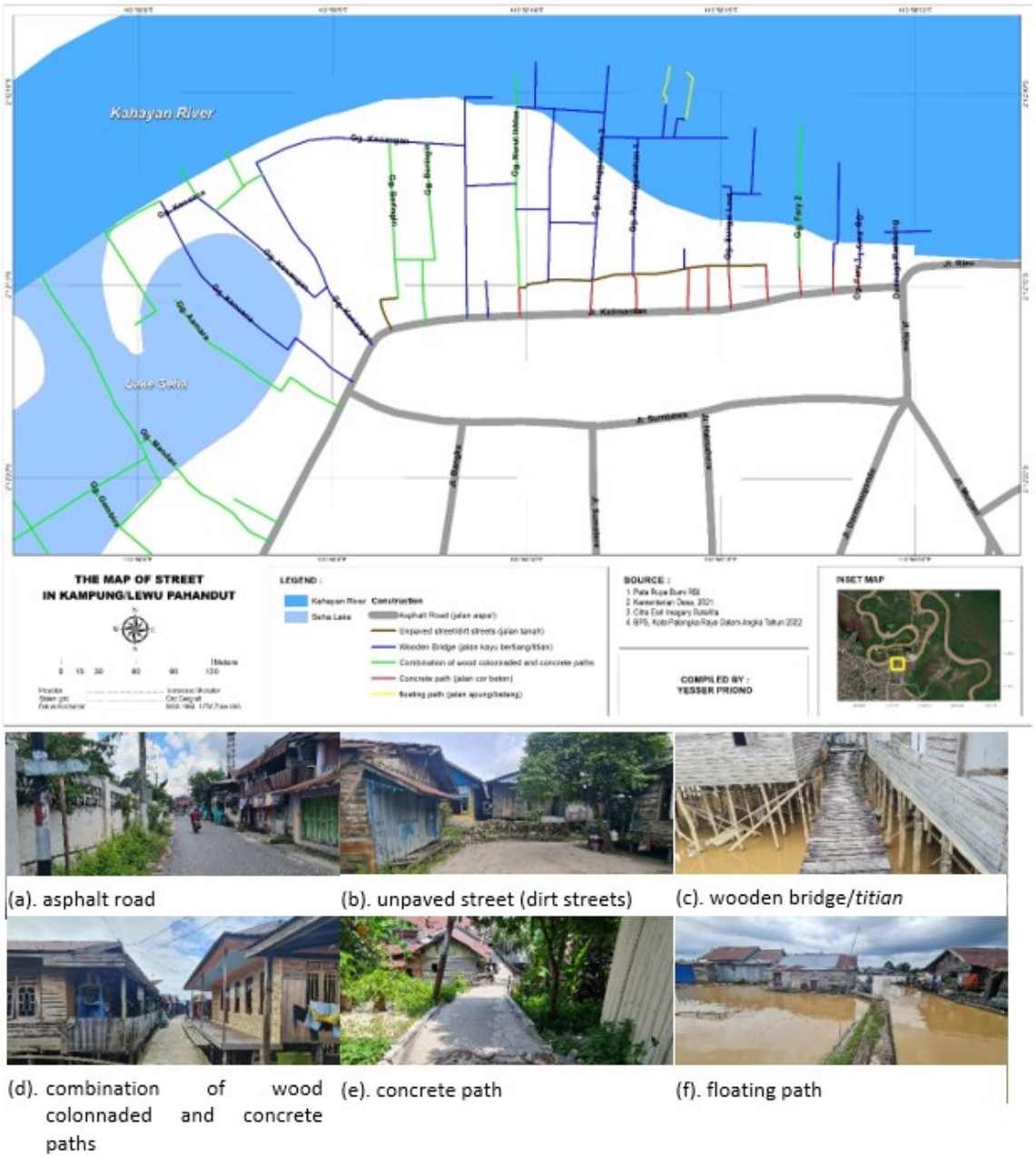

Figure 3. **Street in *Kampung* Pahandut,** *Source: Analysis & Observation Field, 2022*

Characteristics of buildings

According to Riwut (1979), the Dayak community selected the riverbank as their residential location refers to natural factors. The peculiarities of riverside settlements are contour patterns, topography, and the water level. The river's tides accordingly influence the condition and situation of the buildings erected at the riverfront.

