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Flood disaster and risk anticipation strategy

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Abstract. The purpose of this study is to describe the risk anticipation strategy in facing flood as an action by local people particularly in the settlement area of Makassar suburbs. This is urgent to describe due that flood area is the densely populated area. This research used interviews, observation and literature study. Interviewing is for residents about their strategy in anticipating the risk of floods. Results of interviews that are mapped are based on the indicators of risk anticipating strategy. Observation technique is about the settlement condition before and after the flood. Literature study is about related theory and the same problem of this research for comparing each other. This study found that the residents as local people in risk anticipating flood as strategy, such as refuge to relatives and neighbors whose homes are free of the flood, store goods on higher ground, or tie to keep them from flood flowing, pet animals, preparing rubber tires for transportation.

1. Introduction

Flood is one of the problems faced by people, especially in lowland areas. The high rainfall in the rainy season resulted in large volumes of water flowing rapidly to the lowlands. The after effects are the presence of standing water in one area for several days and soaking, even destroying whatever is in the area. This condition is the threat and the losses caused by the flood in the form of material, psychic, to the loss of life of both cattle and humans.

Natural factors generally influence flood disaster in the form of high rainfall; soil surface is lower than the sea water level. Human factors also play important roles such as improper land use (settlements in riverbanks, catchment areas, deforestation, etc., garbage disposal into rivers or canals, construction of settlements in flood-prone areas [1], and networks problematic drainage [2].

One of the big cities in Indonesia is the flood-prone category the city of Makassar. Various sources of data indicate that every year there is a flood in the city of Makassar. In the last 2 years, for example, in mid-December 2017, a wave of one meter high in the suburbs of Makassar City [3], then mid-January 2018, heavy rains made people anxious [4], and mid-March 2018, floods inundated Biringkanaya sub-district [5].

In 2015, Rudiyanto conducted a study by identifying the critical zone of flood puddle in Makassar City found that 32.97% of Makassar city area is a crucial area of inundation zone. The critical potential zone of the puddle is located in the center of Makassar City, which includes Ujung Tanah sub-districts, Wajo sub-districts, Bontoala sub-districts, Makassar sub-districts, Ujung Pandang sub-districts, Mamajang sub-districts, Rappocini sub-districts, Tamalate sub-districts, Panakkukang sub-districts, Manggala sub-districts, and Tallo sub-districts, and warehousing areas in Tamalanrea and Biringkanaya



subdistricts. Potential puddle zone is located in some areas Tamalate District, Tamalanrea, and Biringkanayya. The zone of low puddle potential is located in some areas of Manggala sub-district [6].

Several factors cause these areas categorized prone to flooding. For example, the findings of Rachmat, Adhe Reza and Adjie Pamungkas research in Manggala sub-district of Makassar City are inadequate drainage condition factors, the proximity of the building with the river, the location of settlements in the puddle accumulation area, the decreasing of soil infiltration power, the road construction which is vulnerable to puddle damage, and the high potential of the affected population. This situation becomes a picture for the community in preparing to anticipate the flood when the rainy season arrives [7].

Regard to flood anticipation, every flood-affected community, both individually and in the community, has its strategy that is born from hereditary experiences and knowledge. This is evident in the results of research, among others Bermano and El Quthney on the community's strategy to deal with the flood disaster in Bengkulu City, Hasrul Hadi about adaptation and relocation of settlements due to flood tidal flooding [9], Zelina Triuri and Djaka Marwata on adaptation strategies for communities facing floods in Tebet, South Jakarta [10] and Zulfahmi Tarigan on adaptation and mitigation strategies for floods in communities in Aur village Medan Maimun Sub-district [11]. These studies indicate strategies and adaptation as the (local) knowledge of local communities in the face of the challenges posed by flood disasters.

The same thing happened to the people of Makassar city in the often flood-stricken suburbs. When the rainy season arrives, they make various preparations as a strategy to minimize their losses. The strategy emerged based on the environmental conditions of Makassar suburban society, which mostly consisted of the housing.

