Geosfera Indonesia
p-ISSN 2598-9723, e-ISSN 2614-8528
available online at : https://jurnal.unej.ac.id/index.php/GEOSI
Vol. 7 No. 3, December 2022, 277-291

https://doi.org/10.19184/geosi.v7i3.35066

Research Article

Exploration of Knowledge and Community Preparedness in Flood Disaster Mitigation

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ARTICLE INFO

Article history

Received :
17 October 2022

Revised :
26 November 2022

Accepted :
18 December 2022

Published :
24 December 2022

ABSTRACT

Floods are natural disasters that should be highly considered due to their threats to human lives and the economy. It is also the third largest natural disaster in the world, which has claimed many lives and properties. Therefore, this study aims to identify community knowledge about floods and determine the efforts to increase preparedness strategies. A qualitative study was conducted in the village of Sapanan, Binamu District, Jeneponto Regency, Indonesia. Subsequently, data collection was carried out by observation, interviews, and documentation with various selected informants. Based on the results, the following were obtained, 1) The level of knowledge and actions performed by the Sapanan people was quite good regarding flooding. This was due to the experience of the community with the disaster, which they had decided to use as a learning platform, 2) The impacts often caused after flooding were the outbreaks of many diseases, which hindered the community from performing their usual activities. This was because they were busy cleaning their homes, with children consequently unable to attend school regarding the muddy state of the chairs and environment, and 3) The community's efforts to increase preparedness for the disasters included land use monitoring and prone location planning in safe areas. In this case, the level of knowledge and actions performed by the people of Sapanan village was quite good concerning flooding. This was because of their numerous experience with the disaster, which they had decided to use as a learning platform.

Keywords : knowledge; preparedness; the community; flood

1. Introduction

Floods are natural disasters that should be highly considered due to their threats to human lives and the economy. It is also the third largest natural disaster in the world, which has claimed many lives and properties (Aryono, 2011; Badwi et al., 2020; Ningsih et al., 2020; Rahmadani & Syarif, 2020). According to Law No 24 of 2007 concerning Disaster Management, Article 1 point 1 explained that a disaster is an event threatening and disrupting people's lives and livelihoods. This is often caused by natural, artificial, and human factors, leading to life casualties, environmental damage, property losses, and psychological impacts (Peraturan Pemerintah Republik Indonesia, 2007). Hartuti (2022) also stated that high rainfall caused flooding in several locations within Jeneponto district, from December 2018 to February 2019. According to Syam et al. (2021), one of the areas in Jeneponto Regency experiencing

severe flooding was Sapanang Village within Binamu District. Besides causing material losses, many people of various groups also became sick and died, namely, infants, children, adolescents, and adults.

Most of the people in Sapanan Village are in a vulnerable condition due to living in a potential flood area, indicating the need for a special strategy to improve their chances of survival. In this case, preparedness is an effort that should be considered in minimizing the impact of the disaster. This effort is a series of activities used to anticipate and prepare the community for a better level of readiness in handling disasters (Yulaelawati, 2008). In this context, community preparedness is needed to ensure an effective response to flooding, regarding the minimization of its negative impacts. The condition in Sapanan Village emphasizes limited knowledge about flood mitigation, where slow reactions are often observed due to the frequent experience of the community with the disaster. Regarding the flooding incident on January 22, 2019, awareness was immediately raised, leading to the provision of knowledge about the importance of community efforts in increasing preparedness for future disaster occurrences.

Disaster preparedness is a fundamental need for every region, to reduce the risk of hazardous occurrences anytime and anywhere. This explains the necessity to prevent the disaster through appropriate methods, to minimize the risk of subsequent occurrences, especially human victims involvement (Hoffmann & Muttarak, 2017; Kodoatie, 2002; Narayanan et al., 2018; Ronan et al., 2015; Thomas et al., 2015). The prevention methods used possibly differ in each region, because of the locational geographic effects, common disasters, and social conditions. Therefore, each area needs to study the appropriate method for handling natural disasters. Preparedness helps the community in forming and planning the actions that should be considered in the event of a flood. This indicates that the solution and evacuation successes during the disaster are very dependent on the readiness of the community and residents. Effective and efficient flooding management also requires knowledge of the hazards and risks existing in the watershed (Rahmadani & Syarif, 2020; Simanjuntak & Paolo, 2022). Since all activities are often carried out suddenly under chaotic conditions during flooding, good planning, coordination, and training are then needed for an appropriate solution and evacuation strategies (Hamed & Rao, 2019; Hirschboeck, 1988; Lane, 2017)

According to Syam et al. (2021), no early warning system, evacuation routes, and first aid training were observed in Sapanang village. This subsequently emphasized the prevention and management of flooding in the area. Based on the results, the mitigation-based management system prevented and reduced the risk of disasters through physical development and public awareness about the importance of environmental protection.