The buildings in the Kahayan Riverside area have unique characteristics that express the local architecture. The typical of housing at *kampung* Pahandut includes (1) floating house/raft house *(huma lanting)*, (2) pillar house/stilt house *(rumah panggung/huma bajihi)*, and (3) permanent/concrete house *(rumah permanen/huma segah)*.

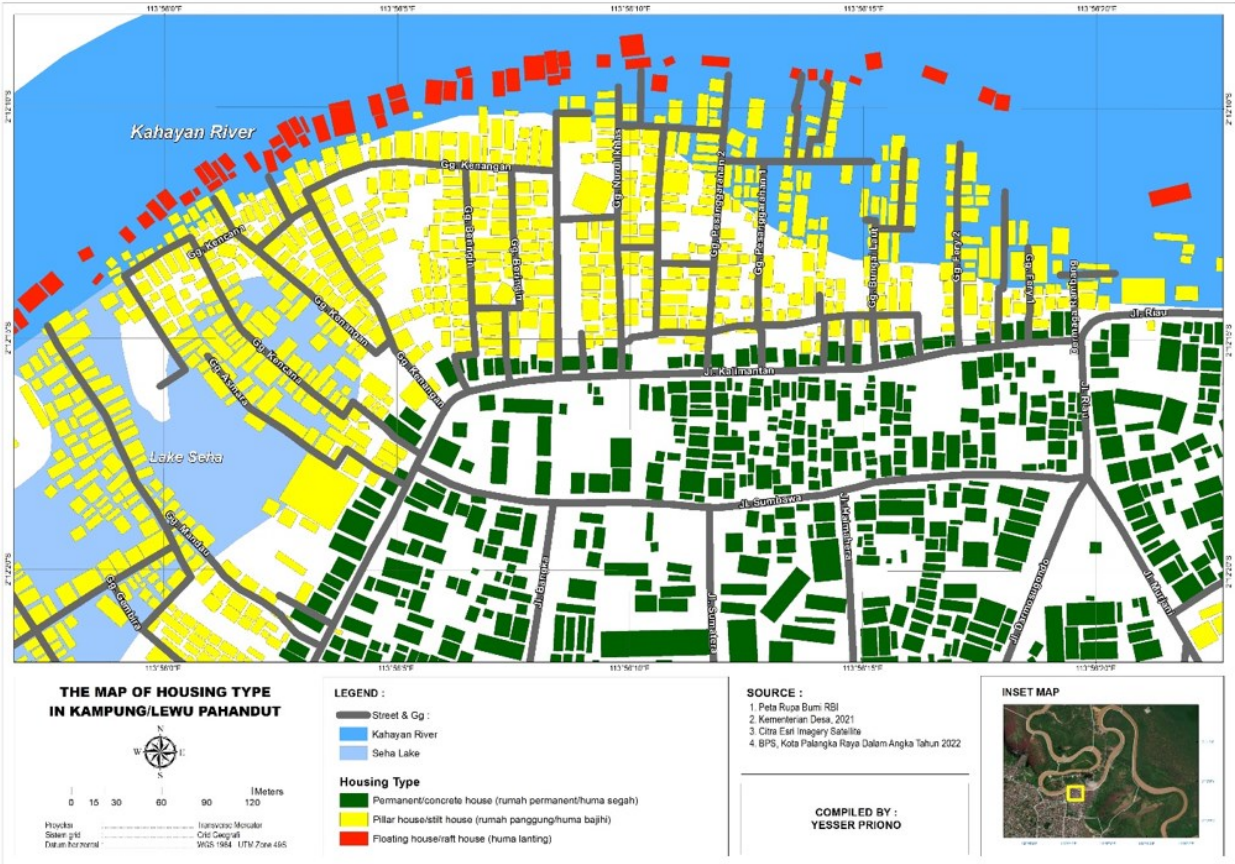

Figure 4. Map of Housing Type, *Source: Analysis & Observation Field, 2022*

1. Floating house/raft house *(huma lanting)*
   The floating houses are distributed into several types according to their specific functions: (1) a place to live, (2) a fish cage farm, (3) a boat repair/dock *(batang)*, (4) a stall, and (5) a boat parking space *(jukung)*. The floating building is supported by pillars made of wooden logs with a diameter of 50-100 cm, and each pillar consists of 2-3 logs arranged in parallel.

Figure 5. **Floating house/raft house *(huma lanting)* in *Kampung* Pahandut,** *Source: Observation Field, 2022*

2. Pillar house/stilt house *(rumah panggung/huma bajihi)*
   The *Rumah panggung* is a collonaded house that dominates the Kahayan Riverfront and creates a high-density settlement. The pillar system is regarded as the construction method applied by the community to handle the Kahayan River's tides. In addition, it is also a response to the topographical and natural condition of the Kahayan River. The pillar houses are supported by hardwood *(ulin/tabalien)* as a foundation so that the structure can be more resistant to water and moisture. The construction of floors and walls of the house uses softwood materials such as *banuas* wood, *meranti* wood, *lanan* wood, and *kayu hutan* (forest wood). At high tide conditions, the pillars of the building will submerge in the river, and during the dry conditions, they will stand upright and firmly erected on the ground.

Figure 6. Rumah bertiang/panggung/*huma bajihi* in *Kampung* Pahandut, *Source: Observation Field, 2022*

3. Permanent /concrete house *(Rumah permanent/huma segah)*
   The concrete houses (permanent houses) in the *Kampung* Pahandut area are situated in high-altitude regions. Previously, building materials used wood, and buildings tended to be built like pillar houses. Over time, it transformed into concrete buildings and was directly built on the ground.

