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Riverine Settlement Adaptation Characteristic in Mentaya River, East Kotawaringin Regency, Kalimantan Province

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Abstract. The research looks for the importance of riverine settlement preservation as one of the efforts to carry out sustainable management of a traditional settlement. East Kalimantan, more specifically riverine settlement in Mentaya River is known as one of the traditional settlements that put river as the central of their livelihood activities. The theory of Rapoport [1] was used to investigate the importance of cultural aspect influence to the settlement process, and to seek for the behavioural and environment relationship in determining the pattern of adaptation process. Mix method approach was conducted by utilizing in depth interviews among 40 respondents within three districts, namely in Baamang, Mentaya Seberang and Mentawa Baru Ketapang subdistrict. The result shows that culture dominantly affect the process of settlement adaptation, especially the aspect of family structure, social network, and kinship. The adaptation pattern is influenced significantly by physical environment, type of physical condition of the houses, economic condition and the degree of heritage preservation motive. It sums up that adaptation process could be effective if the integration of culture, activities and government regulations is performed.

Keywords: Adaptation, Riverine Settlements, Behavioural and Environmental Interactions

1. Introduction

The word of sustainability is nowadays labelled in a planning and design cycle to reflect the effectiveness of the program. In Indonesian context, sustainability has become one of three pillars of national development, together with the gender and the good government pillars. Budihardjo and Sujarto [2] noted that sustainable development as a process of change where resource utilization, investment direction, development orientation and institutional change are always in balance and in they were reinforced to meet now and then human needs and aspirations. In many development applications, the most important things of setting the sustainability is by designing indicators to measure in which stages these process is conducted. Mc Larren [3] defined the concept of sustainable development as a process of achieving a set of desired conditions. It could be the condition of equity, natural environment protection, economic and social welfare, and also community well-being.

Mentaya riverine settlement located in the riverbank of Mentaya River of East Kotawaringin Regency in Kalimantan. According to its historical background, the beginning of growth of Sampit City has been started since Banjar Sultanate era in 1500 AD and progressed to become an urban area after the emergence of two largest wood and rubber processing factories in Kalimantan, namely PT NVBDH (Brengsel Factory) and PT Sampit. In the early days of the kingdom, people opened up land for gardening and extracted natural products as well as built houses to keep the land. At that time the



Sampit city is still a village by the river with a population of about 500 people. After occupying the area for a long time and feeling the life is getting better, they began to invite families and relatives from their home region (Banjarmasin) to settle in the new city. This leads to the development of riverine settlement.

At the time of Dutch colonization in the mid-19th century, the urban growth embryo began to form in accordance with the development of seaports and road frames. The Dutch designed the roads and pathways by linear pattern and surrounded by settlement which is grouped according to ethnicity (Chinese, Javanese, Dayaknese, Dutch and other immigrant ethnicity). In the post-independence period, the Sampit Urban Area became bigger because of the construction of the Brengsel and PT Sampit timber plantations as well as several other timber companies in areas that revive economic activity in Sampit City. The settlement development is also influenced by cultural and religious values, both in social relations and in the design of houses and residential areas. These historical remains can be found in the form of buildings, dwellings, and infrastructure such as the *Rumah Bahari*, the City Park, the Evangelical Church, the Brengsel Plant, the harbours, markets, and the main road network on the banks of the Mentaya River.

Adaptation is the process and the way in which it adapts to its environmental conditions [4]. The purpose of adaptation is for people to live harmoniously and well-integrated with their environment. The river as the philosophy of life and the orientation of the Dayaknese (indigenous Kalimantan) became one of the characteristics of settlements on the banks river. In other words, the adaptation that occurs can be seen from two aspects. First, adaptation to environmental conditions; how the characteristics of river edge activities can be accommodated. Furthermore, adaptation to the condition of their house; how is the settlement process form a spatial organization pattern that makes residents feels at home. Finally, efforts were made to achieve ideal conditions of the house and the desired environment to reach their settlement sustainability. Brocklesby and Fisher [5], Widodo [6], Diem [7] stated that the relationship between behaviour and environment are in the settlement process. These literatures identify the importance of meaning to the cultural aspect and see this relationship as a unity of the environmental quality system. Such interactions are understood as adaptations.

