Profiling Community Vulnerabilities Flood Disasters: An Indicator-Based Vulnerability Assessment for Banjar District, South Borneo

Astri Hanjarwati[✉] and Sulistyaningsih

Department of Sociology, UIN Sunan Kalijaga Yogyakarta, Yogyakarta, Indonesia
{astri.hanjarwati,sulistyaningsih}@uin-suka.ac.id

Abstract. This study aims to determine the profile of the vulnerability of the people of Banjar Regency to flood disasters. Banjar Regency was chosen because its area has a high risk of flooding. The method used in this study is a survey research method, with a total of 100 households as respondents. How to collect interview data directly to the head of the family or the representative family member. Data analysis used SPSS 24, with descriptive analysis and frequency analysis. The research results are divided into physical vulnerability, economic vulnerability, and social vulnerability. Based on the data analysis, the people of Banjar Regency have high Physical Vulnerability because the location of Banjar Regency is in the lowlands, close to the river and often receives flooding from higher areas of the Regency. Banjar Regency experiences flooding 3–4 times in one year. Meanwhile, the houses owned by the residents are in accordance with the standards and are resistant to flooding. The economic vulnerability of the community is very low, 100% of the respondents have income. In addition, it is also shown that 70% of respondents do not have debts above 10 million. The social vulnerability of the community is also quite low, seen from the solidarity between families, the attitude of mutual cooperation and mutual assistance to the community when a disaster occurs.

Keywords: Flood disasters · physical vulnerability · Social Vulnerability · Economic Vulnerability

1 Introduction

Flood is a type of hydro-meteorological disaster that often occurs in parts of Indonesia and causes a lot of losses in the form of loss of life and property and requires recovery [1]. Theoretically, based on the results of previous research studies, several flood disasters in Indonesia always cause many deaths and injuries and property and property losses due to several factors, namely (1) a sudden flood; (2) there is no early warning tool for flood disasters; (3) minimal public knowledge about flooding; (3) buildings in Indonesia (especially flood-prone areas) are not resistant to flood disasters [2].

South Kalimantan Province is an area that is prone to flooding. Based on the results of the study of the disaster risk index, South Kalimantan Province is included in the high

category with a score of 144 [3]. Two districts in South Kalimantan that are prone to disasters, namely Tanah Laut District which is prone to landslides, while Sungai Danau District is prone to flooding [4].

Areas that have a high disaster risk index score must increase capacity and reduce vulnerability to reduce the risk that will occur due to disasters. Capacity building both physically, economically and socially. The amount of risk is influenced by two factors, namely capacity and vulnerability, both physically, socially and economically [5–7].

From year to year Banjar Regency, South Kalimantan Province is an area that often occurs flood disasters. In 2021, the flood that occurred is not like in previous years, this year the flood disaster is bigger. Of the total 11 sub-districts in Banjar Regency, only two sub-districts were not affected by the flood. The worst-affected sub-district is Martapura District, where out of 19 villages and 7 sub-districts in Martapura District, there are only 4 villages that are not affected by the flood. Research conducted on mapping flood hazard classes, categorizes there are four flood hazard classes, namely high, medium, low and non-hazardous. Based on this reality, researchers are interested in studying about how vulnerable the people of Banjar Regency, South Kalimantan are to Flood Disasters? The problems above are discussed in this study from the perspective of the sociology of disaster.

Vulnerability has emerged as a central concept in understanding the state of a system or its tendency to be damaged by a hazard [8]. In general, system vulnerability is the capacity of the system to withstand harm from external threats [9]. Vulnerability is a function of exposure to a stressor, effect (also called sensitivity or potential impact) and recovery potential [8]. Vulnerability is not a straightforward concept, and there is no consensus on its exact meaning [10].

Indicator-based vulnerability analysis quantitatively represents and assesses the critical attributes of communities that contribute to their potential loss. General measures related to aspects such as population size, highly vulnerable socio-graphical groups, income, and building stock characteristics indicating what is at risk (exposure) and its vulnerability to loss [11]. The set usually includes a broad category of community assets and capacities, referred to as capital, namely social, economic, and built-environment capital [11].