In this paper, the strategy of suburban society to attending the flood is important to be disclosed, considering that housing development in Makassar City mostly occurs in urban areas that are generally flood-prone. Moreover, the rapid growth of Makassar's population forced the expansion of the metropolitan regions in the eastern outskirts categorized as the lowland.

2. Materials and Method

This research is a survey on four flood-prone housing in the eastern suburbs of Makassar city; they are Nusa Harapan Permai settlement, BTN Kodam settlement, Bumi Tamalanrea Permai settlement, and BTN Mangga Tiga settlement. Respondents are determined by quota sampling each of 10 people so that the total respondent is 40 people. To them, submitted questionnaires and interviews. The questionnaire data was then analyzed using frequency tabulation, and interview results to strengthen the questionnaire.

3. Empirical Findings

3.1. Profile of flood area.

In the eastern suburbs of Makassar City, the residential location of residents is generally located in lowland areas. Some new settlements are built on landfills that are supposed to be rainwater catchment areas. This situation is then exacerbated by the poor housing drainage system which causes the area to become an annual flood subscription.

There are four residential areas which are used as research sites: (1) Nusa Harapan Permai settlement, (2) BTN Kodam settlement, (3) Bumi Tamalanrea Permai settlement, and BTN Mangga Tiga settlement. Some locations in the housing are always flooded, and some other areas are flood-free.

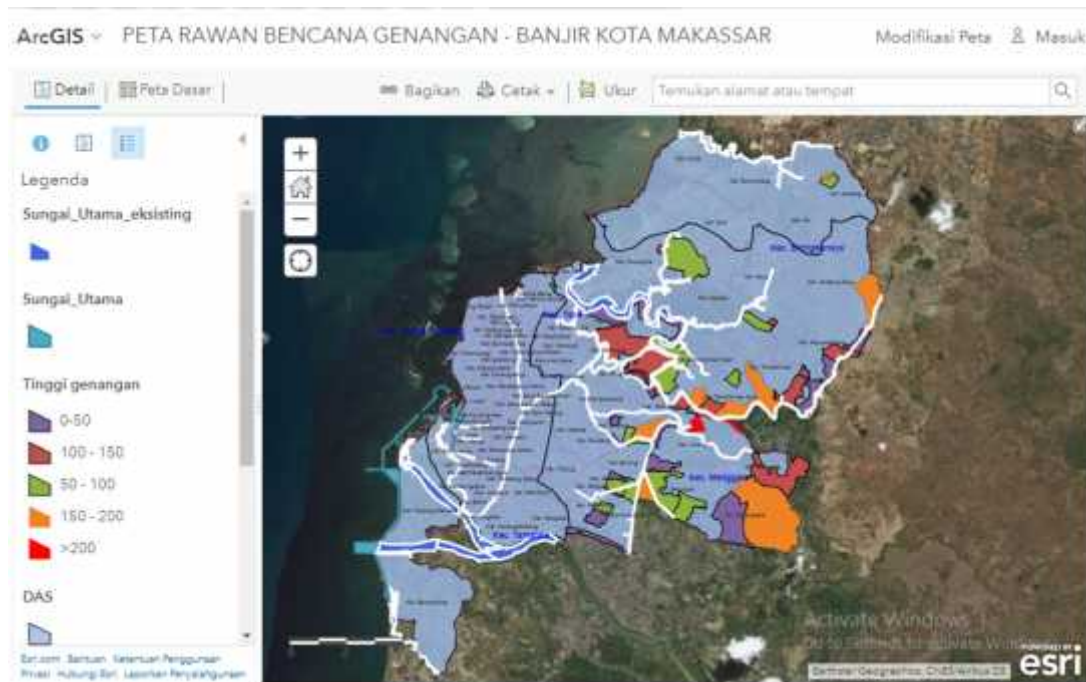


Figure 1. Flood spread in Makassar city [12].

3.2. Flood characteristic.

Floods that occur in the suburbs of Makassar is a flood that occurs due to excessive water in that place and also overflowed in that place. During high rainfall at local locations where soil conditions at the site are difficult to absorb water (due to dense, possibly because of the humid conditions, and also because the water absorption area is low) then the possibility of local flooding will be very high.



