Community resilience to face flood disaster in the Baleendah Village, Bandung Regency, Indonesia

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Abstract. This study aims to determine the level of resilience of the people of Baleendah Village in dealing with floods. This research uses a holistic approach that considers all aspects as a whole. The approach known as mixed research methods. The mixed research method strategy used is concurrent triangulation strategy, where researchers collect qualitative and quantitative data together, then compare the two data to find out the difference or a combination. The community resilience variable used in this study refers to guidelines for measuring disaster resilience issued by GOAL (2015) that has 30 variables that are grouped into 5 thematic areas. These variables include knowledge and education; emergency preparedness and response; and risk management and vulnerability reduction. Based on the analysis of 3 variables and 10 aspects of community resilience, it can be concluded that the Baleendah Village community currently has a resilience level at the "RESILIENT" level, which means that the community can adapt and have a solution to overcome the floods. Based on the study findings, there are two main problems in increasing the resilience of the Baleendah Village community, namely access to financial assistance for people who are economically in the low income community category, and sanitation.

1. Introduction
Floods occur in the Baleendah Village almost every year. The flood was caused by the overflow of the Citarum River which occurred at a time of high rainfall intensity. The Citarum River is a river with a high level of sedimentation, which is 7.9 million tons per year [1]. The high sedimentation in the Citarum River is exacerbated by the very high development of the region, thereby increasing erosion to the Citarum River body. These developments made the Baleendah Village a densely populated area, and included in the slum area of Bandung Regency 4 [2]. Based on data, floods occurred at 4 locations, 966 housing units and 1 worshiping facility, with inundation heights reaching 1 meter.

The high development in the village of Baleendah will increase the vulnerability of the region to flooding. The high threat of flooding in the village of Baleendah did not make the area deserted. This condition is very interesting to study, especially related to the resilience or resilience of the Baleendah village community when facing flood disasters. Resilience or resilience of the community is the ability of the community to survive and rise after a disaster. Resilience allows a community or community to survive in a disaster location [3]. Therefore, this study is intended to determine the level of resilience of the people of Baleendah District in dealing with floods. The purpose of this study is to identify the level of resilience of the Baleendah village community in dealing with floods.
2. Methodology

2.1. Data collection
Data collection was carried out based on primary and secondary data. Primary data is done by observation, the object of observation in this study includes the causes of flooding, inundation heights (seen from the sign of inundation in the building of residents), the impact of floods, forms of community resilience, evacuation routes, and evacuation sites. Interviews are conducted using the "in-depth interview" technique. This study uses the Guttman Scale, where respondents who answered "yes" will be given a scale “1”, and respondents who answered "No" will be given a scale “0”. Data from the questionnaire were recapitulated and processed using SPSS. The secondary data collection method is a technique of collecting data from existing data. Secondary data sources can be through internet media, research reports, data and product documents of the relevant agencies. In this study, several related institutions are used as secondary data sources, such as Bandung Regency Disaster Management Agency, Bandung Regency Statistics Agency, Bandung Regency Parks, Spatial and Cleanliness Service, Bandung District Health Office, and Public Works Agency.

2.2. Data analysis
The variable resilience refers to McCaul and Mitsidou [4], modified into a simple form. Where the selected variables are 3 thematic areas, namely: Thematic area of knowledge and education; The systematic area of risk management and vulnerability reduction; and the Thematic area of disaster preparedness and response (Table 1).

| No | Measurement                                      | Variable                                      |
|----|-------------------------------------------------|-----------------------------------------------|
| 1  | Risk management and vulnerability reduction     | Leadership                                   |
|    |                                                 | Rights and advocacy                           |
|    |                                                 | Access to assistance                          |
|    |                                                 | Inclusion for vulnerable groups               |
|    |                                                 | Access to health in the event of flooding     |
|    |                                                 | Provision of food and water                   |
| 2  | Knowledge and education                         | Awareness and knowledge of society           |
|    | Vulnerable                                      | The attitude of society when flooding         |
| 3  | Preparedness and emergency response             | Sustainable environmental management          |
|    |                                                 | Social protection                             |

3. Results

3.1. Community resilience in Baleendah Village
Based on the results of research on community resilience is divided into three thematic areas, namely: The thematic area of knowledge and education; The thematic area of risk management and vulnerability reduction; and The thematic area of disaster preparedness and response. In measuring risk management and vulnerability reduction, the variable of community leadership in five hamlets, included in the high category was around 78.73% and community right and advocacy averaged 82.58%, access to government and private assistance was low about 47.74%, inclusion group assistance on average 92.87%, access to health in the event of a disaster is low about 59.44%, and the average Provision of food and water is about 59.63%. The results of measurements of the variables of knowledge and education, awareness, and knowledge of the community are at a high level of around 75.92%, and the attitude of the community when the flood variable is very surprising, on average 100%. The measurement of preparation and emergency response in the variable of sustainable environmental management averaged 83.20%, and the social protection variable was very low at 49.92%. The measurement data show in Table 2.
As the results shown in Table 2, Baleendah communities have a good level of risk management and vulnerability reduction, which is an important point in low leadership found in Hamlet 18 because no one can lead the community, regulate, provide good information in a disaster. Communities independently do adaptive to hazards and disasters that occur. Hamlet 18 is highly prioritized in social assistance and social protection because of its location adjacent to the Citarum River.

