

# ICRP

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# 2018

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## PROCEEDING OF 3<sup>rd</sup> INTERNATIONAL CONFERENCE ON REBUILDING PLACE (ICRP) 2018

*Towards Safe Cities & Resilient Communities*

**13 & 14 SEPTEMBER 2018**  
**IMPIANA HOTEL, IPOH, PERAK**

**ORGANIZED BY :**



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## ADAPTIVE SETTLEMENTS TOWARD FLOODING IN THE RIVERBANKS OF MEUREUDU RIVER, INDONESIA

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**Abstract** - Meureudu Riverbanks, was a pioneer place of a collective settlements, that was developed than eventually became a City of Meureudu in Aceh Province, Indonesia. Initially it formed as traditional fishermen settlements but has now shifted into modern settlements. However, the settlements have developed sporadically to form an unplanned pattern of settlements. This condition has resulted in low maintaining river, and has not adapted to the existence of the dwelling with the environment. Floods occur repeatedly in the river that affects the community. This study aimed to find the residential pattern design and adaptive settlements with Meureudu River watersheds. Easy and close access roads to markets created economy of the people in motion. This has also caused large number of unbridled migrants to enter and build the settlements. The method used is a combination of quantitative methods based on interview data and questionnaires and qualitative exploratory methods based on field observation. The data were collected through observation, field measurement and secondary data sources. The results show that the condition of settlements along the river basin do not reflect the culture of the river. In order not to further aggravate the condition of the settlement and its impact on the occupants, two types of houses, namely in the form of stage and non-stage are recommended. The stage house is located on the riverfront with an orientation overlooking the river. Undersea area can be used as security from the puddle of river water runoff during the flood and as a garden area and public while dry, while at a distance of 100 meters from the river non-stage house form might be built because the runoff of flood water can no longer affect on occupancy.

**Keywords** - adaptive settlements, riverbanks, floods, Meureudu River, Indonesia

### 1 INTRODUCTION

The majority of settlements have grown in areas around the water including rivers, lakes as well as seas (Mahatmanto, 2008). Meureudu River was initially started off as the beginning of collective settlements and eventually developed into the City of Meureudu. Currently, the city of Meureudu acts as the capital of Pidie Jaya Regency in Aceh Province, Indonesia, with the function as a center of district government, tourism activities, trade and service center and city of transit. However, the settlements grow have grown sporadically along the Meureudu River basin and have formed an unplanned pattern of settlements. Such conditions have resulted in not ideally circulating environments of settlements and resulted in poorly maintained river, bad infrastructure in the neighborhoods (swales) for drainage flow, unavailability of adequate green open spaces along the watersheds, and non-adaptive existence of the dwelling (both construction and distance) as a form of flood mitigation (Irwansyah *et al*, 2015). This condition has caused City of Meureudu to experience repeated floods that may harm the community.

Residential and human is an inseparable unity, involving mutually beneficial relationships and is strongly influenced by the quality of the environment and the quality of the individual. Human relationships with the environment reside are formed by various factors, among others: culture, environmental conditions, influence from outside, and behavior (Hirsan, 2011). Settlement is a collection of dwelling where initially each occupant mutually agreed formally and informally to form a community based on socio-cultural proximity. The socio-cultural relationship and the ability of each individual to adapt have greatly influenced the development of controlled settlements and provide a feeling of security for the residents. Many settlements have not developed but are uncontrolled and inconvenience to their inhabitants.

Adaptation is a strategy that humans use to respond to environmental and social changes (Allan, in Marfai, 2012). Maryono (2005) explains, rain factor is a natural condition that can cause floods depending on the intensity. Flood is a natural phenomenon that is part of the climate cycle. Floods cause disastrous for humans is the result of human intervention to nature (Kusumaatmadja, 2004, as cited in Suhandini, 2011). Flood is an ordinary natural event, then developed into a disaster problem if the water overflows disrupt the life, livelihood, and human safety (Setyowati, 2010). In order for settlements in Meureudu river watershed area to be sustainable, it is necessary to make adjustments to respond to repeated floods in Meureudu City. Marfai (2012) stressed that the adaptation process is very dynamic because the environment and human population are changing constantly. Human adaptation to the environment indicates the interrelation between humans and the environment (Desmawan, 2012). Flood adaptive housing model is one form of mitigation that can be recommended for the development of Meureudu City.