In a traditional settlement and riverine especially, the most important aspect of the sustainability is the process of adaptation and focuses on the harmonious relationship between man and nature. Previous studies did not focus on the human environment relationship in regards to traditional riverine settlement. Rather than, seeing riverine settlement generally related to climate change and natural resilience context. This study aims to identify and to analyse the characteristics of adaptation of settlement of Mentaya River is as effort to support the sustainability of traditional settlement of Kalimantan river bank. Adaptation becomes the main analysis to be discussed, since adaptation will show the processes, motives and ways to settle for the riverine settlements in order to maintain its livelihood and its efforts to improve the quality of life [8][9][10]. The research focuses on the mixture of indicator of natural environment protection and individual wellbeing in the adaptation of traditional settlement. It is undoubtedly that culture plays an important role in the settlement, as culture contributes to the meaning of identity and the characteristics of a settlement [1][11][12]. We argue that sustainability of a riverine settlement will be effective if in the adaptation process involves the integration of culture, activities and government regulations. This paper therefore explores the livelihood adaptation process in Mentaya riverine settlement has revealed the influences of behaviour and environment relationship. It contributes to current debates on riverine settlement livelihoods adaptation by emphasizing on the process, motive and adaptation technique conducted by the population.

2. Data and Method

The mixed method approach was conducted in this research, which qualitative approach was used more dominant than the quantitative one. The exploratory comparative analysis identifies the process,

motive and adaptation technique of Mentaya River settlement to the condition of house and environment. Another analysis included a superimpose map analysis to determine the characteristics of riverine settlement pattern.

The data presented in this paper were derived from semi-structured interviews among 40 respondents located in three sub districts, namely Baamang, Mentaya Seberang and Mentawa Baru Ketapang corridors. The in-depth interview technique is utilized by purposive sampling, which is determining criteria of respondent based on:

- Living in a house distance of 0-20 meters from the Mentaya River.
- Residents of riverbank settlements aged 15-60 years.
- Already settled for at least 10 years

Interview guideline was divided into 3 major sections that fit the research objectives, answering (a) Mentaya river traditional settlement characteristic, (b) process, type and motive of their settlement adaptation and (c) occupants expectation to their settlement sustainability.