These reports were considered unable to completely display the flood mitigation processes in Sapanang Village, leading to the performance of this present analysis. Therefore, this study aims to carry out the following, 1) identify the knowledge of the community regarding flooding in Sapanan Village, Binamu District, Jeneponto Regency, Indonesia, 2) identify the impact of the disaster on the village community, and 3) determine the efforts of the community in increasing preparedness strategies for flood occurrences.

2. Methods

This qualitative study was conducted between February to May 2022 in Sapanan Village, Binamu District, Jeneponto Regency, South Sulawesi Province, Indonesia, as shown in Figure 1.

Figure 1. Study area

The information sources in this study prioritized primary and secondary data. Using the snowball sampling method, primary data were obtained from various informants, which contained the following,

1. Key informants: Sapanan Village Communities
2. Supporting Informants: Village and District Heads, as well as the Communities

The secondary data then emphasized documents, including relevant books and literature, and related images. The collection of these data was also carried out through observation, interviews, and stage documentation. For the data analysis, a qualitative descriptive technique was used, with the model following the concept provided by Miles & Huberman (1994). In this concept, the experimental activities were interactively and continuously carried out at each stage of the analysis, for appropriate completion (Miles & Huberman, 1994). This analytical process was then accompanied by implementing a verification strategy with data reduction, categorization, display, and conclusion.

Data reduction emphasizes the focus of the analysis according to needs and is often arranged systematically. At this stage, the reduced data provided a comprehensive overview, which was subsequently presented with more understanding at the next level. Meanwhile, the reduction stage in this study focused on skipping the informant interviews for each subject. For the presentation stage, all the data obtained from the previous level were shortly presented for easy understanding. This process was carried out by displaying a Table or Diagram format. The conclusions are, however, expected to answer the formulation of the study problem formulated at the beginning. At this stage, new non-existent results were highly observed. These outcomes emphasized the description of an object empirically studied and analyzed, whose veracity prioritized the needs for subsequent analysis.

3. Results and Discussion

3.1. Community Knowledge of Flood Disasters in Sapanan Village, Binamu District, Jeneponto Regency

Based on the results, 61.67% and 38.33% of the informants were women and men, respectively. This large number of women was due to the time used in distributing the questionnaires during working days and hours. The use of the snowball sampling method also affected this large value, because of the consistent recommendations of the gender by other selected informants.

Regarding the age aspect, the informants ranged from 24-66 years old, with 40% and 3.33% of them aged 40-49 and more than 59, respectively. For their educational level, 56.67% of the informants were S1 graduates and above, with housewives dominating the occupation aspect at 45%. Moreover, 93.33% of them had self-owned homeownership status, with 6.67% being rented/contracted. Based on their experience of floods, approximately 85% had encountered more than 5 occurrences while living in Sapanan Village.

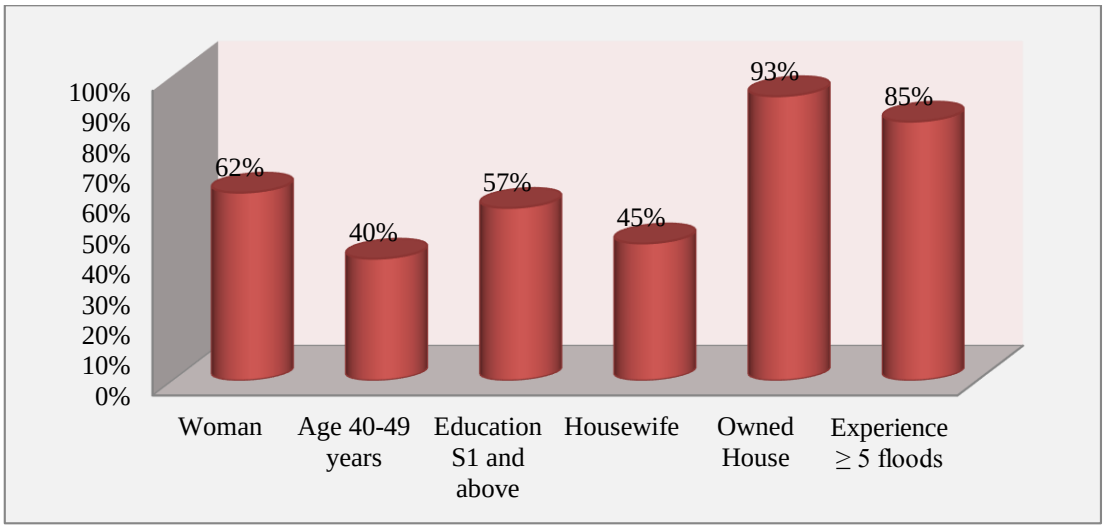

Figure 2. Graph of Informants' Dominant Characteristics

Based on Figure 2, most of the residents in Sapanan Village were in their productive age, with a fairly high educational level. Since they have been living in the area for quite a long time, a high

experience level was possessed regarding flood events. Although 62% of the informants were women, the objectivity of the results was still not reduced. This was based on the consideration that 85% of them had sufficient experience in handling the disaster, due to encountering floods at their homes more than 5 times.