The sustainable livelihoods framework views vulnerability in terms of capital or assets owned by people in a community for the provision of their livelihoods which can be categorized as human, social, financial, physical and natural assets [12]. Human assets are the skills, knowledge, health and physical capabilities possessed by the workforce of a community in implementing livelihood procurement strategies [12].

Social assets refer to the social networks, affiliations and associations that people subcontract for the fulfillment of their livelihoods [12]. The economic assets of a community are the "capital base" which includes insurance, credit and debt, and the holdings of cash and savings which play an important role in earning a successful livelihood. Natural and environmental assets are natural resource reserves and environmental services. Finally, physical assets refer to the infrastructure, production equipment, and technology used by communities to provide livelihoods that are vulnerable to external hazards.

Vulnerability is a condition that is influenced by many factors and consists of various dimensions with the main factors including widespread poverty, food insecurity, illiteracy, unemployment, lack of awareness of risk, damage to infrastructure, poor governance, lack of institutional capacity and inability to enforce regulation [13]. By Organization of American States [14] Vulnerability is a condition or characteristic of a community, system or asset that makes them easily affected by damage or the negative impact of a hazard. In many cases, the root cause of disasters lies in vulnerabilities arising from economic and social inequalities such as issues of welfare, poverty, access to education, unemployment, land ownership and land markets. Communities who have direct access to capital, equipment and supplies as well as a healthy body condition are the fastest group to recover from a disaster that occurs or are a group with low vulnerability [15].

Measurement of vulnerability can be seen from several aspects including survival skills/ability, ability to obtain basic needs, risk of death, medical risk that affects individual's ability to function, ability to think, memory, cognitive, organization and orientation, mental health condition, drug use, communication skills, social behavior, and homelessness [16]. By Proag [15] there are several types of vulnerability, namely physical, social, and economic vulnerability. Physical vulnerability relates to the physical assets of buildings, infrastructure and agriculture. Social vulnerabilities consist of community groups such as women, children, the elderly, refugees, persons with physical or mental disabilities, and the poor. Meanwhile, economic vulnerability is assessed from the risk of loss including direct damage (physical damage and repair costs) and indirect (loss of jobs, production, income, or vital services).

2 Methods

The research method used is survey quantitative research. The population in this study were households in Banjar Regency, South Kalimantan which were affected by the flood disaster. Determination of the sample using the stratified random sampling method, that is, one of the sub- districts that were worst affected by the flood disaster was selected. Based on BPBD data from Banjar Regency, the sub-district worst affected by flooding is Martapura District. So the sample in this study is Martapura District with a sample of 100 households. Determination of the number of samples is based on Arikunto's theory which states that if the population is below 100 then all members of the population are samples in the study [17]. The minimum sample in quantitative research is 30 people [18].

The data collection instrument in survey research is a questionnaire. The question model in the questionnaire is an open and closed question, with the aim of obtaining more complete and varied data. The data collection process was carried out directly by the way researchers visited the houses of the respondents. This is done to get the best data and to know the real condition of the respondents.

The next process after collecting data by survey is conducting data analysis. The stages of data analysis carried out are:

1. Validity and reliability test
2. Assumption test consisting of (homogeneity test, normality test and linearity test)

3. Hypothesis Test
4. Test description
5. Correlation Test and Factor Analysis

3 Profiling Community Vulnerabilities Flood Disasters

3.1 The Vulnerability of the People of Banjar Regency, South Kalimantan

Based on the results of data processing on 100 respondents, there are 6 age groups, namely respondents under 20 years old, 21–30 years old, 31–40 years old, 41–50 years old, 51–60 years old, and age group above 60 years old. It can be seen that based on the diagram above, there are 2 respondents in the age group under 20 years, 21 respondents in the 21–30 year age group, then 28 in the 31–40 year age group. The number of respondents in the age group 41–50 years is 21 people, in the age group 51–60 years there are 20, and finally in the age group above 60 years there are 8 people. From the explanation, it is known that respondents with an age range of 31–40 years have the most number, namely 28 people, this means that the majority of respondents are still of productive age.