In Aceh Middle Term Development Planning Year 2012-2017 (RPJM) mentioned that the quality of the environment and disaster is one of the priorities of development to handle. If it was not handled properly it may impact the development of regional economy. The reason the research was conducted in the Meureudu riverbanks because it is a new district capital, and it includes an important development barometer in Aceh. Thus, planning in preparation for anticipated development and inadequate development and minimal disasters is a necessity that could not be postponed.

## 2 RESEARCH METHODOLOGY

The study was located in Meureudu City, 152 km from Banda Aceh City, precisely in Meureudu river watershed area. This area is used as trading area, fisherman's housing and its facilities with medium density level, and pond land.

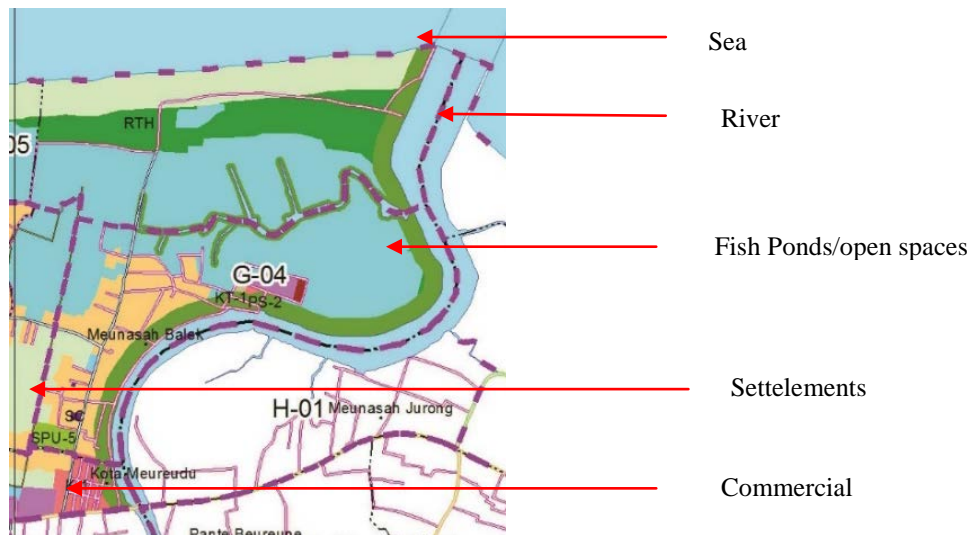


Figure 1 Map of Research Locations

Source: Detailed Spatial Planning (RDTR) Capital of Meureudu Sub-district, Pidie Jaya District

### 2.1 Study Approach

The method used for this study was mixed method. The method, which is a combination of quantitative methods based on interview data and questionnaires and qualitative exploratory methods that was based on field data (field observation) in the exploration of potential settlement Meureudu River.

Sources of data in this study include primary data derived from field research (e.g. observation, questionnaires, interviews, and documentation) and secondary data derived from literature review and documents from agencies related to this research. Data were collected through observation, field measurement and secondary data sources. Field observation is the most dominant portion in obtaining data and information.

Data processing uses analysis of survey results that have been done in the field related to the pattern of adaptation of the dwelling and the environment. The analysis process aims to understand certain phenomena in order to have a deeper knowledge through space. The complexity of phenomena reviewed was based on the process of formation and expression of spatial. In this case the symptoms were examined on how the process of flooding, adapted by the society to face the flood, form spatial pattern.

### **3 RESULTS AND DISCUSSIONS**

#### **3.1 Description of the City of Meureudu**

The settlements in Meureudu River watershed include the oldest settlements. This settlement has a swampy type of land, with topography in the form of a gentle plain with an altitude between 2-5 m above sea level, having a slope classification of <8%. This is measured from the height of the river i.e. about -0.5-1 meter. This means that there are some residential locations below the level of river water.