According to these experience levels, the informants assumed that the flood had disrupted life, although it was capable of being handled. In this case, 53.33% of them indicated that the disruptions included clean water issues, working difficulty, and power outages, Approximately 31.67% of the informants also prioritized disturbance and difficulty handling, as well as various problem sources, such as the inability to work and compulsory family/property safety. Meanwhile, 15% focused on evacuation, due to the uncontrollable events of the problematic disaster or catastrophe.

In Figure 3, all selected informants stated that flood occurrences in their residential locations were disastrous, with 46.67% of them emphasizing their disruptions to people's lives. Approximately 18.33% of the informants also mentioned that the phenomenon was a natural event causing the loss of lives and properties. Moreover, 25% of them stated that the flood events occurred due to the careless disposal of garbage, with 10% prioritizing the occurrences as a puddle after rainfall.

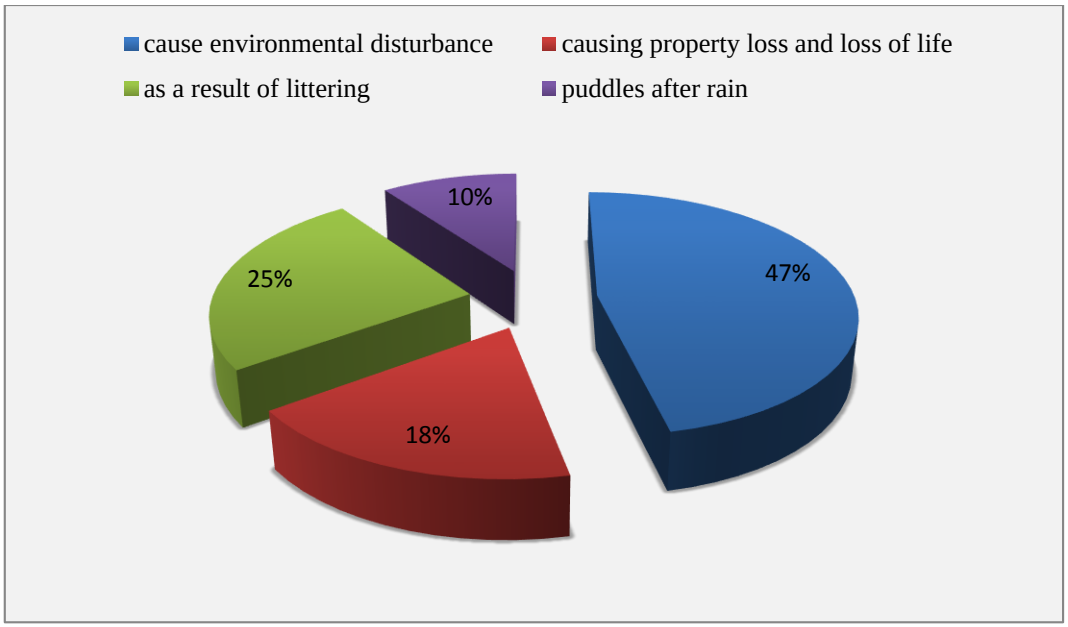

Figure 3. Definition of flood according to informants

Based on Figure 4, the informants stated that floods had disrupted life, although were capable of being handled. In this case, 53% of them stated that the disruptions included clean water issues, working difficulty, and power outages. Approximately 32% of the informants emphasized disturbance and difficult handling, as well as various problem sources, such as the inability to work and compulsory family/property safety. Meanwhile, 15% prioritized evacuation, due to the uncontrollable events of the disaster or catastrophe.

