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Local Community Adaptation to Flood Disaster In Soppeng District

Rusdi Rusdi[1], Alonge Titus Adeyemi[2] , Feri Padli[1]

[1]*Universitas Negeri Makassar, Pendidikan IPS, AP Pettarani, Makassar, Indonesia*
[2]*Ladoke Akintola University of Technology, Old, Oyo/Ilorin Rd, 210214 Ogbomosho, Nigeria*

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Corresponding author:
Rusdi Rusdi
Email: rusdi@unm.ac.id
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ABSTRACT

Every year floods occur in Soppeng regency. The high rainfall and land conversion become the main cause of the flood. It affects the society both in their life and their welfare. The community has carried out various responses and adaptation strategies to deal with the risk of future floods. Thus, this study aims to determine the local adaptation strategy of the community in dealing with flood disasters in Soppeng Regency. The method in this study was carried out using in-depth interviews and observations in flooded areas. The community participation comes from socially inductive research that produces descriptive results. The result of this research shows that the lack of coordination between the community, government, and private parties (NGOs) leads to higher vulnerability. In addition, the adaptation model carried out by the community begins at the household level, especially the house-building model in the form of a stilt house. It consists of two parts namely, the lower and the upper. The lower part is usually used to deviate goods, agricultural materials, and vehicles, while the upper part is used as a place to rest and carry out daily routines such as cooking, chatting with neighbors, receiving guests, and so on. The act of adaptation in groups is by raising the position of the house to the second floor, building a small embankment, and moving household appliances to a higher place.

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1. Introduction

Floods are the most frequent disasters in Indonesia. There will be 1558 flood events in 2022 (BNPB, 2022). The consequences of catastrophic flooding will threaten human life, property, and environmental damage. Floods have caused the most significant cumulative global loss from natural disasters since 1950 (Heinzlef et al., 2022) In addition, it is expected to triple by 2025, not only due to global climate change but also due to population development and some economic assets (Jongman et al., 2012; McGranahan et al., 2007) Flood risk factors will increase in the future, namely climate change, increased rainfall, sea level rise, groundwater level subsidence, and use change land and housing developments located in flood-prone areas (Hirabayashi et al., 2013).

Every year the area in Indonesia that always affected of floods is Soppeng regency. Communities located around riverbanks, lakes, lowlands, and wetlands are at risk of flooding. In addition, some access roads are closed due to the destruction of the Sulawesi trans bridge(Himawan, 2019) Another cause of the flooding is geomorphological conditions which are lowlands that are directly adjacent to watersheds, high rainfall, and land use changes in upstream areas. The habit of the community to opening new land in the catchment area is also the main driver of flooding in Soppeng Regency. In handling floods, the community has not applied patent guidelines, there is no coordination between the community, government, and NGOs. So, they are still adapting with this flood independently.

Several studies have been conducted show an increase in losses associated with catastrophic flooding. The number of populations affected and lost assets continue to increase, especially in flood-prone areas that occur in Jakarta. In Jakarta, the riverbanks are often inhabited by low-income communities because land prices tend to be cheaper in flood-prone areas. Therefore, low-income residents tend to occupy areas that are prone to flooding, as is also the case in Marioriwawo District, Soppeng Regency. Currently, local communities in Soppeng District are building small-scale adaptation strategies based on learned experiences and previous flood events. Therefore, the identification of community adaptation strategies can improve disaster risk reduction efforts, as local knowledge is helpful in developing coping mechanisms for residents in other flood-prone locations.(Garschagen et al., 2018; Mishra et al., 2018)

The flood management carried out is largely focused on the implementation of technological measures, including the construction of embankments and barriers. (Jongman et al., 2012) Local adaptation of the

Community is the most effective adaptation model in disaster risk management because the Community itself has the experience and capacity to deal with disasters (Asdak et al., 2018). Research on community response, community capacity to overcome problems, and adaptation strategies to floods has been carried out in various regions in Indonesia. Such as lowlands and coasts in the northern part of Java Island, for example, Semarang, Oekalongan, Tegal, and Demak (Budiyono et al., 2016; Esteban et al., 2020; Falihin et al., 2021; Falilul et al., 2021; Wijayanti et al., 2017) . In the previous related studies, the researchers have not involved the community in handling the floods. However, in this study, it focuses to identify local adaptation models carried out by local communities to overcome or reduce flood hazards in Soppeng Regency. The various threats identified in Soppeng Regency show the importance of this research.

2. Method

The foundation of method study is the social aspects of society. Participation in the community, resulting from inductive social research, is used to produce descriptive results. In flood-affected areas, we conducted in-depth interviews to collect information on the local response and adaptation of communities. The purpose of this interview was to uncover community responses to catastrophic flooding occurrences that caused significant losses in the research region, notably in 2019.