3. Results and Discussion

3.1 Respondent Profile

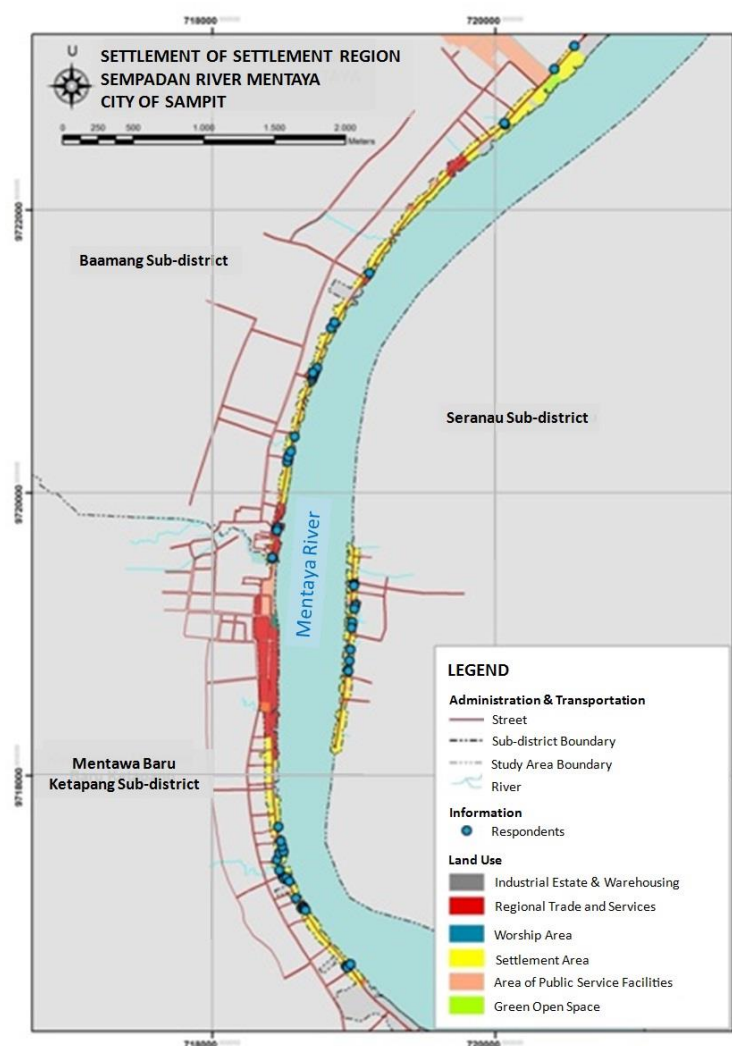


Figure 1. Map of Respondent Distribution Location

The profile of the respondents describes the economic condition, family structure and home occupation process. Based on the interview, it is depicted that in general, the family structure is traditionally formulated. For example the head of the household is still dominated by man (58%). He is also the only breadwinner in the family (73%). Most of the respondents mentioned that, they inherited the houses from their parents and occupied by nucleus family and the extended family. The ownership then transferred into self-titled (95%) which guarantee the ownership of the house belongs to the nucleus family.

The educational background shows that the level of education is in the medium level, the majority are graduated from senior high school (73%) and followed by graduated from universities (18%). From employment conditions, many of the income earner works at informal private sector (40%) and government employee (20%). Almost all the households being interviewed are originally native (88%) inhabitants and have long settled in the houses for more than 30 years.

3.2 *Characteristic of Mentaya Riverine Settlement*

3.2.1 *Natural Conditions*

Discussion of these natural conditions includes hydrological, geological, and topographic conditions in Sampit City. Hydrological conditions or surface water in the city of Sampit is flooded by a large river of Mentaya River which empties into the Java Sea. Mentaya River flows from north to south of Sampit City, has an average width of 400 meters with a river length of $\pm$ 400 km and an average depth of 6 meters. The settlement along the Mentaya River is located in lowland with altitude of land at Corridor I Baamang of 32 mdpl, Corridor II Ketapang 34 mdpl, and Mentaya Seberang Corridor of 3 mdpl. The soil types found in the suburbs of the Mentaya River are podsolic and organosol (peat) which reflect the suitability for built environment.

3.2.2 *Infrastructure Condition*

The basic needs of infrastructures in the Mentaya Riverine settlement are complete because of the availability of electricity, clean water, road network, drainage, telecommunication network, and other public facilities such as shops, houses of worship, educational facilities and transportation facilities. However, the presence of public open space and green belt area is still less prevalent in some settlement areas so that residents take advantage of the house front or the edge of the road for a place to socialize. Other basic needs that are still lacking are waste management services. Based on the observation, the residents process their waste conventionally, by burning the waste piles. It is due to the unavailability of communal trash in their environment. This is quite disruptive because if the garbage is not properly managed it can adversely affect the river environment. The emergence of waste piles could trigger floods, create unpleasant odors, leads to slum, and disrupt the smoothness of water transport.

In accordance with Sampit Urban Spatial Plan Year 2016-2036, the research location is designated as a Regional Activity Centre[13]. This means that the location of the settlement is strategic because it is close to the municipal service centre. The proximity and the completeness of the infrastructure provided, also the quality of the infrastructure building condition is at a sufficient level to perform its services as the activity centre (Pusat Kegiatan Wilayah).

3.2.3 *Settlement Pattern and Conditions*

Mentaya riverine is an unplanned settlement with patterns following the circulation of roads and rivers. It is a linear pattern filled with a regular grid settlement. The regular shape is due to the flat topographical conditions, so that the road growth becomes parallel with a uniform shape. The design of the house is still traditional, and constructed from ironwood. Most of the houses directly adjacent to

the river and it is located on the river body (in this case located on the east side of Baamang and Ketapang Corridor) are pillar house. On the other side of Mentaya River, the majority of the construction is landed houses. The house is above the river oriented back to the river, while the house opposite the land oriented facing the river. Observation reveals that generally the houses in Mentaya river settlements are pillar houses (*Rumah Panggung*). Only few of them are raft houses (*Rumah Lanting*), which is almost all of them was abandoned.