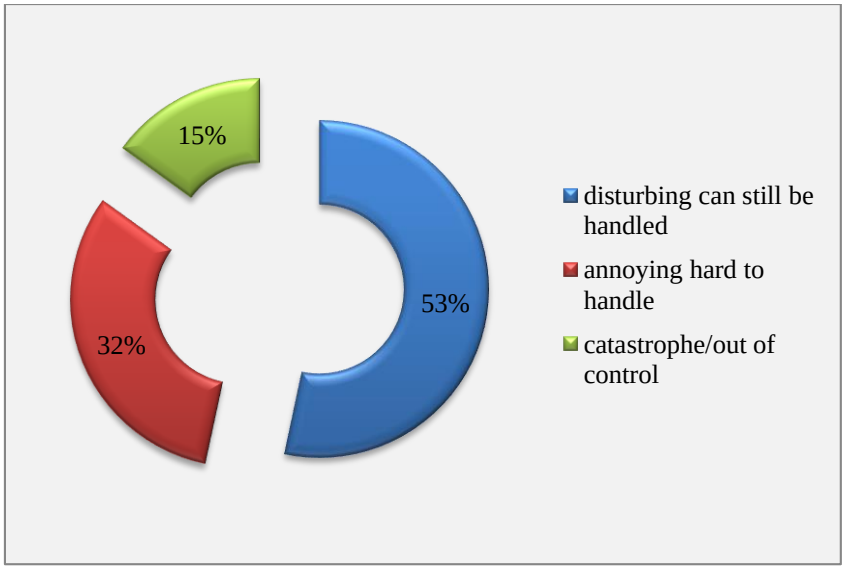

Figure 4. Informants' flooding experience

From these results, two factors were observed to cause the flood events, namely natural and human. According to Figure 5, several natural factors caused this disaster, regarding the responses of the informants. In this case, 43%, 30%, 20%, and 7% of them emphasized high-intensity rainfall, erosion and sedimentation, living conditions in basins/lowlands, and high tide, respectively. Meanwhile, the human causal factors included littering behaviour, house construction on riverbanks, illegal logging, and transformational land use development, regarding 55%, 23%, 12%, and 10% of the informants, respectively.

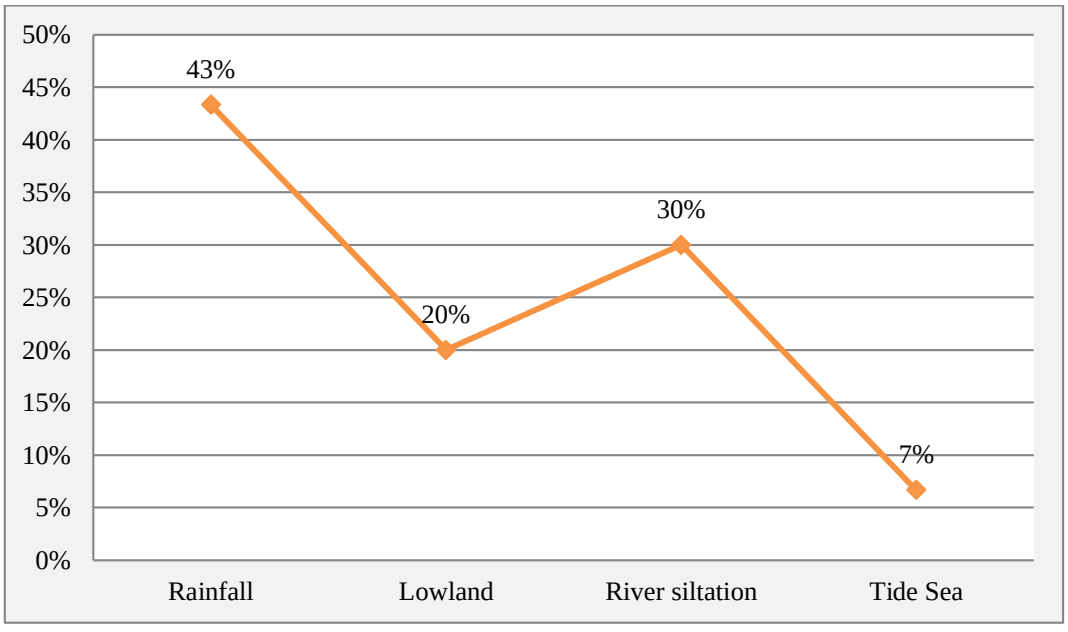

Figure 5. Natural factors causing floods

The level of public knowledge about the signs of an impending flood was identified from each informant's response. In this case, 26.67% and 51.67% of the community believed that a heavy rainfall above 2 h and the excessive water body level were flooding signs, respectively. Approximately 3.33%

of them also assumed that the signs emphasized the cloudiness of the river water, with several materials washed away. Meanwhile, 18.33% believed the flooding signs were due to the leakage/breakage of the river embankments and inactive pumps.

Regarding the actions performed to prevent or reduce the occurrence of floods, the informants produced various answers, which were capable of describing the level of public knowledge. These results indicated that 26.67%, 20%, and 16.67% of the community appropriately disposed of garbage, cleaned the waterways around residential houses, and collaboratively sanitized the water bodies, respectively. In addition, 13.33% and 23.33% of the population planted trees in upstream areas and elevated river embankment,respectively.