Interviews, observations, infographics, maps, transect visits, seasonal calendars, Venn diagrams, and schedules comprise the community involvement technique. To determine the socio-environmental conditions of the research area, observations were conducted. This strategy involves recognizing features along the traveled road, then observing, listening, and asking questions of the local community (Falihin et al., 2021; Falilul et al., 2021; Maru et al., 2022; Rusdi et al., 2020)

In the form of surveys, several questions were posed to determine the effects and responses of floods on the community. For in-depth interviews, we use unstructured questionnaires whose primary content is prepared based on prior research (Happy et al., 2022; Marfai, 2014; Marfai et al., 2015; Ward et al., 2013). The questionnaire covers especially the effects of flooding by identifying significant events that occurred after the disaster and how communities are dealing with those events. Information was collected on the local adaptation of local communities regarding the active role of institutions/organizations in response to flooding, identifying factors that make communities vulnerable to more severe flooding and more extreme flood effects, and identifying adaptations made by communities to reduce inundation damage.

The identification of a succession of significant events that occurred after the flood enables the reconstruction of the Community's history in chronological order so that improvements can be implemented. This is quite useful for anticipating a previously unconsidered event. This study focused on determining the timeline of 2019 floods. Information on local adaptation about the significance of institutions/organizations in terms of flood response can be used to determine the interplay between local systems and external relationships. This study allowed us to identify the parties involved and deemed significant by the local community. The public's impressions of the elements that increase flood susceptibility can provide a broader perspective on the analysis, as there are distinct conditions in each area that can result in increased flood susceptibility. This strategy is regarded superior than formal studies that attempt to isolate and assess specific factors and situations. (Budiyono, 2018; Happy et al., 2022; Jongman et al., 2012)

Residents and experts, such as the Chairman of the RT, the Chairman of the RW comprising of multiple RTs, the Head of BPBD, and social workers, were interviewed. The purpose of this interview is to gather information about local adaptation techniques figure 1.

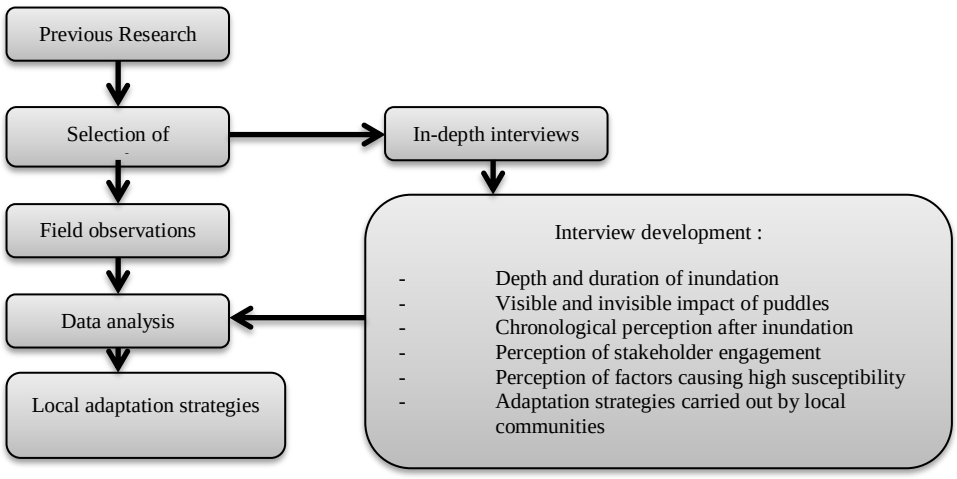

Figure 1. Framework local adaptation

3. Results and Discussion

3.1 The condition of social protection in soppeng district is related to the flood disaster.

The study was conducted in Tokare, Kessing Village, Leworeng Village, Donri Donri District, Soppeng Regency, Padali Tellulimpoe Village, and Limpomajang Village; the worst flood was in Kecamatan Marioriawa, with the flood location, being Padali Tellulimpoe Village, at an altitude of about 5–10 centimeters. Other areas in Limpomajang Village have a water level of about 30-70 centimeters, Batu water level of about 10-15 centimeters from the asphalt road, and Attangsalo Village 20-40 centimeters. In addition, the overflow of the Glass River, Glass Village, Marioriawa District, also closed the Soppeng-Sidrap axis road with a water level of 30 to 60 centimeters.

Most of the communities affected by the flooding are located near the riverbanks. The condition of residential area is opposite the river, with the structure of wooden house buildings (not permanent). The inner building material of the house consists of old wood and bamboo, while the roof uses zinc. The condition of the building is a characteristic of the building at the research site. Some wooden house buildings with poles are already hanging above the riverbank, so they must be tied with ropes to strengthen the house building. Despite this, new buildings have sprung up on the riverbanks because it became a habit and desired to gather with their close relatives figure 2.