The difference between pillar houses and raft houses is on the nature and development [14]. The nature of the raft houses is to be used for economic reasons. Initially as the river is for major accessibility of the population, they use the raft houses for boat moorings. Later on, it has been used for houses, stall/ shop and for fish cages. On the other hand, the pillar houses are originally used for a landmark for Kalimantan Province. It is popular to be named *Rumah Betang*, where the major construction is made from ironwood, which has special feature as an anti-termite material. According to Dayaknese belief, it has to be built facing east (the direction of sunrise) with the stern face to the west (the direction of the sunset). It is considered a symbol of hard work to survive from sunrise to sunset (Source: Interview, 2017).



Settlement in Mentaya Seberang

Raft houses (*rumah lanting*) in Mentaya Seberang

Settlement in Baamang Hulu

Pillar houses (*Rumah Panggung*) in KetapangTraditional house called *Baanjung*, architectural design is combination from Dayak, Banjar and Dutch culture**Figure 2.** Type of houses in Mentaya River Settlements

3.3 Process, Type and Motive Of Mentaya Riverine Settlement Adaptation

The process of the adaptation is accelerated by heterogeneity of characteristics of economic activities from the population[12], in order to enhance individual and collective abilities in improving the quality of life. Initially the land was bought and the house was built by the great grandfather. The division of space is based on the number of family members and economic ability. Usually the number of rooms within a house is designed based on extended family context. The minimum number of rooms are 7, namely 1 living room, 1 family room, 3 bedrooms, 1 room for kitchen and dining room, and 1 bathroom / WC is allocated outside the house (they called it *Batang*).

The housing design is to divide the public and private area by putting the public area in the front of their house, as a welcoming area. And the private area is connected to service area in the back of the house. Between the public and private area is separated by a blind curtain shows the sense of trust between family members. Following the development of the family member to be more independent, several of the children moved out to the houses near to their workplace. There is also belief that a family should survive and sustain by themselves. Together, they can solve and ease all the problems arose.

For more than 30 years living at home, no renovation has ever been done. Most of the households mentioned the lack of funding as one of the factors not doing renovation. However, the most common renovation is done on the roof, which replaces the roof material from shingles (*sirap*) to tin roof.

This kind of renovation is sometimes followed by strengthening their house platform by checking the durability of the wood against the water erosion. Another type of adaptation is by preserving their first houses as the house preserved and is enriched with their family history. Although many of them moved out from the first houses, but they keep on maintained the originally of the housing design, which was dominantly influenced by Dutch and Dayaknese architectural design. The motive is to preserve cultural architecture value as their settlement identity.

To enhance livelihood, many of the households decided to stay at the riverine along with their nucleus family. Their motive is to stay close with their ring of support [7,10,11]. Several adjustments to their houses arrangement has been made to adapt to the level of the development of the family needs. For example, extending the room space to welcome a new born baby, changing the room usage to improve the economic performance by having a home based enterprises such as tailor, food stall and barbershop. These activities are as adaptation motive of putting their home as an investment material. In this context, home is seen as a commodity to improve occupants' economic status.

On the other hand, adjustments also have been made to their environment. The concept is to raise their comfortability and having a harmonious relationship of human and environment [4]. The interview result reveals several of adaptation types conducted by population such as:

- Moving out trends to the lowlands. As family getting bigger, each nucleus family wants to have their own independent household authority. They move out and directed to the lowland, avoiding the riverine activities agglomeration. They understood that household activities could emerge physical burden for the river preservation.
- Learning, conducting and preserving positive behaviour towards environment management, such as no littering habit, collaborative unpaid work (*gotong royong*) for maintaining environmental hygiene, planting shade tree to improve home comfort and so forth.
- Maintaining good mutual relationship with the neighbour. For example: forming a collection watch among residents towards their security of the property. As it is evidenced by statistical record of criminal activities happened due to the increasing number of immigrants occupying the Mentaya River.