Of the 100 respondents in this study there were 45 men, 54 women, and 1 respondent who did not fill out the answers in the questionnaire. This shows that the number of female respondents is more than the number of male respondents. This study also explains the marital status of the respondents, from 100 respondents there are 62 people who are married, 18 people who are not/unmarried, then there are 17 people who are widowed/widowed, and there are also 3 respondents who did not fill out the answers to the questions in the questionnaire.

The number of dependents in the family, the majority in the respondent's family has 1 dependent. It is proven by the number of families with 1 dependent, namely 54 families, then the family with 2 dependents, namely 27 families, then there are 13 families with 3 dependents, and 4 families with more than 3 dependents. However, there were also 2 respondents who did not provide answers to questions regarding the number of dependents in their family.

The last education that the respondents took in this study were several groups, namely respondents who did not go to school or did not finish elementary school, respondents who had completed elementary school, respondents who finished junior high school, respondents who graduated high school, graduated Diploma III, and respondents who have completed the undergraduate education level. Based on the diagram above, there are 4 respondents who do not go to school or complete elementary school, 16 respondents who have completed elementary school education, then 12 respondents who have completed junior high school education. Respondents who finished high school education had the highest number compared to other levels, namely there were 42 respondents who graduated from high school, at the next level of education, namely Diploma III graduates, there were 6 respondents, and there were 20 respondents who had completed undergraduate education. This shows that the majority of people are aware of the importance of education.

There are several types of work that are engaged in by the respondents, namely 8 people work as civil servants, 5 people are entrepreneurs, 6 people each work as farmers

and construction workers, 34 people are traders, 12 respondents are still students or students, and the last 29 people who work outside the type of work previously mentioned. These jobs include administrative staff, online motorcycle taxi drivers, housewives, nurses, tourism service employees, volunteers, fishing net makers, and carpenters washing corpses.

The income of the respondents in this study there are 4 ranges of income groups, namely the first respondent with an income group of Rp. 0–Rp. 500,000 there are 24 people, then respondents who have an income of more than Rp. 500,000–Rp. 1,500,000 there are 36 people. The third respondent with an income of more than Rp. 1,500,000– Rp 3,000,000 there are 24 people, and the last respondent with an income of more than Rp. 3,000,000 there are 15 people. However, out of 100 respondents there was 1 respondent who did not provide an answer regarding the amount of income he had.

The following is information about the participation of respondents in an organization, there are 11 people who participate in organizations such as posyandu cadres, PKK, firefighters, habsyi groups, Aksi Cepat Tanggap (ACT), RT social gathering, OSIS, HMI, farmer groups, and BPK. However, most of the respondents did not participate in an organization, namely 89 people, of which the majority of respondents were not members of an organization.

3.2 Physical Vulnerability

Natural disasters that occurred in Banjar Regency included floods, landslides, tornadoes and fires. According to the Banjar Regency Regional Disaster Management Agency, the western region of Banjar Regency has moderate to high vulnerability to flood disasters. Several sub-districts are also affected by floods every year, such as Martapura, East Martapura, and Cintapuri Darussalam Districts. While the eastern region has a moderate to high vulnerability to landslides. How many sub-districts were affected by the landslide, namely Paramasan District and Mataraman District. Meanwhile, the threat of drought with a moderate level occurs for all areas of Banjar Regency. Most areas also have a moderate to high threat of extreme weather disasters. Some western regions also have a moderate to high threat of forest and land fires. The number of villages in each sub-district that experienced floods can be seen in Table 1.

The distance of the respondent's house to the river, the respondent's house which is 5 M–100 M from the river is 41 houses, then the house is 101 M–200 M from the river, there are 6 houses, then there are 3 respondent houses with a distance of 201 M–300 M to the river, and the respondent's house which has a distance of 301 M–500 M with the river there are 13 houses. Further away, the respondent's house is 501 M–1 KM away from the river, there are 28 houses, and the last house is more than 1 KM from the river, there are 9 houses. This shows that most of the residents' houses are very close to the river.