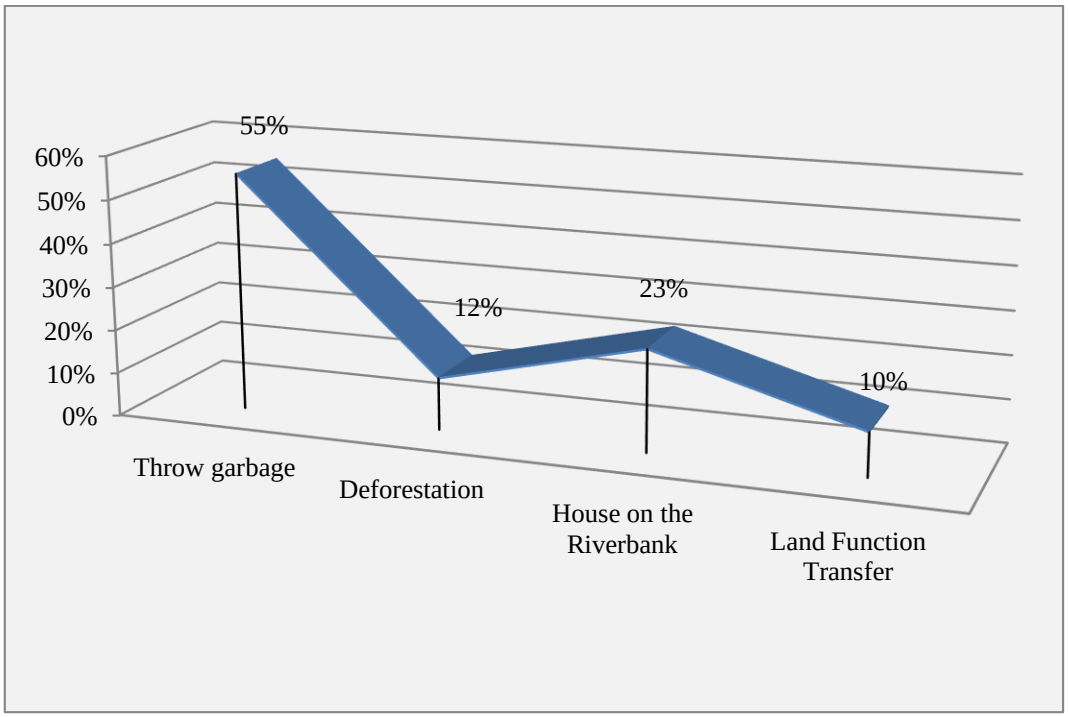

Figure 6. Human factors causing flood

According to the results, the actions performed by the community were divided into three stages, namely before, during, and after flood occurrences. Before the occurrence of the hazard, various actions were carried out, where 3% of the community developed a disaster-prepared bag containing important documents/securities. Approximately 10% of the population also prepared logistics (foodstuff) for emergency needs, with 22% and 42% readying evacuation equipment and elevating the foundation of renovated houses, respectively. In addition, 23% of the community planned/placed valuables in a relatively safe area (23%).