- Inhibiting the further occupation of raft houses (*Rumah Lanting*) for safety reason. This is also intended for slowly reducing the slum characteristic caused by unmanaged physical appearance of riverine settlements.

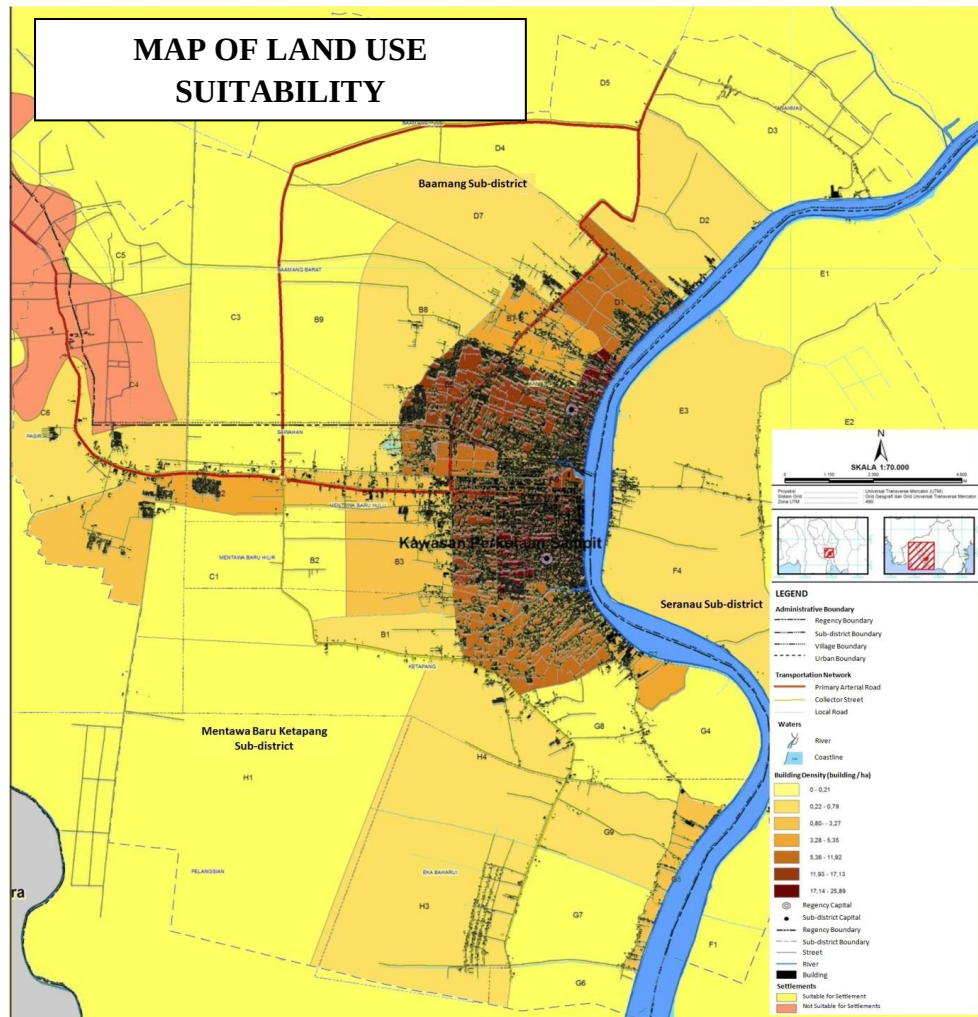


Figure 3. Map of Overlay of Building Density Map and Area Development Trend

3.4 Mentaya Riverine Settlement Sustainability

The settlement pattern is formed by at least six elements [11], namely (a) ownership security, (b) accessibility, (c) privacy, (d) social interaction, (e) infrastructure and (f) harmonious relationship between human and environment[11]. Evidence shows that security of tenure develops the relationship between residents and settlement. The security tenure protects the improvement of the property value, including also culture and traditional value of the home design. The knowledge and local wisdom of using their native building material such as ironwood proved to be sustained and extend the durability of building construction period. The privacy of able to decide based on family interest put them to have more social bonding between nucleus and extended family. This improves their quality of live in performing collective capability.