Figure 7. Permanent /concrete house *(rumah permanen/huma segah)* in *Kampung* Pahandut, *Source: Observation Field, 2022*

Landuse

The case study area of the *kampung* Pahandut area covers 17.45 hectares of area with the following land uses: (a) housing area of 16.39 ha, (b) open space of 1.04 ha, and (c) green area (*Ruang Terbuka Hijau*) of 0.15 ha. The rest are covered by water (the river and the lake). Informal buildings with pillar wood construction dominate the settlement in kampung Pahandut. Recently, the transformation processes occurred at Kampung Pahandut following the change of the riverside environmental conditions triggered by the development of Palangka Raya city.

Architectural Adaptation in *Kampung* Pahandut

Following Schmidt et al. (2016) about the adaptable architecture, the spatial and architectural adaptation of Kampung Pahandut is described as follows:

Adjustable

Adjustable architectural adaptation occurs in the riverside area of *kampung* Pahandut, which has the attributes of change in the form of filler elements (stuff). The observations in the field found changes that formed empty spaces that the inhabitants used as cattle cages, such as ducks. The cage is arranged into a floating system to flexibly adapt to the water level during the flood and dry season. The floating system drives the residents to make the impermanent cage. The cage becomes a space-filler element that can be moved quickly.

Refillable

The observations on refillable factors in the riverside area of *kampung* Pahandut found changes in open spaces, dock areas, and land areas. Water that becomes a space-filler element in the neighbourhood becomes an element that displays significant changes. The water is vulnerable to the tidal condition following the changing season, making the space either change into a container of water or empty land space and vice versa. When the river receded, the space became an empty land space and was utilized as a playing field for children. In the dock area, the tidal change will influence how the people use the space for daily activities. In this area, changes in water level affect the land space and create the different order of the piers and change the circulation lines. Each change of seasons will form a different elevation, and in effect, it will change the pattern of daily activity.

