Community Adaptation Strategy to Floods in Kademangan Village, Mojoagung District, Jombang Regency

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Abstract: This study focuses on the adaptation strategies of Kademangan Village in Mojoagung District, Jombang, in responding to recurring floods. Due to Indonesia's geographical location at the intersection of three major tectonic plates (Indo-Australian, Eurasian, and Pacific), and its tropical climate, the country frequently experiences natural disasters, including floods. Kademangan is highly vulnerable to flooding due to its low topography, proximity to rivers, and high rainfall. The area has experienced 18 floods yearly, with water levels ranging from 30 cm to 3 meters. Flooding in the area has caused physical and psychological damage, including damage to agricultural land, and property, and disruption to residents' health. The local government struggles to manage waste disposal and flood prevention efforts, which worsens the situation. Local knowledge helps predict floods but is not enough to prevent them. Resilience, influenced by spirituality, education, and social ties, plays a significant role in how individuals and communities cope with these disasters. This study highlights the importance of strengthening resilience through education and policy interventions to reduce flood-related risks.

1 INTRODUCTION

Based on the world disaster-prone map, Indonesia has the most intense disasters. The cause is triggered by geological conditions at the meeting point of three large plates, namely the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate. As a result, Indonesia is often hit by earth disasters, such as earthquakes, tsunamis, and volcanic eruptions. In addition, Indonesia's climate conditions also influence disasters in Indonesia. The existence of two seasons when compared with geological and geomorphological conditions, both physically and chemically, can produce soil with high nutrient content. However, these conditions can also cause negative impacts such as hydrometeorological disasters. Floods are conditions in which an area is submerged with a large volume so that it can cause physical and psychological losses. Usually, flooding often occurs in areas crossed by many rivers. According to Yudianto (Hakim et al., 2023:221), there are three causes of flooding, including land conversion, extreme weather, and watershed topography. Generally, floods occur due to high rainfall, causing the soil and drainage system to be unable to absorb excess water. In addition, humans can also cause flooding. Land changes, settlement development in watershed areas, deforestation, and dumping waste into rivers are some forms of human action that can cause flooding (Hakim et al., 2023:221).

Data shows that in the period 2000-2020, there were 24,222 natural disasters, both tectonic and hydrometeorological. The percentage of floods was 23% higher with the number of deaths caused increasing by 18% compared to the annual average.

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Based on the latest data release from BNPB in 2021, there were 5,402 disasters in Indonesia, with floods being the disaster with the highest number of cases with a total of 1,794 incidents. According to the Aqueduct Global Analyzer analysis, Indonesia is the 6th country in the world with an affected population of 640,000 people. The data shows that floods are still the dominant disasters that occur in Indonesia (Rumere, 2023:2). Kademangan Village is one of the villages in Jombang Regency that is at high risk of flooding. Explicitly, the floods that often hit Kademangan Village are caused by low topography, high rainfall intensity, and being the upstream area of the Pancir Gunting River and Catak Banteng River watersheds. This condition causes the flood that hits Kademangan Village every year to have an average height that varies greatly, ranging from 30 cm to 3 meters. Referring to the research of Handayani and Dinda (2022:132) Kademangan Village has experienced floods 18 times a year. The longest flood occurs within 48 hours and can recede within a few hours. This incident causes quite a lot of physical and non-physical damage, such as damage to agricultural land, disruption to public health, loss of property, and disruption to the psychological condition of residents.