Table 2. Recorded of community resilience.

| No. | Measurement                                      | Community resilience assessment (%) | Average (%) |
|-----|--------------------------------------------------|------------------------------------|-------------|
| A.  | Risk management and vulnerability reduction      |                                    |             |
| 1.  | Leadership                                       | 33.33                              | 78.73       |
| 2.  | Rights and advocacy                              | 100.00                            | 82.58       |
| 3.  | Access to government and private assistance      | 45.83                              | 47.74       |
| 4.  | Inclusion for vulnerable groups                  | 95.83                              | 92.87       |
| 5.  | Access to health in the event of flooding        | 68.74                              | 50.44       |
| 6.  | Provision of food and water                      | 65.97                              | 59.63       |
| B.  | Knowledge and education                          |                                    |             |
| 1.  | Awareness and knowledge of society               | 74.33                              | 75.92       |
| 2.  | The attitude of society when flooding            | 100.00                            |             |
| C.  | Preparedness and emergency response              |                                    |             |
| 1.  | Sustainable environmental management              | 76.04                              | 83.20       |
| 2.  | Social protection                                | 63.89                              | 49.92       |

In the access to health in the event variable of flooding Hamlet 27 and 28, both are very low at 25% even though in aggregate it shows a moderate average of 50.44%. At the time of the flood disaster, health access was very inadequate due to the impact of the flood. Inundation makes it difficult to get access to health because there is no place used for this access. Government assistance cannot reach health services for the community in the hamlet, only safe areas are inundated with the private government can provide temporary health facilities. This is not only healthy but also the provision of food and drink that cannot be served when flood occurred. Thus the people in Hamlet 27 and 28 based on people's perceptions of the provision of food and drink were also low, namely 49.38% for the people in Hamlet 27, and 50% for the people in Hamlet 28.

In measurement the knowledge and education, the awareness and knowledge of society variable, the community has adequate knowledge and education, because they have annual flood experiences. On the other hand, they are very adaptable and responsive to face flood. So that, when the peak rainy season comes, the community is ready to face the disaster situation. They will face flooding with their experience, such as packing valuable personal items, escaping, preparing important food ingredients as well as securing items that are in their homes. So, it is reasonable if the community perceptions of Baleendah Village are measured to produce an average of 75.92%.

The most impressive and surprising is in the variable attitude of society when flooding according to their perceptions that almost all Hamlet communities in Baleendah Village aggregate produce a value of 100%. When floods and post floods they never complain about the circumstances that occur, love and value systems for their villages make them grow and live between annual floods. Socially, they help each other with flooding and post-flood. When a flood occurred to three weeks, even in the third week the children go to school, workers outside the flood area also start their activities as usual. Except for farmers whose land is located in the flood area, they still wait until the flood recedes.
Measurement preparedness and emergency responses are generally very high in the Baleendah Village community. Efforts are made to equip themselves every year to prepare for floods. The individual technical efforts are to protect their homes, prepare embankments on the banks of the river, and make protection for personal and electronic goods. The weakest of variable is social protection. Although they appear to be adapted to the flood environment, people still get the psychological impact. They also received this consequence as a result of not wanting their area to be relocated by the regional government and the central government. This is following the recorded results on social protection which averaged 49.92%. The lowest social protection is in the community of Baleendah Village on Hamlet 27, and Hamlet 28 which is 33.33%.

3.2. Risk management and vulnerability reduction
Measurement in the risk management and vulnerability reduction variables consists of six aspects, namely: leadership, rights and advocacy, access to inclusive assistance for vulnerable groups, access to health facilities during floods, and the provision of food and water. In the aspect of leadership, the community considered leadership in Baleendah Village is facing floods in a good category.

Leadership should be able to be well organized, personnel from leadership must be able to map personnel in certain functions in overcoming crises when they occur and in times of calm [5]. It is reasonable that the community in Baleendah Village strongly believes in the Village Government, the Lurah is a leader who considered capable of accommodating and providing solutions during floods and after floods. At present, the leadership that is trusted by the community is the Village Head, Chairman Hamlet and Chairperson of the Community Group. The village chief was able to coordinate the team when flood occurred, held counseling for the community, and pro-active to find solutions to solve the problem of flooding in Baleendah Village. At present, there are no other organizational leaders who specifically deal with communication problems and overcome and provide solutions in the event of a flood. Expansion of the organization is needed to communicate disasters to the community to the level of neighbors. Thus, even though the Lurah, Chair of Hamlet, and the Chairperson of the Community Group as the leader (administration) need a coordinator at the neighboring level [6]. This improves communication and cohesiveness between communities in the event phase and after a continuous event.