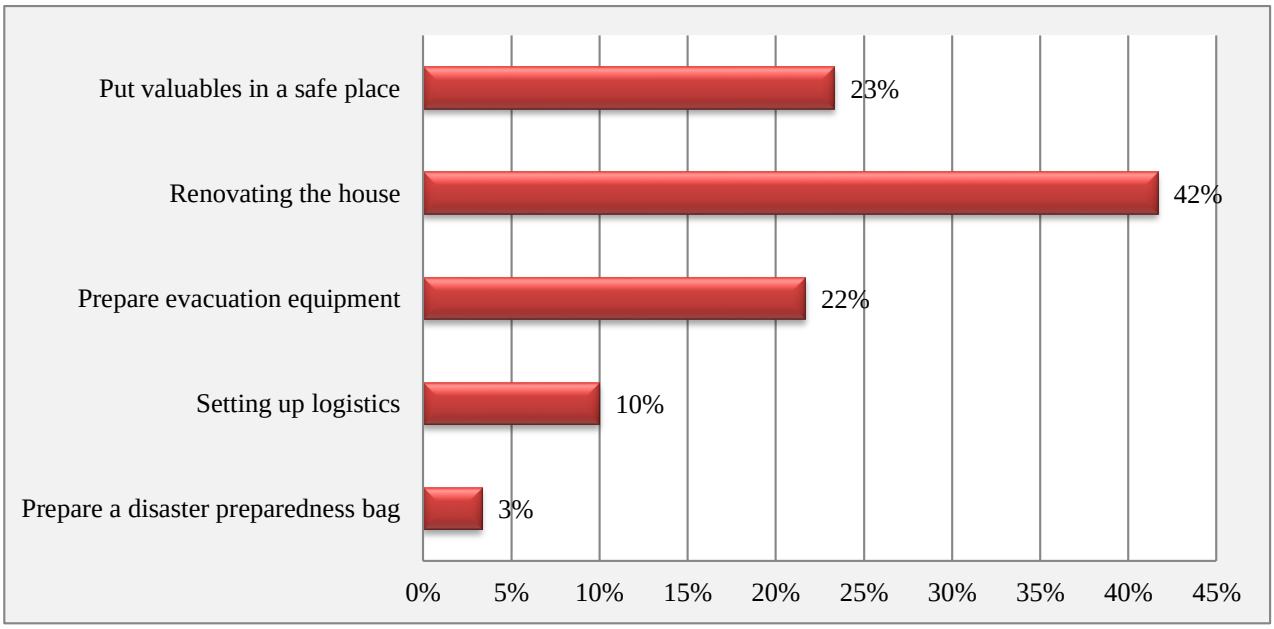

Figure 7. Actions Performed Before the Flood

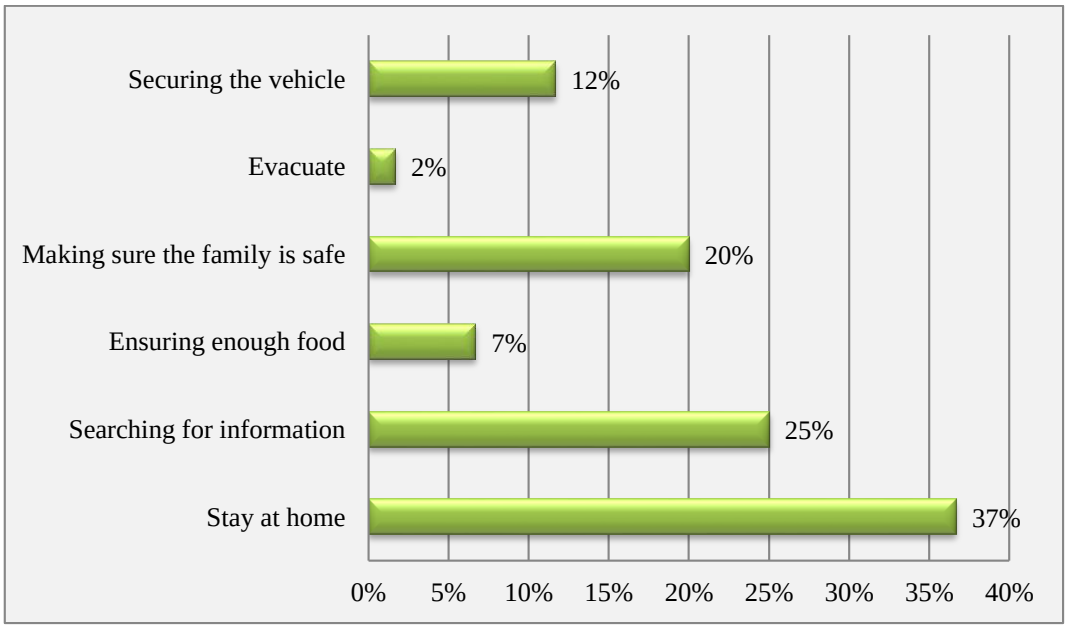

Figure 8. Actions performed during a flood

Based on Figure 8, various actions were performed during a flood occurrence. This showed that 37% of the community stayed at home to maintain the safety of belongings, with 25% of them seeking information related to flooding through neighbours, handy talkies, mobile phones, television, and radio. Approximately 7% of the villagers ensured sufficient food/logistics supplies, with 20% assuring the safety of all family members. In addition, 2% of the community evacuated to a safe location, with 12% ensuring the protection of vehicles. From these responses, very few people evacuated/stayed at home during a flood occurrence, because most of them had elevated their houses.

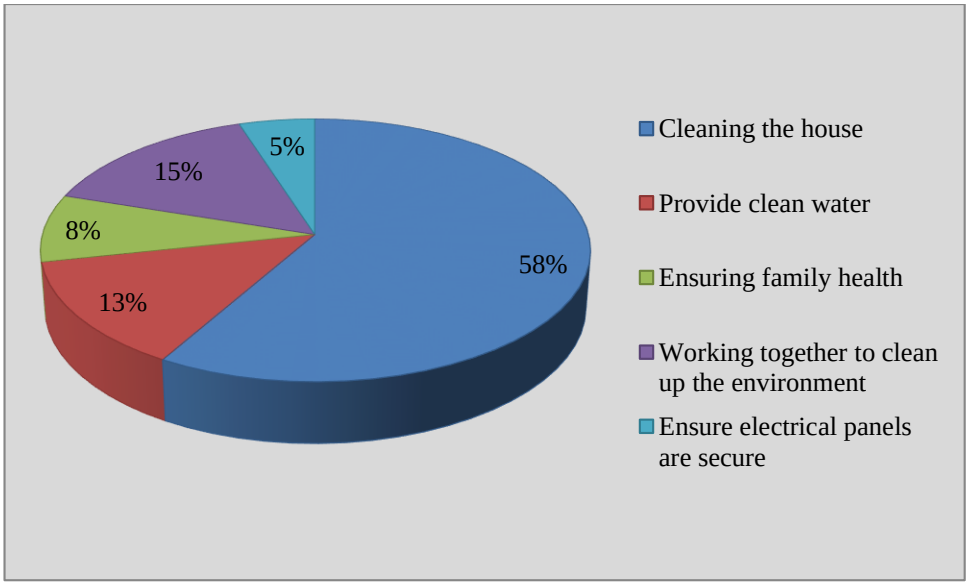

Figure 9. Actions performed after the flood

Regarding Figure 9, various actions were performed after the occurrence of a flood. In this case, 58% of the community cleaned houses and goods from flood garbage, with 13% of them providing clean water and bathing facilities for family needs. Approximately 8% of the villagers also ensured the adequate health condition of the households from the hazardous effects, with 15% sanitizing the environment from various rubbish/mud. In addition, 5% of the community only ensured the safety of the household electrical panels.