In macro this settlement lies in the trading zone. Therefore, many residents work as merchants and shopkeepers. Other professions are civil servants. There are those who work as fishermen and fish farming and pond shrimp. In this area there is harbor Fish Landing Place (TPI). As a result many residents work as transporters. Based on data on the study site, 60% are of indigenous population and 40% of migrants. Factors such as easy and close access to markets influence the economy of the people. These have also caused a large number of unbridled migrants to enter and build.

Residents get land as a residence that is derived from inheritance, buy, or rent it. Non-stage house (land) dominates the shape of the house by 70% and in addition to the stage-shaped house. The orientation of the building is toward the river, sideways from the river, and back to the river. This is influenced by the changes in the environmental conditions where there are roads. The condition of the settlement paid less attention to the environmental hygiene problem, it is seen that people are still throwing garbage into the river and making the communal toilets (MCK) on the river.

Transportation routes are dominated by land access. There is an asphalt road that the frontal car can pass from downtown to the beach, while the road environment is made of concrete and land that can only be used by motorcycle. Besides land access there are still people who use river transportation normally by boat.

#### **3.2 Land Use of Meureudu River Watershed and the Problems**

The form of the settlement extends along the stream with the development in the border of the river to the mainland. The settlement of Meureudu City originally shaped the structure of a traditional fishing town settlement; it was characterized by the existence of open spaces and proximity to water access. From the analysis it was found that fisherman settlements in Meureudu City experienced a shift in function from traditional to modern. This condition is caused by the large number of migrant residents who have strong capital, have trade skills, and have good management skills, which can affect indigenous people.

The land use designation leads to the Meureudu River watershed leading to an optimal land use system that can support all regional functions. Newly grown homes on vacant land in the basin have resulted in irregular conditions. The composition of houses is very close together and there are unclear environmental roads. The settlement pattern of Meureudu River watershed area and settlement problems are as Figure 2.

The phenomenon of the width of the river 20-30 meters with a depth of 5-8 meters is given dykes as high as 1 meter from concrete rebates and boulders. Based on the RDTRK of Meureudu City 2014-2034, Meureudu River must have a minimum border of 5 meters along the outer leg of the embankment. In addition, the width of the river border 0-2 meters, almost along the river body directly adjacent to the wall of the building. Population growth is not followed by the availability of settlement land, resulting in the large number of residents who build buildings on the river border/buffer area. River buffers and water bodies are the determination of some distance from rivers or bodies of water that are allowed for flooding.