Figure 2. Flood Events in Soppeng Regency

The existence of buildings on the riverbank causes a high level of vulnerability to flooding hazards, so the potential for damage is also high. Based on observations in the field, most of the buildings on the riverbank are old, and the walls are built with thin boards and bamboo. Some of the poles are already hanging on the outskirts of the river. These building materials are straightforward to damage and decay when exposed to water. Therefore, the building is not only vulnerable because of its location in flood-prone areas but also because the structure of the building needs to be stronger.

In addition to the presence of vulnerable buildings in the river area, poor environmental quality is also seen in the area. Sanitation and solid waste problems affect the state of public health. At some point, there are still piles of garbage on the river's forks. This condition can also contribute to the overflow of river water during a long flood. The damage is the worst in the area around the Walanae River, where water often flows over its banks. Some of the structural steps taken by the local government include building permanent and non-

residential embankments in the form of piles of sacks filled with sand along the river's body. However, interviews with residents show this is less effective because not all water bodies have embankments.
In-depth interviews conducted in flood-prone areas show that most indigenous residents have lived side by side with the river for a long time. The livelihood of its inhabitants is primarily farming. They remain in flood-prone areas because they have grown comfortable with and accustomed to flooding. The flood that comes is only temporary, and the water will recede again when today's flood occurs tomorrow. In addition, they also have families from previous generations living in the area. The last reason is to change places, which requires high costs to buy land not prone to flooding.

Floods in 2019 were the largest floods that occurred in Soppeng Regency, with water levels reaching 30 to 60 cm, figure 3. There are two affected sub-districts, namely Donri Donri district and Marioriawa sub-district, precisely in Tellulimpoe Village and Kassing Village. According to the Head of BPBD Implementation, Soppeng Regency, the flood resulted in losses of around 43 billion. The high gloss is not only the houses of the affected residents but also the rice fields and plantations of the residents are also flooded. There are about 2,217.42 hectares of flooded rice fields. Meanwhile, for plantation land, there are around 1,368.64 hectares that are also flooded.

Figure 3. Flooding covering highways

Analysis of community response to floods, based on the chronology of events, perceptions of factors that cause higher vulnerability, and the importance of post-flood organizations/institutions. Based on the chronology of post-flood 2019, in general, flood evacuation measures are carried out first by the Community itself. Prior to evacuation efforts and outside help, communities responded to flooding by moving household items and electronic equipment to higher ground and evacuating children and parents to family homes, schools or mosques. On the first day after the flood, coordination was only carried out between residents. Later, after the second day, there was coordination with the local village head. Village heads and community groups began

monitoring and guarding flood-prone points. On the third day, aid began to arrive from the outside Community, especially in the form of basic necessities and use.

Meanwhile, the government is building makeshift tents. Assistance danced until the seventh day after the flood occurred in the form of basic necessities. However, in terms of health, it still needs to be paid attention to by the public. No medicines and medical personnel are available to help residents if anyone experiences injuries or flooding-related illnesses. Therefore, many people still have to be evacuated to the nearest Puskesmas.

Table 1. The perspective of factors causing higher flood vulnerability

No	Sources of vulnerability	Main causes
1	Lack of coordination between stakeholders	Lack of communication between stakeholders
2	Work that is out of sync between stakeholders	No stakeholders take on a coordination role
3	The problem of solid waste	Poor waste management, lack of public awareness
4	Illegal buildings along the riverbank	Illegal migrants from elsewhere
5	Embankment not fully functional	Lack of care by local governments
6	Drainage system does not work	The problem of garbage, drainage is not routinely cleaned
7	Flood measures are not able to cope with high inundation	Improper flood mitigation construction
8	Passivity of community members	Individual attitudes, lack of communal work
9	The river is not cleaned regularly	Lack of care by local governments
10	River silting	Sedimentation from upstream
11	Land subsidence	Groundwater pumping
12	Unpredictable weather	Climatic conditions and variability
13	Accessibility limitations due to damaged road network	Overloaded vehicles, especially trucks

The source of information can be obtained from the perception of the Community itself regarding the factors that cause vulnerability. Respondents were asked to consider several sources of vulnerability and choose which factors were the top priority. The results are shown in Table 1. This study classified vulnerability factors into the following sources: Government/stakeholders, poor environmental conditions, communities, infrastructure and facilities, and their maintenance. The government's contribution to higher vulnerability refers mainly to out-of-sync work and the need for coordination between stakeholders. In addition, the lack of preparation, knowledge, and experience that the Community has in dealing with floods. This is the main obstacle to flood events in 2019 which resulted in hampered evacuation and aid distribution processes. Therefore, it is the top priority on the priority list. Poor environmental conditions, lack of early warning, and lack of public concern for flooding also contribute to worse conditions. This factor is mainly related to the availability of local communities, the need for more initiatives from the RT/RW, illegal buildings, and the absence of mutual aid to clean river channels/drainage. Local community preparedness is primarily related to disaster preparedness, such as shelter site planning and food and medicine preparation for emergencies. Therefore, all responses are carried out abruptly and without planning. The last factor is flood protection infrastructure and maintenance, which only partially function during extreme conditions. This situation was caused by embankments that are not high enough to withstand extreme water levels, low maintenance of rivers and drainage networks, and damaged and waterlogged road networks, hampering the evacuation process.