Based on these results, the level of knowledge and actions performed by the community regarding flooding was quite good. This was due to the numerous disastrous experience possessed by the people while living in Sapanan village. In this case, the community had decided to use these events as a learning platform, to handle subsequent occurrences.

3.2 The Impact of Floods on the Community in Sapanan Village, Binamu District, Jeneponto Regency

The community problems that often occur due to the impact of flooding included physical, social, economic, and environmental effects.

a. The physical impact emphasizes damages to public infrastructures, facilities, and service offices.
b. The social impact prioritizes health risks, mental trauma, economic downturn, disruptions of educational (children unable to go to school) and public-service office activities, as well as shortages of food, energy, water, and other basic needs.
c. The economic impact includes material losses and disruption of industrial activities, such as inability to work, job lateness, obstructed commodity transportation, etc.
d. The environmental impact focuses on water pollution or river vegetation damage.

These results were obtained from the following interviews conducted for the informants, regarding the impacts of flooding on the Sapanan village community:

According to Mr. Hamzah Karaeng Lurang,

> *"When asked about the impact caused by this flood, many people are often unable to carry out their normal activities. This is because they are busy cleaning their homes. The flood also caused many diseases. Apart from the illness caused, it is normally impossible for me to attend work during flooding occurrences." (Interview, July 23, 2022)*

Based on Jamairah Karaeng Sangging:

> *"The impact of flooding that often occurs in this village, firstly, the houses are dirty due to the soil deposition. Secondly, there are many diseases due to the disastrous occurrences" (Interview, 23 July 2022).*

For Syamsuddin Karaeng Liwang,

> *"The flooding effects constantly occurring in this area include excess soil deposition, which leads to dirty surroundings. The existence of many diseases is also a major effect" (Interview, 23 July 2022).*

From these interviews, the impact of flooding on the community prioritized the dirtiness of houses due to the mud soil being deposited. Additionally, this disaster caused many diseases, inadequate farming processes, the inability of children to attend school, and the loss of valuable properties.

3.3 Community efforts in Sapanan Village, Binamu District, Jeneponto Regency in Increasing Preparedness For Flood Disasters

In the Sapanan village community, several efforts were performed in handling flooding, which often occurred during the rainy season. The following are some principles for actively mitigating the disaster (Hermon, 2021).

a. Accumulate a large amount of water upstream by developing reservoirs, as well as conserving soil and water.
b. Absorb high rainwater into the ground with infiltration wells and provide green open areas.
c. Controlling water in the centre through temporary storage in a retention area.
d. Flowing water quickly into the estuary or the sea, by guarding container capacity.
e. Securing residents, vital infrastructure, and property.

According to Paimin (Hermon, 2021), the mitigation of flood was used to reduce the risk of the disaster, through physical development and awareness, as well as capacity building.

Based on an interview with the Binamu sub-district Head, the following statements were obtained,

> *"I, as the Head of the Binamu Sub-District, specifically have to understand disaster mitigation, especially for the recurrent flood in the village of Sapanan. This shows that mitigation is a series of efforts made when a disaster occurs. In this case, we are often invited, and we have to appeal to the public to be vigilant for flood occurrences. However, there are still some negligent people in this regard. The obstacles in this socialization process also include the lack of public awareness and inadequate knowledge about mitigation. In this counselling process, we were also effectively involved." (Interview July 25, 2022).*

According to Suardi Karaeng Lira,

> *"The actions performed during the flood were efforts to save themselves, such as running to a high place. When the disaster was over, many people had itching, diarrhoea, and lots of mosquito bites." (Interview July 26, 2022).*

Muhammad Alwi Karaeng Tompo also stated the following,
"The efforts I made when the floods occurred were running to a high and safe place, with valuables also protected. Regarding the socialization process, I never participated because I'd rather go to the rice fields." (Interview July 26, 2022).

For Amran Karaeng Sija,
"The efforts carried out during flooding emphasized protection at a high and safe place. Apart from that, information were provided by the government, with the community often invited every rainy season. In this case, the government commonly state that the protection of lives should be highly considered than conditions during flooding events. Although the sub-district head has suggested to the government that ditches need to be made for the river, the performance is yet to be implemented." (Interview 26 July 2022).

Based on these results, the efforts mostly performed by the people were running to high spaces and developing higher house foundations to anticipate flooding.

3.4 Community Knowledge of Flood Disasters in Sapanan Village, Binamu District, Jeneponto Regency

The results indicated that the level of knowledge and actions performed by the people of Sapanan village regarding flooding was quite good. This was because the community had numerous disastrous experiences, which were then used as learning platforms for the prevention of subsequent occurrences. These results were in line with Chan et al. (2014), where the greatest impact was observed in calculating and increasing the preparedness and good knowledge levels of rural families. This is because knowledge is a behavioural determinant and the mental aspect of understanding (Notoatmodjo et al., 2012). The lack of this determinant regarding flooding was observed from the habits of people that did not care about environmental protection. For example, those disposing of garbage indiscriminately on riverbanks and ditches, and large land conversions -size.