Figure 2. Flood characteristic in Makassar City [13]

3.3. Anticipation strategy.

At the time flood occurred, there are several strategies pursued by the respondents as a form of anticipation of the negative impact of floods, namely;

3.3.1. Refuge to a neighbour whose house is flood-free. All respondents do not do the refugee strategy to neighbors. Most of them stay in their homes with the intent of observing floods, unless the floods rise and they leave their homes. Of all respondents, there were about 35% who fled to neighbours, and 65% survived. Those who survive generally see the floods will soon recede in the next few hours.

3.3.2. Put the goods in a higher place. Flood conditions that affect the houses are very diverse depending on the physical environment. Some floods flow through people's houses, and there are also floods that inundate low-level houses (10 cm), moderate levels (30 cm) and high levels (1 meter). Also, the efforts of citizens are also conditioned by the situation of each home. For people who have a lot of sitting furniture or electronic appliances then these items are what they secure in a higher place. Some of them put on chairs, on the dining table, and on the bed and other places that are not reached by the flood. Some other respondents no longer need to lift their electronic goods, because it has a place that is not reached by water as in the closet.

3.3.3. Bind goods so as not to drift. In two housing that flooded quite swiftly, respondents do the step of sowing by binding their goods so as not to drift away. The goods are tied in the form of bamboo halls, chicken cages, and bamboo chairs. However, not all respondents have furniture from bamboo. They make an effort to keep the goods so as not to shift or override other items.

3.3.4. Save pets and cattle. Raising livestock and pets in crowded housing is a fun side activity for many residents. They do so by utilizing their homepage or vacant lot at the back. Some pets and livestock are popular in housing among others; chickens, ducks, birds, cats, and rabbits. There are approximately 65% of respondents in research sites that have pets and livestock. Generally, they have cats, birds, and chickens. A small part keeps ducks and rabbits. When the floods come, they rescue the pets in various ways such as evacuate them in flood-free locations or save in a safe place from the floods inside the house.

3.3.5. Preparing rubber tires for transportation. In a study site whose floods reached a height of 1 meter, some respondents have prepared giant rubber tires as a means of transportation. They use it to transport anything, especially goods and people. This condition occurs in Bumi Tamalanrea Permai settlement.

4. Discussion

The strategy is a conscious effort with full consideration in achieving certain goals. These considerations relate to the physical environmental conditions of the community by which they take action.

At the study site, the floods that occurred generally did not last long and only occurred within a few hours. Therefore, the strategic measures of their rescue are also practical or temporary. Fleeing to flood-free homes or relatives, putting things on high, binding goods to keep them from flowing, saving pets and farm animals, setting up rubber tires is a temporary strategy. When the floods recede, they can immediately return the goods

Practical actions like the above are also done in many flood-prone areas in Indonesia. The results of research by Khasan and Widjanarko [14] call it coping strategy of raising goods to higher ground, making crafts from cork. There are also findings of Halim and Zainuddin [15] on the social action of the Segeri people facing the flood by storing goods on high, binding goods on trees, and making simple embankments.

The community's simple strategy emerged from the experience of citizens based on local environmental conditions. Nurul Hartini outlines this reality that people living in flood-prone areas have developed certain preparations and activities to manage floods in their living areas each rainy season [16]. While Hardoyo et al. considered the adaptation to be technical [17], Saut Sagala *et al.* referred to it as non-structural adaptation because of the community itself acting without government instruction

[18]. However, the role of the government as a responsible person is significant through the determination of policies, coordination, and providing facilities for flood prevention as well as the impact of the flood [19]. Analyzing the above description, it can be said that the strategy of citizens anticipating floods always has rational and practical considerations. Considerations are local.

5. Conclusion

- The local physical environment situation influences the strategy undertaken by people in flood-prone areas of Makassar city. Some of the conditions in question include flooding through and flooding inundation.
- In areas where flooding occurs, residents do not need to evacuate goods and family members elsewhere. They stayed at home while waiting for the water to recede. However, in areas where flooding occurs, they generally evacuate to flood-free areas. In general, however, citizen strategies are always practical in anticipating the negative impacts of floods

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