This condition is exacerbated by several problems faced by the Kademangan Village Government, such as the constraints on socialization of flood control and waste management, lack of supervision by village officials in the community in managing waste properly, and lack of equal distribution of embankments along the river flow (Anggraini and Isna, 2021:7). This has resulted in the flood that hit Kademangan Village not being resolved properly, and even the affected areas are expanding. However, the Kademangan Village Government has not yet provided further policies to address these problems. As a result, every time a flood occurs, the losses felt by residents increase. In dealing with floods, the people of Kademangan Village already have local knowledge of seeing signs of an impending flood. Based on the results of observations made by the author, this knowledge is still less effective in dealing with the flood disaster that occurred in Kademangan Village. However, with this knowledge, the community can adapt to an environment that is prone to flooding. Differences in spiritual levels, education and experience, and closeness of social relationships will affect the level of resilience possessed by each individual. These conditions will affect how to adapt after experiencing stressful circumstances. The level of community knowledge will affect individual resilience in dealing with disasters (Kurniawati and Suwito, 2017:136). Meanwhile, the experience will act as a stimulus that influences the level of preparedness. Spirituality factors also play an important role in shaping community resilience. Individuals who have a good level of spirituality will assess disasters positively so that they can create a sense of optimism and confidence to recover quickly (Apriyanto and Setyawan, 2020:25). In addition, social support can also increase resilience. Individuals who have good social support will display an optimistic and confident attitude in making decisions so that they can adapt quickly (Sari, 2020:9).

2 METHOD

This type of research is quantitative descriptive. Descriptive research is research that attempts to explain objects or subjects systematically so that the findings obtained are in-depth, broad, and detailed. The purpose of descriptive research is to describe facts systematically with the characteristics of research objects that have precise frequencies (Zellatifanny and Bambang, 2018:83). The research location chosen by the author is Kademangan Village which is located in Mojoagung District, Jombang Regency. This village is divided into three hamlets, namely Kademangan Hamlet, Kebondalem Hamlet, and Pekunden Hamlet. The reason the author chose this location is because every year the area is a regular flood disaster with varying water levels in each hamlet. This difference is caused by the topography of each hamlet which is different and there are two large rivers, namely the Pacir Gunting River and the Catak Banteng River which flank Kademangan Village. Meanwhile, the research time related to data collection and processing is planned by the author from March to June 2024. The population referred to in this study is the number of families in Kademangan Village with a total of 1,489 families (Kademangan Village Government, 2023). The sample was taken using the accidental sampling technique. According to Sugiyono (Daeng GS et al., 2022:3), accidental sampling can be defined as determining a sample based on coincidence, meaning that anyone who meets the author and is by the characteristics of the research is used as a respondent.

Physical data and social data are the two types of major data sources used in this study. Social data can be acquired by distributing questionnaires to flood-affected communities and making observations about socio-cultural conditions. In the meantime, field observations are used to gather physical data for the analysis of Kademangan Village's environmental and

settlement circumstances. The author acquired secondary data sources from pertinent organizations, including the Jombang Regency BPBD and the Kademangan Village Government. The data in question comprises the number of household heads in the Kademangan Village community, the number of dwellings affected by the flood disaster, statistics on the overall disaster losses, and data on flood disaster occurrences in Kademangan Village during the last three years.

Hamlet	number of families (KK) (Hamlet)	$Sn = \frac{\text{Population (hamlet)}}{\Sigma \text{ Population (KK)}} xS$	Number of samples
Kademangan	498		2 2
Kebondalem	457		2 0
Pekunden	534		2 3
Total	**1.489**		**6 5**

Data collection through observation is conducted to directly observe the object being studied. Interviews were used to obtain answers regarding the adaptation strategies implemented by the village community in response to floods. Data analysis involves the stages of data editing, data transformation, data tabulation, and cleaning.

3 RESULTS AND DISCUSSION

Kademangan Village is one of the areas in Jombang Regency that is highly vulnerable to flood disasters. In general, the floods that occur in Kademangan Village are triggered by several factors, such as the generally flat topography, the increase in population that can cause environmental problems, and the presence of two river streams passing through the village, which causes a high vulnerability to flooding between the river streams and the residential areas. (Kuswardhana dkk., 2023:54 dan Cipta dkk., 2024:523). The flood that struck was able to disrupt the lives of the community, resulting in both material and non-material losses. The losses can include damage to facilities, the paralysis of the community's economy, the emergence of various diseases, disruption of teaching and learning activities, and the creation of trauma. (Yulinar dan Ratri, 2021:564). Therefore, adaptation strategies are needed so that communities can recover after experiencing a disaster.