Physically, as it can be seen from the overlay map analysis result, the development of the riverine communities gained governmental support. Based on the Spatial Plan Regulation found in SIPP Year 2015 document, the spatial structure and detail development is directed to follow its organic formation

alongside the Mentaya River[13]. The map also shows that river is still dominantly used as the main orientation of economic activities in the city of Sampit. SIPP also as law abided regulation that suggests the local government to establish infrastructure provision suitable with the characteristic of the Mentaya riverine settlement. For example, policy needed for several traditional preserved houses such as the ownership protection, the detail regulation (*Petunjuk Teknis*) for heritage conservation actions, integrating tourism activities with traditional attractions features.

The connection between main activities, government support and culture proves to be key ingredients to maintain livelihood[15][16][17]. The main activities of Mentaya riverine settlement is a traditional oriented activities as it depends on the natural environment. The physical development is regulated within the carrying capacity of Mentaya River and surrounded area, while social activities is encouraged to be preserving of cultural value into way of life. The local wisdom to always have harmonious relationship with natural environment proven to make them always feels comfortable living in the neighbourhood. Bounded with the location requires them implementing good habit to maintain the environment and always integrate economic activities with the characteristics of the region as an environmentally friendly riverine settlement area. Furthermore, the community expect that the government will has to be consistent in performing settlement liveability. For example: various programs of economic development in tourism should be integrated and be a focus of Mentaya river development. This can be done by promoting river tour (*Wisata Susur Sungai*), religious attractions (*Safar / Ramadhan Festival*) and garden tour (*Wisata Kebun Rakyat*).

It is clear, that in order to perform livelihood; that is the feeling of being comfort, safe and secure in the riverine settlement, human capital, natural capital and social capital should be performed as key factors in the settlement adaptation process [18]. Human capital such as local knowledge, skills and capacity to adapt has been proven to influence the effectiveness of livelihood sustainability in term of capability to create practical solutions for economic survival. Natural capital that is the physical characteristic as a river has maintained settlement activities to be in accordance to its natural limitation and advantages. Finally, social capital namely family structure, network, connections (neighbourhood, kinship), relation of trust and mutual understanding and support, shared values and behaviours are dominant features that enhance livelihood sustainability. It also evidenced that the adaptation pattern is influenced significantly by physical environment, type of physical condition of the houses, economic condition and the degree of heritage preservation motive.