Based on the results of the survey, it shows that 100 respondents knew about the flood disaster that could hit their settlements, because they had lived in the area for a long time which was very close to the river and every year there were floods of different severity. This information is related to the number of their experiences experiencing flooding in their settlements with a time span of 2015–2021, in the first information, the respondents who experienced flooding 1–3 times amounted to 60 people, then those who

Table 1. Number of Villages/Sub-Districts in Each District That Experienced Flood Natural Disasters

District		2018	2019	2020* (January–May)
1	Aluh-Aluh	-	-	-
2	Beruntung Baru	-	-	-
3	Gambut	2	2	
4	Kertak Hanyar	2	1	1
5	Tatah Makmur	-	-	-
6	Sungai Tabuk	6	-	-
7	Martapura	18	7	3
8	Martapura Timur	12	10	2
9	Martapura Barat	7	7	2
10	Astambul	13	-	-
11	Karang Intan	3	1	
12	Aranio	-	-	-
13	Sungai Pinang	1	1	1
14	Paramasan	-	-	-
15	Pengaron	2	3	2
16	Sambung Makmur	2	-	-
17	Mataraman	4	2	1
18	Simpang Empat	7	4	2
19	Telaga Bauntung	3	1	1
20	Cintapuri Darussalam	9	3	4
Banjar		**91**	**42**	**19**

Source: Banjar Regency in Figures (2021)

experienced flooding 4–6 times amounted to 26 people, and finally Respondents who felt the flood 7–9 times in that time span were 14 people. Because indeed for those who have lived for a long time and their homes are very close to the river, they feel flooded every year. Of course with varying severity.

The following is information about the damage to houses experienced by the respondents due to the floods that hit. First, there were 7 respondents whose houses were not damaged, then for respondents whose houses suffered minor damage, namely with a loss range of 2–10 million, there were 41 people, then for losses of moderate severity or with a loss range of 11–20 million, there were 19 people. Twenty-six people's houses were damaged at a severe level or a loss range of 21–30 million, and finally there were 7 respondents whose houses were severely damaged with a loss range of more than 30 million.

According to the respondents, there were 5 categories of damage to public facilities or residents' houses, namely according to 6 respondents there was no damage to existing residents' houses and public facilities, then according to 38 respondents the damage to residents' houses and public facilities was at a mild level of 20%–30% of the damage occurred, then according to 23 respondents the damage to residents' houses and public facilities was at a moderate level of damage, namely 31%–50%. Then 20 respondents felt that the damage to residents' houses and public facilities due to severe flooding was 51%–90%, and the last 13 respondents felt that the damage caused by flooding to residents' houses and public facilities was very severe, namely 91%–100%.

The losses experienced by respondents due to the floods that hit were varied, namely 6 respondents did not feel any losses due to floods, 62 people experienced losses of 1–10 million due to floods, 15 people experienced losses of 11–20 million due to floods. Then there are 14 respondents who suffered a loss of 21–30 million, and 3 respondents suffered a loss of 31–40 million due to the floods that hit.

The roofing materials for the houses of Banjar District villagers vary, there are several materials they use for their roofs, namely houses that use zinc roofing materials totaling 69 houses, houses with aluminum roofs totaling 4, houses with tile roofing materials totaling 9, then houses using There are 16 shingle or thin boards made of ironwood, and 2 houses that use concrete for the roof.

Then there are 4 types of wall materials used by residents of Banjar District, namely wood, brick, concrete, and calciboard. There are 63 houses using wood for the walls, 10 houses using bricks, then 22 houses with concrete wall materials, and the last one is kalsiboard wall material, there are 5 houses.

The distance from one house to another house belonging to the community in the majority of Banjar District is very close, this is evidenced by 84 respondents providing information that the distance from their house to neighboring houses is only 1–3 m, then 12 respondent's houses are only 4–6 m away from the house. Neighbors, and 4 respondents' houses are 7–10 m away from their neighbors' houses.