Movable

The observations revealed changes in the transition space between the river body and the riverside area. It happens because of the tidal conditions of the river. The impact changes the infrastructure from permanent *titian* to temporary *titian*. In terms of the condition of floating buildings, they follow the movement of the water surface so that the building's structural elements can move both in vertical (up and down) and horizontal directions (right, left, front, and back). The temporary titian is made of wooden logs that become a permanent *titian* that links with the floating house. As a result, they enable to move the sites following the movement of their floating houses. This situation creates both attractive and dynamic environmental conditions.

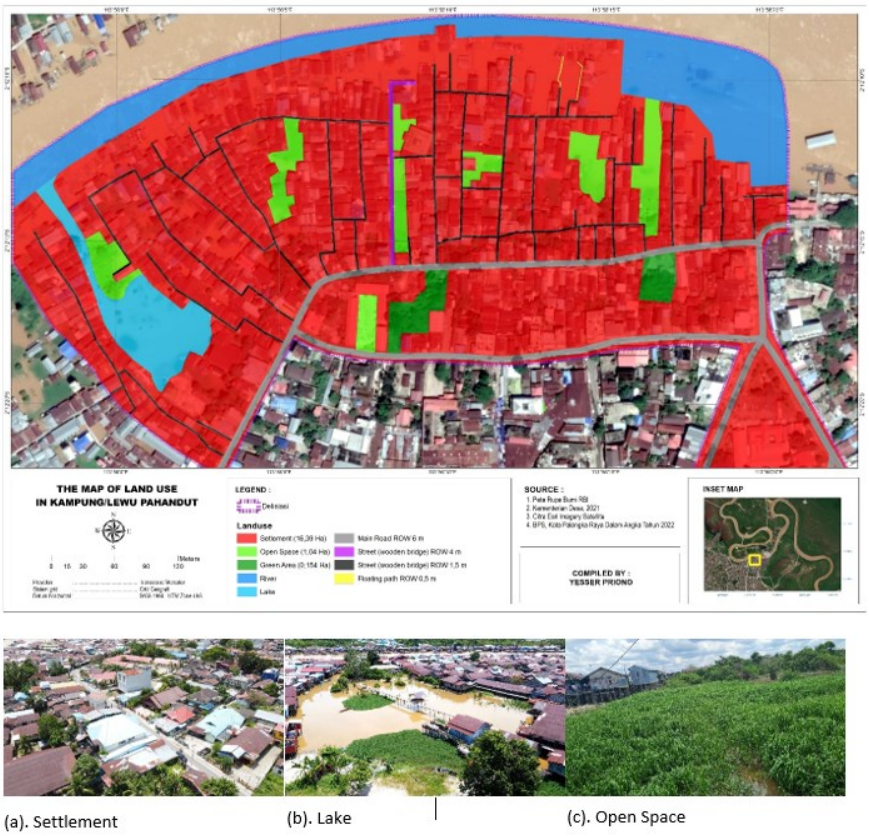

Figure 8. Land Use in Kampung Pahandut, *Source: Analysis & Observation Field, 2022*

To adapt to topographical and environmental conditions, houses at *kampung* Pahandut diversified following the differentiation of the ground floor structures, including: (a) houses on the ground; (b) houses with half on stilts and half on the ground; (c) houses on stilts; and (d) floating house.