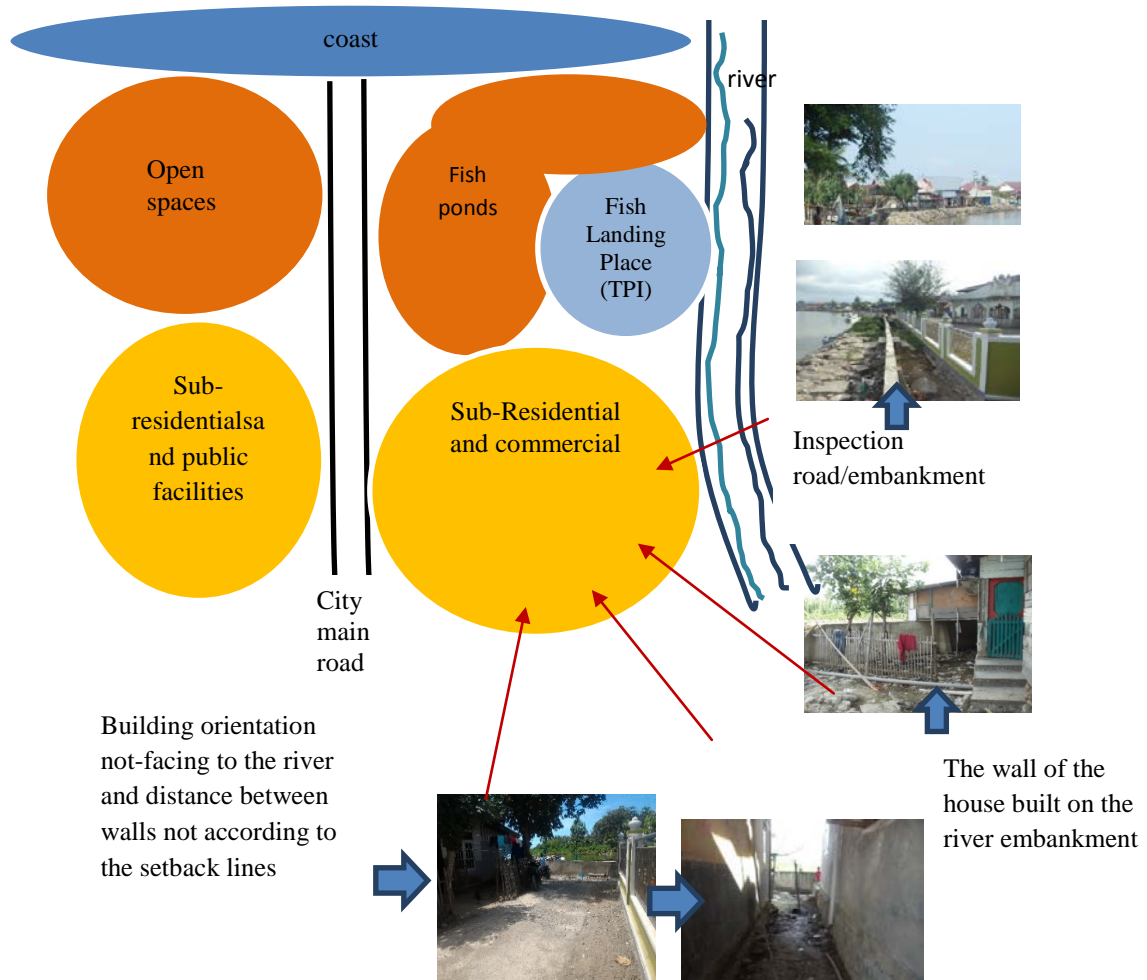


Figure 2 Settlement Pattern of Meureudu City and its Problems

### 3.3 Design of Adaptive Settlement Models

This study resulted in the formulation of an adaptive settlement model with the Meureudu River watershed environment as one of the solutions to tackle floods. Planned two types of houses namely in the form of stage and non-stage. The stage house is located on the riverfront with an orientation overlooking the river. In addition, undersea area can be used as security from the puddle of river water runoff during the flood and as a garden area and public while dry, while at a distance of 100 meters from the river non-stage house form may be built because the runoff of flood water has no affect anymore.

Based on the settlement model recommended by the Ministry of Housing and Regional Infrastructure, the settlement model for the Meureudu River watershed area is an integrated design model that is planned by design. The choice of this model is due to several factors such as the people in this region has historically settled for a long time, so relocation is not an easy problem because people are reluctant to move to other places. Besides, the threat of flooding can come at any time. Thus, being friendly with floods is the right solution for the settlements in the City of Meureudu.

**Non-stilted  
houses form**

Transition form from  
Stilted house to Non-  
stilted house form



**Stilted Houses form**



Figure 3 Adaptive Settlement Pattern in Meureudu Watershed

#### 4 CONCLUSIONS

It can be concluded that besides being influenced by topographical factors of sloping areas and river boundaries that do not meet the standards, the floods in Meureudu City are worsened by the conditions of occupancy and infrastructure that do not respond to flooding. The easy and close access road to the market keeps the people's economy moving, but that aspect also has caused the large number of unbridled immigrants to enter and grow in the Meureudu River watershed. The concept of the above handling is proposed based on the study of settlement conditions and adapted to the needs and desires of citizens (interviews) because the concept has minimized the eviction house residents.

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