Information related to the knowledge of the respondents about the availability of buildings or vacant land that they can use when a flood disaster occurs, half of the respondents, namely 50 people answered that there is land or buildings that they can use for shelter when a flood occurs, such as mosques, school halls, prayer rooms, district office and education office. Please note that the prayer room in Kalimantan has a large size like the size of a mosque in Java. However, 50 respondents answered that around their place of residence there is no land or room that they can use to take shelter during a flood because the land is already narrow.

This information is about the distance of a building or land that can be used for shelter during a flood from the respondents' houses, 68 people answered that their house and the building or land were as far as 500 M–1 KM then 28 people answered that their house had a distance of 1.1 KM–2 KM, and 4 people answered that their house is 2.1 KM–3 Km from the building or land.

The density of houses or public facilities in the respondents' villages related to the lack of space or vacant land that can be used for shelter. There were 64 people who answered Yes, 18 people answered no, 17 people answered doubtfully, and there was 1 respondent who did not give an answer.

3.3 Social Vulnerability

The number of family members who stayed at home when the flood occurred, there were 9 respondents who answered that no one stayed at home when the flood hit, then there were 41 respondents who answered that there were 1–3 people at home when the flood came, 46 people answered that when the flood occurred there were 4–6 people, the last 4 people answered that during the flood there were 7–9 people at home.

Regarding the number of elderly or toddlers in the respondents' families, 49 people did not have elderly or toddlers in their family, 21 people answered that in their family there were 1–2 toddlers, 21 more people answered that there were 1–2 elderly in their families, 4 people answered that there were 1 toddler and 1 elderly, then 3 people answered that in their family there were 1 toddler and 2 elderly, and finally there were 2 people who answered that in their family there were 2 toddlers and 1 elderly.

When a flood occurs, the majority feel that they help each other and have good social relations, namely 94 people who feel this way. However, there were 4 people who did not provide answers to related questions.

3.4 Economic Vulnerability

The majority of the residents of Banjar District do not own livestock, which is 88 respondents, only 12 people answered that they have livestock. Nine respondents answered that the types of animals they have are poultry in the form of chickens, birds, and ducks. Owning a business or agricultural land that adds to their income or becomes the main source of income for the respondents, there are 16 people who answer that they have agricultural land and 84 people answer that they do not have agricultural land that they can use as a source of income.

Ownership of credit or debt by the respondents before the flood occurred, 6 people answered that they had credit such as motorcycle loans, clothes, bags, and loan funds with certificates as collateral. Then 93 people answered that they did not have credit and 2 people answered doubtfully.

The number of credits or debts owned by respondents, there are 94 people who do not have credit or debt, then there are 2 people who have credit of 1–10 million, 2 people with a total credit of 11–20 million, and there are 2 other people who have credit amounted to 21–30 million.

Information about sources of income originating from natural resources around the respondent's residence, there were 12 people who answered Yes, then 85 answered that their income came from other things, and 3 people answered doubtful. There are two types of natural resources which are the sources of income for the respondents, namely agriculture and rattan weaving. There are 11 people who use agriculture as a source of income, 3 people make rattan weaving as their income, and 86 people do not have natural resources that they can use as a source of income.

4 Conclusion

The research results are divided into physical vulnerability, economic vulnerability, and social vulnerability. Based on the data analysis, the people of Banjar Regency have

high Physical Vulnerability because the location of Banjar Regency is in the lowlands, close to the river and often receives flooding from higher areas of the Regency. Banjar Regency experiences flooding 3–4 times in one year. Meanwhile, the houses owned by the residents are in accordance with the standards and are resistant to flooding. The economic vulnerability of the community is very low, 100% of the respondents have income. In addition, it is also shown that 70% of respondents do not have debts above 10 million. The social vulnerability of the community is also quite low, seen from the solidarity between families, the attitude of mutual cooperation and mutual assistance to the community when a disaster occurs or when a disaster occurs, it is very close.

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