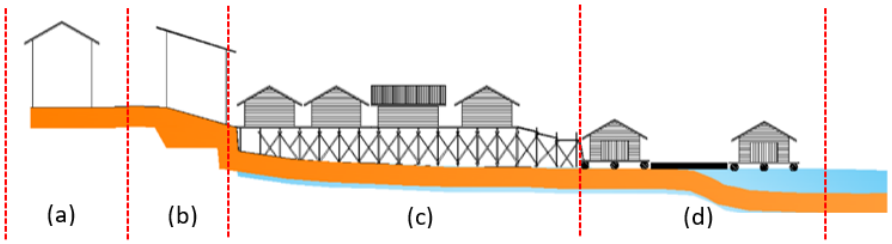

Figure 9. Housing situation in the dry season, *Source: Authors, 2022*

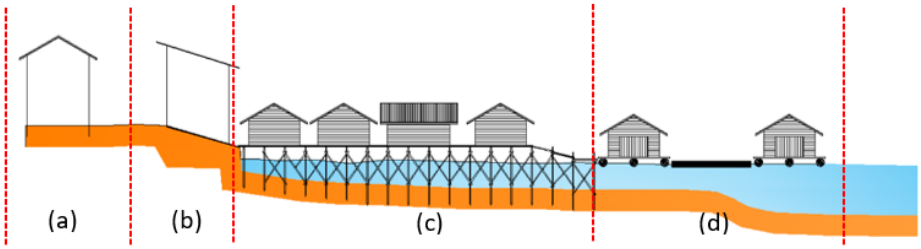

Figure 10. Housing typologies in flood season, *Source: Authors, 2022*

Based on environmental regulations, the *kampung* Pahandut area divides into 5 (five) classifications as follows: (1) River environment resided by floating *houses (huma lanting*). They are tied into an anchor from a wooden pole stuck into the ground; (2) The Lake environment's condition of which the environment forms spontaneously following the

city's development. Building construction in this area involves constructing pillar buildings/pillar houses *(huma bajihi)*. The height of the building poles is relatively the same, ranging from 2-3 meters; (3) Wet plain environment dominated by stilt buildings construction (pillar houses). The height of the poles on this building varies according to the topographical shape of the environment context; (4) Slope environment is a transition space between the highlands and the wetlands. The buildings are characterized by a combination of concrete materials that tread on the ground and pillar construction on the slope area; (5) Highland environment or a hilly area, wherein the water level does not exceed the land surface. There is rarely a flood in this environment due to the rising water levels. The buildings in this highland environment are varied. The buildings predominantly use wood construction, concrete construction, and a combination of wooden and concrete structures.

Figure 11. Classification Environmental in *Kampung* Pahandut, *Source: Authors, 2022*

5. Conclusions

Kampung Pahandut is one of the oldest villages on the banks of the Kahayan River at Palangka Raya city. The condition of the waterfront environment is constantly changing, which makes the community must adapt to environmental conditions and, in effect, triggers cultural responses. Architectural adaptations found in the riverside area of *kampung* Pahandut are adjustable, refillable, and movable. The first adaptation is adjustable. It is shown in how the inhabitants utilize the open areas in response to changes in the riverside area's environmental conditions that are affected by the tidal of the Kahayan River. The second architectural adaptation is refillable. This situation often arises in the riverside area. This adaptation occurs in the regions that accommodate different activities in high tide conditions (floods) and low tide conditions (dry). Adaptation occurs due to the spatial need for the daily activities, including spaces for the playground, the docks, and the field to grow crops, while adjusting the layout of physical elements to accommodate those functions. Refillable adaptation is shown on the pier following the changing of the tidal conditions. The water is adjusted using a flotation system and hinges on the *titian* that follows the level water level during the flood and dry conditions. Finally, movable architectural adaptation is an adaptation that occurs due to displacement or change in the location. Movable adaptations affected changes in the structure and shifted the site location from one place to another. This adaptation expresses a response to environmental changes following the water surface and temporarily occurs. This form of adaptation often intensely occurred in the floating houses/*Huma lanting* that, in effect, they can far away dislocate from their original sites following changes in water level.

Based on the physical elements of the riverside area of *kampung* Pahandut, the configuration of the road and residential patterns are influenced by several factors, including (a) the shape of the river that naturally formed, (b) the topography of the environment of the *kampung* Pahandut area, and (c) the tidal conditions of the riverside. As a result, this transformation would have some impacts, among others are the culture of the riverside community and the socioeconomic conditions of the people who live in the riverside area. The culture of settling by the river is a decisive factor in shaping the character of the riverside at *kampung* Pahandut. It reflected the community's dependence on the river. Although the city of Palangka Raya transformed into a land-based city and left behind the

riverfront area, at kampung Pahandut, the community still maintains the Kahayan River as the source of people's daily lives.

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Conflict of Interests
The authors declare no conflict of interest.

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