According to Robbins, adaptation is defined as the process of maintaining life in the face of environmental or social conditions to achieve goals or meet needs. (Steven dkk., 2023:1829). Adaptation can also be defined as a dynamic process resulting from environmental or social changes that require an individual to alter their lifestyle behavior. Behavioral change is considered a strategy often used by humans to sustain life in their environment. Each individual has a character that enables them to adjust and survive in a particular environment. Individuals who exhibit good behavior towards the environment will have a positive impact on life. Therefore, Sahlins emphasizes that the process of adaptation is dynamic because the environment and human populations continue to change (Almuthorri dan Nugroho, 2019:3).

Based on the results of observations and interviews, the adaptation strategies implemented by the Kademangan Village community can be categorized into four: physical adaptation, social adaptation, and cultural adaptation. (kultural). Here are various forms of adaptation carried out by the Kademangan Village community in facing floods.

3.1 Physical Adaptation

According to Douglas (Steven, 2023:1830), physical adaptation is the process of changing the structure of buildings and the environment, which can take the form of renovations or adjustments. This type of adaptation is usually adjusted according to the level of damage as well as changes in the environment and buildings. The higher the damage caused by the disaster, the better the community's adaptation. The main goal of physical adaptation is to maintain the function of the building even in the event of a disaster. (Asrofi dkk., 2017:133). The characteristics of physical adaptation can be seen in residences or buildings located in flood-prone areas. Physical adaptation is also an implementation by users who add elements or modify the physical structure without eliminating its original function, thereby supporting disaster adaptation efforts. (Yulinar dan Raktri, 2021:566).

During the rainy season, the Pacir Gunting and Catak Banteng rivers are unable to handle the water flow, which contributes to floods in Kademangan Village. The residents of Kademangan Village are forced to physically adjust to the yearly flood disasters. Kademangan Village residents have made the following adaptations: (1) raising the house floors; (2) constructing non-permanent embankments; (3) modifying the house structures to

two stories; (4) building fences out of bamboo or concrete; (5) installing high electrical outlets to prevent water inundation; (6) elevating the house yards; (7) those with low house floors will make pogo, or wooden boards placed in the house rafters to save belongings during floods; and (8) growing flood-reducing plants, such as bamboo, banyan, jackfruit, and cotton trees.

Figure 1. Raising the house floor is one type of physical adaptation. Source: Author's Documentation (2024)

3.2 Social Adaptation

In simple terms, social adaptation is a way of adjusting to the social environment. Changes that can impact their lives typically cause humans to adapt to their surroundings. By changing their personalities to suit their surroundings, they can make these adaptations. Septiawan (2022:23). This is because mutual relationships among organizations or groups can influence the physical environment, which in turn supports life. Communities that have kinship ties will be better equipped to handle disasters (Yulinar dan Raktri, 2021:567). This can manifest in the form of mutual assistance among disaster-affected victims. That condition can be realized if norms are in place and high solidarity serves as a reference in creating kinship relationships. (Ayustiana, 2021:15). In adapting, the mindset of the community and the ability to adjust to physical, social, economic, and cultural environmental conditions. Being one of the areas highly vulnerable to floods makes the kinship relations among the community very close. The form of social adaptation can take the shape of cooperation and providing emotional support to fellow community members.

Based on the research, the forms of social adaptation carried out by the people of Kademangan Village are (1) cooperation in cleaning up materials and debris brought by floods, (2) in the event of a major flood, the community collaborates to establish emergency posts for evacuation and communal kitchens, (3) assisting in evacuating vulnerable groups to disasters, such as the elderly, pregnant women, people with disabilities, and children (Handayani and Dinda, 2022:132), (4) when signs of an impending flood appear, residents usually take turns patrolling to monitor water levels, (5) residents with two-story houses are usually used as temporary evacuation places by the community.