This was in line with Dantzler (2013), where various factors influencing families were examined, regarding the self-preparation for disastrous events. In this case, the attitude of the household was a very important factor. Attitude is the willingness of an individual to perform. It is also an action in determining complete behaviour, knowledge, thoughts, beliefs, and emotions, which played very important roles. In this case, two attitudinal components were observed within the family, namely risk perception and previous disastrous experiences. Since disasters are events separated in space and time, some people only considered them a possibility and consequence of natural changes (Erdelj et al., 2017; Geale, 2012; Jiang & Ritchie, 2017; McEntire, 2021; Raikes et al., 2019).

3.5 The Impact of Floods on the Community in Sapanan Village, Binamu District, Jeneponto Regency

The impact caused by the flood in Sapanan village was observed from the interviews conducted with various informants. This included the numerous disease outbreaks that prevented people from working, as most of them were often busy cleaning their homes. In this case, the daily activities of people became the sanitization of mud remnants from flooding (Boardman & Vandaele, 2020; De Walque et al., 2017; Winkler et al., 2018). According to UNESCO, the physical, social, economic, and environmental impacts were observed.

a. The physical impacts emphasize the damage to public facilities and service offices.

b. The social impacts included death, health risks, mental trauma, economic downturn, disruptions of educational (inability to attend school) and public-service office activities, as well as shortages of food, energy, water, and other basic needs.
c. The economic impacts prioritize material losses and disruption of industrial activities, the inability to work, job lateness, obstructed commodity transportation, etc.
d. The environmental impacts include water pollution and river vegetation damage.

3.6 Community efforts in Sapanan Village, Binamu District, Jeneponto Regency in Increasing Preparedness For Flood Disasters

The results show that the efforts performed by the community in handling flooding often occurred during the rainy season. This involved self-rescue, where people commonly ran to higher spaces for protection and returned to their respective homes after the disastrous occurrences. The community did not also dispose of trash in the river, with most of them working collectively to appropriately clean the water ditches. The development of permanent ditches or retaining walls with embankments along the river was subsequently proposed, although none had been implemented. This was supported by the general guidelines for Disaster Mitigation, Regulation of the Minister of Home Affairs Number 33 of 2006, dated 18 October 2006. To reduce flooding, the comprehensive mitigation steps include the following,

a. Supervised land use and site planning for safely placing vital vulnerable facilities in the area.
b. Adjustments to building designs need to be multilevel and resistant to flooding.
c. Infrastructure development should be watertight.
d. Construction of retaining walls and embankments along the river, to reduce flood disasters.
e. Setting the speed of surface water flow and upstream areas is very helpful in reducing the occurrence of floods. Some of the efforts needed in regulating the speed of water entering the drainage system also include the development of a dam/reservoir development, reforestation, and construction of infiltration platforms.
f. Dredging rivers and developing river slits in open channels, pipes, or tunnels, to reduce flooding risk.
g. Construction of retaining walls and breakwaters for wave energy reduction in the events of a storm or tsunami.

The following are the principles for actively mitigating flood disasters (Hermon, 2021),

a. Retain much water upstream by developing reservoirs, as well as conserving soil and water.
b. Absorb a large amount of rainwater into the ground with infiltration wells and provide green open areas.
c. Control water in the middle through temporary storage in the retention area.
d. Distribute water quickly to the estuary or the sea, by maintaining the tank capacity.
e. Securing residents, vital infrastructure, and property.

From these descriptions, the knowledge of the people of Sapanan village towards flood mitigation emphasized the efforts to save themselves during and after the disastrous occurrencesdisasters (during a flood and after a flood occurs). Their knowledge also prioritized the impact caused by flooding and the efforts to overcome it.

4. Conclusion

Based on these results, the level of knowledge and actions performed by the people of Sapanan village regarding flooding was quite good. This was due to the numerous experience of the community in handling disasters. In this case, the experience was subsequently used as a learning platform for the prevention of floods. Furthermore, the impact often caused after flooding was the outbreak of many diseases, which influenced the inability of the community to carry out their usual activities. This was because they were busy cleaning their homes, with the inability of the children to attend school subsequently influenced by the deposition of mud on the chairs and institutional environment. Community efforts in Sapanan Village, Binamu District, Jeneponto Regency In increasing preparedness for flooding, the following community efforts should be conducted in Sapanan Village, (1) supervision of land use and site planning for safe placement of vital vulnerable facilities, (2) adjustments to building designs need to multilevel and resistant to flooding, (3) infrastructure development should be watertight, (4) construction of retaining walls and embankments along rivers to reduce flood.

Conflicts of Interest

The authors declare no conflict of interest.

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