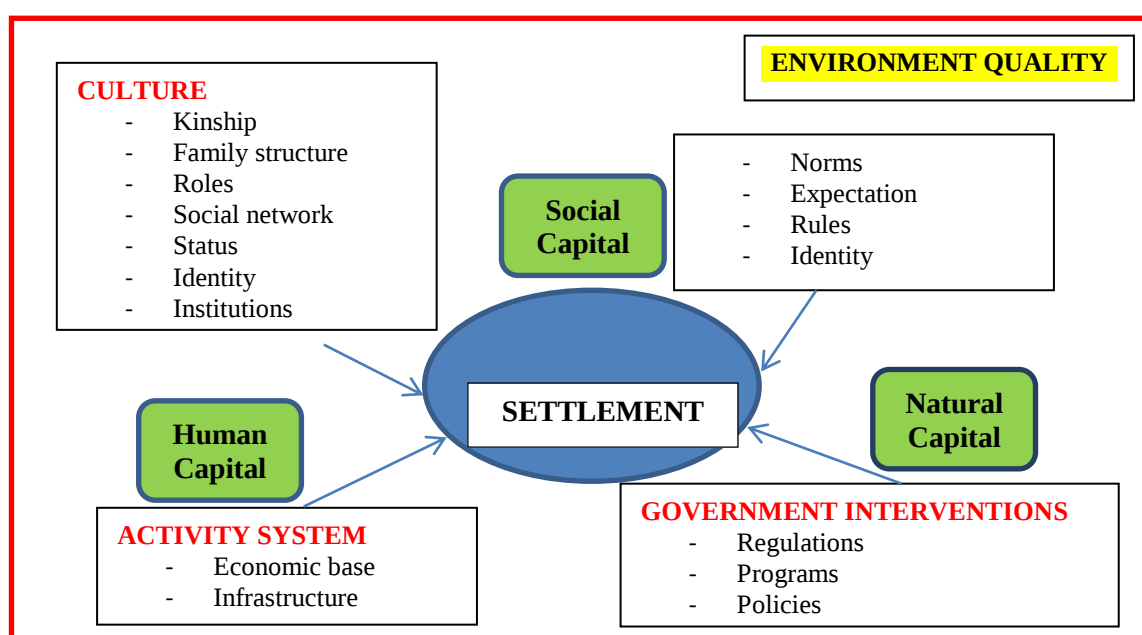


Figure 4. Environment Behaviour Relation in Human Settlement, Modified from Rapoport 2010

4. Conclusions

This research confirms that human environment relationship is needed to be maintained in mutual way to perform settlement sustainability. The result also reveals that adaptation process should be done simultaneously inside the house and in the environment. As a process, it is conducted by learning by doing approach. Exploring local wisdom and cultural value is one of the successful factors for Mentaya riverine settlement adaptation. Furthermore, positive behaviour from the residents and collaborative works between neighbourhoods should be preserved as the main cultural value that keeps the adaptation process harmoniously.

5. Acknowledgement

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6. References

- [1] Rapoport A and Rapoport A 2010 Theory , Culture and Housing Theory , Culture and Housing 37–41
- [2] Budihardjo, Eko and Sujarto D 1999 *Kota berkelanjutan* (Alumni Bandung)
- [3] Maclaren V W 2007 Urban Sustainability Reporting *J. Am. Plan. Assoc.* 37–41
- [4] Rapoport, Amos; Altman I W F J 1980 Volume 4 Environment and Culture *Environment and Culture*
- [5] Brocklesby M a. and Fisher E 2003 Community development in sustainable livelihoods approaches - an introduction *Community Dev. J.* **38** 185–198
- [6] Diem A 2012 Wisdom of The Locality (Sebuah Kajian : Kearifan Lokal dalam Arsitektur Tradisional Palembang) **2** 299–305
- [7] Widodo J 2012 Urban Environment and Human Behaviour: Learning from History and Local Wisdom *Procedia - Soc. Behav. Sci.* **42** 6–11
- [8] Taylor J 2015 A tale of two cities: comparing alternative approaches to reducing the vulnerability of riverbank communities in two Indonesian cities *Environ. Urban.* **27** 621–636
- [9] Saragih, S. J L dan A R 2007 Kerangka Penghidupan Berkelanjutan Sustainable Livelihood Framework
- [10] Surjono 2011 Lessons Learned from Traditional Settlement Patterns for Housing *J. Basic Appl. Sci. Res.* **1** 759–763
- [11] Pacione M 2011 Applied Geography : Principles and Praxis vol 28pp 7–28
- [12] Karlsson M and Bryceson I 2016 Continuity and change: understanding livelihood shifts and adaptation in coastal Belize 1830–2012 *Local Environ.* **21** 137–156
- [13] Sampit B K 2015 *Sistem Informasi Permukiman Perkotaan Kota Sampit*
- [14] Rijanta R, Setiawan B, Marfai M A, Geografi F, Geografi J, Geografi F, Mada U G, Geografi P J, Geografi F, Mada U G, Jurusan P, Teknik F, Gadjah U, Kota S and Pahandut K 2014 Urban Riverside Settlement Model Case : Kahayan Riverside Settlement , Palangkaraya **9** 17–27
- [15] Dovey K and King R 2011 Forms of informality: Morphology and visibility of informal settlements *Built Environ.* **37** 11–29
- [16] Sasongko I 2005 Pembentukan Struktur Ruang Permukiman Berbasis Budaya (Studi Kasus : Desa Puyung - Lombok Tengah) *Dimens. Tek. Arsit. Vol. 33, No. 1, Juli 2005* 1 - 8 **33** 1–8
- [17] Stedman R C 2002 Toward a Social Psychology of Place *Environ. Behav.* **34** 561–581
- [18] Serrat O 2017 Knowledge Solutions 21–26