Figure 2. Posts Used by the Community to Monitor River Conditions. Source: Author's Documentation (2024)

3.3 Cultural Adaptation

Cultural adaptation is a human activity to sustain life from disturbances based on certain customs (beliefs). Forms of cultural adaptation can include understanding, knowledge, and habits that must be adhered to and preserved by society. Local wisdom is knowledge, traditions, and practices that are preserved through generations. Local wisdom can take the form of knowledge in managing natural resources, maintaining environmental balance, and preserving customs and traditions that have been practiced in society. From the perspective of disasters, local wisdom can be defined as how local communities understand their environment to face challenges and disturbances. Usually, local wisdom emerges from the results of human thought adapting to the environment, thus becoming a reference in behavior and being implemented from generation to generation. Therefore, local wisdom is traditional and unique. (Setiobudi dan Husna, 2023:1815).

Since ancient times, the people of Kademangan Village have had local knowledge in recognizing signs of impending floods. Ilmu titen is a local knowledge used by the people of Kademangan Village to recognize the signs of impending flood disasters (Handayani and Dinda, 2022:132). The ilmu titen adhered to by the people of Kademangan Village is formed based on environmental and natural indicators present in Kademangan Village. Here are some parts of the ilmu titen still adhered to by the

people of Kademangan Village (Handayani and Dinda, 2022:134-135):

3.3.1 Niteni Mendung (determining the Cloudy Sky)

Niteni mendung (determining the Cloudy Sky) is a local knowledge of the community in identifying signs of flooding based on cloudy skies. Usually, cumulonimbus clouds can trigger rain with high water discharge intensity. Based on the interview results with Sunarsih (April 9, 2024), to know the signs of an impending flood, the people of Kademangan Village will look for dark clouds. If the western side, which is the Wonosalam area, experiences dark clouds, it can be assured that a flood will occur.

3.3.2 Niteni Arah Lepen (Observe The Direction Of The River Flow)

Besides determining the Cloudy Sky, to know the signs of an impending flood, the people of Kademangan Village also observe the direction of the river flow. (niteni arah lepen). If the river flows from west to east, the water discharge will increase. So it can cause a major flood that can submerge the entire Kademangan Village area. However, on the contrary, if the river flows from east to west, the water discharge is usually not too large. Although there is still a potential for flooding, the inundated area is not too extensive. Only the areas around the riverbanks were affected by the flood.

3.3.3 Niteni Panggon (Marking the Place)

Niteni panggon is a local knowledge of the community in identifying signs of flooding based on the conditions of the upstream area. This local knowledge is still related to the local knowledge of niteni awan mendung. According to the local community, to be able to know the signs of a flood, people will look at the direction of the moving clouds. Usually, the Wonosalam area serves as a benchmark for detecting signs of flooding. This is because the Wonosalam region has the characteristic of being a highland area. If heavy rain occurs, it can affect the downstream areas which will receive more run off water from upstream.

3.3.4 Niteni Wulan (Marking the Month)

According to the residents of Kademangan Village, floods typically happen during specific months. One of the local methods for predicting when a flood will occur is niteni wulan, which involves interpreting natural signs. The purpose of the niteni wulan knowledge is to prepare the community to be able to face floods. The results of the interview conducted by Handayani and Dinda (2022:135) state that the people of Kademangan Village will mark December as the time when floods occur because it is the month when heavy rainfall happens. With this knowledge, usually before entering the month of December, the community will prepare themselves by making pogoh or wooden boards placed on the ceilings of their houses or securing their belongings and valuables. In the belief of the Kademangan Village community, floods usually occur in certain months. Niteni wulan is one of the local wisdoms in reading natural signs to determine the time of a flood. The purpose of the niteni wulan knowledge is to prepare the community to be able to face floods. The results of the interview conducted by Handayani and Dinda (2022:135) state that the people of Kademangan Village will mark December as the time when floods occur because it is the month when heavy rainfall happens. With this knowledge, usually before entering the month of December, the community will prepare themselves by making pogoh or wooden boards placed on the ceilings of their houses or securing their belongings and valuables.