One of the natural impacts caused by flooding is damage to household appliances and building infrastructure, including furniture and electronic devices. Indirect examples of real impacts include school closures, and disruption of agricultural and economic activities during low tide (stagnant), usually lasting 2-5 days. Tradisi on market activity also participated, resulting in an increase in the price of daily necessities due to reduced supply. The flood also affected the daily activities of the population since many of them could not go to work and earn money. About 1 4% of the population, mainly children under 15 years old, also get sick for 1-2 weeks due to flooding, mainly in the form of diarrhea and infections, table 2.

Table 2. The role of policymakers/organizations

No	Policymakers/organizations	Role
1	Community Leaders/ Religious Leaders/Traditional leaders	Population organizing
2	RT	Population organizing
3	RW	Population organizing
4	Flood Management Team	Evacuation and first aid
5	Phc	Health care of refugees
6	Village Head/Kelurahan	Population organizing
7	PMI	Evacuation and first aid
8	Sub-districts	Population organizing
9	Regent	Population organizing
10	Political party	Help (Clothing and food)
11	LSM	Help (Clothing and food)
12	Firefighter	Evacuation
13	PKK	Providing food for stalking
14	School	Temporary place of exile
15	Taruna Reef	Help evacuate
16	Police	Coordination with local authorities
17	Spritual leader	Coordination with religion
18	River Community	Coordination local and community river

3.2 Community Adaptation Strategies To Flood Disasters

Several models of physical adapt that become people's habits and cultures are identified in the field. Most of these adaptation efforts started at the household level, especially the model of building houses in the form of stilt houses (Atmaja & Fukushi, 2022; Riza et al., 2020). The stilt house consists of two parts: the bottom and the top. The lower part usually stores goods, agricultural materials, and vehicles. In contrast, the upper part is used to rest and perform daily routines such as cooking, chatting with neighbors, receiving guests, etc. Nevertheless, when water inundates the bottom of the house in extreme conditions, the belongings are immediately moved to the top of the house, and the vehicle is taken to a higher place. Joint adaptation measures were also carried out between households in the local Community, especially by building temporary embankments to prevent water from entering residential areas. An example of some of the adaptation actions taken is shown in Figure 4.

Figure 4. Flood Control Building

The forms of adaptation actions that society carries out in the research area are largely determined by economic considerations. The cost of building a small embankment is considered relatively cheap by the local people; Accordingly, this type of action is most performed. This action is usually built from a pile of sacks filled with sand. This sack embankment only lasts about 4-6 months, and after that, it will be destroyed. On the other hand, the condition of the wooden building will gradually decay because it is often flooded with water, so it costs a lot to replace the wood that has begun to decay. This way of construction is considered weak because the building is easily damaged by water. Therefore, improvements must be made to this kind of adaptation by replacing wood that is resistant to water. Evacuation of personal belongings and household appliances is essential when flooding occurs. In building a stilt house, personal belongings, and household appliances (for example, electrical devices, documents, and clothing) can be easily placed in locations higher than floodwaters.

4. Conclusion

This research demonstrates that the most important causes of the higher risk are a lack of coordination and asynchronous work amongst stakeholders. About 60.6% and 73.8% of respondents, respectively, said that the lack of coordination and asynchronous work were related to the community's infrastructure, environment, or society. It shows how the community views the significance of stakeholders' roles in the flood response. Uncoordinated evacuation procedures, uneven relief distribution, and poverty are just a few of the issues the community feels result from stakeholders' lack of coordination in their efforts. the treatment of refugees. Moreover, communities in Soppeng Regency have created a number of small-scale adaptation initiatives to deal with floods, particularly in terms of limiting damage. Physical and non-physical adaptations are examples of such adaptation acts. Raising the level of housing, erecting mini embankments, and relocating home appliances are the three main types of physical adaptation that the community carries out. This adaption is not unique to any one person. Mutual aid organizations carry out a number of adaptation initiatives, including building embankments surrounding communities and cleaning drainage channels and rivers. That adaption may have issues due to society's indifference and passivity. Maintaining neighborhood connection amongst residents is crucial, therefore this approach calls for increased caution.

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