Although in adapting physically, socially, and culturally, they are quite good, most of the Kademangan Village community is less proficient in economic activities. In Dusun Kademangan and Kebondalem, the community prefers to take a break from work to clean the environment from materials and debris carried by the flood. Usually, the material carried by floods can have a thickness of 5-10 cm. If the sediment is not cleaned up immediately, it will damage residents' furniture and make the walls of the house damp. (Faruk, wawancara, 20 April 2024). The people of Dusun Kademangan and Kebondalem perceive floods as a threat that disrupts their lives. However, this is different from the people of Dusun Pekunden who can immediately get to work after the flood recedes. The presence of a positive interpretation of disasters indicates good spiritual coping abilities. A society with such capabilities will have an optimistic attitude in facing disasters, making it less likely to be easily overwhelmed and more inclined to improve the situation. This was stated by one of the residents of Dusun Pekunden in an interview with the author.

"Usually, if the water comes at midnight, it will recede by morning. So, I can still go to work." (Vindy, interview, June 17, 2024).

"I always interpret floods positively, ma'am." Just consider it as cleaning the house at the same time. (Adi Winarto, interview, 17 April 2024).

4 CONCLUSIONS

This study shows that Kademangan Village, Mojoagung District, Jombang Regency, is an area that is vulnerable to flooding due to various factors such as flat topography, population growth, and the presence of two rivers that often overflow during heavy rain. The impact of this flood is very large, disrupting people's lives, both physically and socially, with losses that include damage to facilities, economic disruption, health problems, and psychological.

In dealing with floods, the people of Kademangan Village have developed three forms of adaptation, namely physical, social, and cultural (cultural) adaptation:

Physical Adaptation: Efforts to adjust building structures and the environment, such as raising house floors, making temporary embankments, and planting trees that can reduce the risk of flooding.

Social Adaptation: Adjustment to the social environment, such as working together to clean up post-flood areas, setting up emergency posts, and monitoring river water levels in turn.

Cultural Adaptation: Utilizing local wisdom, such as titen science, which includes marking cloudy clouds, river flow directions, and paying attention to certain months that often flood.

Although the people of Kademangan Village have adapted physically, socially, and culturally quite well, economic adaptation is still not optimal. Most people in Kademangan and Kebondalem Hamlets had to stop working during the process of cleaning up flood debris. In contrast, the people of Pekunden Hamlet have better spiritual coping abilities and view flood disasters more positively, which helps them continue their activities immediately after the flood recedes. Suggestions that can be made for the local government include improving Anti-Flood Infrastructure: The local government can improve flood control infrastructure such as building permanent embankments and dredging rivers regularly. This is to help reduce the frequency of flooding that hits Kademangan Village. An economic empowerment program is needed for flood-affected communities. For example, providing training for the community in businesses that do not depend on weather conditions, such as home industries, can help increase community income after a disaster.

Recommendations for local governments to hold special training programs or workshops that can increase flood preparedness and awareness among residents.

The central government makes concrete policies that can be implemented by local or regional governments to address flood risks more effectively and quickly.

should immediately integrate modern technology, such as flood prediction applications or early warning systems, to complement local knowledge.

Communities are trained to master strategies to improve waste management to reduce flood risks, such as community clean-up initiatives or recycling programs.

for further research, it is better to use a wider and more sustainable area coverage, such as a long-term study on the effectiveness of current adaptation strategies or the socio-economic impacts of recurring floods.

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