Access to assistance has the lowest value. Currently, the assistance provided is in the form of assistance during flood events, such as food and beverage assistance, health, public kitchens, refugee tents. While post-disaster assistance, the community has not yet received it. One of the impacts of the disaster is the loss of livelihoods, therefore post-disaster financial assistance to restore people's livelihoods is very important. This strategy of providing financial assistance requires a special approach [7], so as not to become an ongoing burden for the government. This strategy of providing financial assistance can use the concept of disaster microinsurance.

Vulnerable groups are groups of people who in the event of a disaster have a greater risk of an impact compared to non-vulnerable groups. The vulnerable groups in question include the elderly, children, women and people with disabilities. In this aspect, the assessment is very good. This is mainly due to the high public awareness in responding to the flood disaster. Non-vulnerable groups prioritize vulnerable groups to be saved. Besides that, outside help always prioritizes the group to be saved first.

The ease of access to health facilities during floods is very important for flood victims. Because we do not know when a disaster occurs, people experience more psychological pain, due to fatigue, a traumatic treatment that is good in the event of a disaster and during health recovery, integration between interests and assistance guidelines and toolkit must be available. What happened to the community in Baleendah this variable is still very low. In the implementation of providing health facilities, the government has not provided adequate sanitation or sanitation that can adapt to flood conditions. This is important because it is part of the guidelines and toolkit for disaster mitigation. Also providing mental health services [8].
3.3. Knowledge and education functions

Practical knowledge in reading natural signs and the following flood events after the flood is based on the experience of flooding every year. This knowledge is derived from each experience and verbally communicated in social interactions. This activity is commonly referred to as knowledge transfer, where knowledge is obtained from communication between individuals or groups that interact [9]. Therefore Baleendah Village community has been able to adapt to the frequent flooding in its area. The community has understood the natural signs before the occurrence of floods, such as high rainfall intensity and rising river water levels.

Stakeholders should be responsive to the importance of community knowledge and education in the face of flooding. The intended stakeholders are the government, the private sector, NGOs, and universities. Education to the community is far more effectively conveyed to the community using curricula and scientific approaches obtained by the community. Collaboration between the government, the private sector, NGOs, and universities can be integrated into providing tangible benefits for the community to be adaptive.

3.4. Emergency preparedness and response

Emergency preparedness and response includes sustainable environmental management and social protection [10]. Baleendah Village Community already has fairly high awareness in maintaining the environment so that there is no flood. One form of sustainable environmental management carried out by the people of Baleendah Village is managing waste disposal and community service in cleaning waterways. But the common problem is that social protection is not optimal during floods, such as the absence of non-government stakeholders to help flood victims, and the absence of formal social protection schemes provided by the central government or other institutions such as farmer associations, labor associations, or cooperative. Social security schemes in disaster situations can be in the form of handling children, handling elderly people, the disability must be the most important part of stakeholders [11, 12].

Also, handling is done to overcome psychological problems such as saturation, stress, shock, and psychiatric disorders need to be included in a joint scheme between stakeholders. With this scheme, protection for the community can be more quickly obtained by flood victims. Based on the analysis conducted on 3 variables and 10 aspects of community resilience, it can be concluded that the community of Baleendah Village currently has a level of resilience at the "RESILIENT" level, which means that the people of Baleendah Village have been able to adapt and have a solution to overcome flooding in Baleendah Village (Figure 1).

![Figure 1. Resilience level.](image-url)
4. Conclusion
The main factors of flooding in Baleendah Village are poor drainage conditions, higher water levels of the Citarum River than the surrounding channels, and landfill in rivers and canals. The Baleendah community have a high level of adaptation in dealing with floods. That is a very important role in increasing community resilience. The adaptation ability is influenced by the knowledge and education of the community through experience during their stay in Baleendah Village, counseling and training from the Bandung Regency government related to flood management.

However, in accessing financial assistance, the people of Baleendah Village have not yet obtained such access. This can be caused by budget constraints owned by the Bandung Regency Government. On the other hand, this financial assistance is very important considering that there are not a few livelihoods for the people who have lost their floods, such as stalls, rice fields and fields, and so on. Besides, there is no access to adequate sanitation that is resistant to floods. Access to financial assistance is very important to provide, especially for people who are economically in the low-income community category. Of course, if financial assistance is only relying on the regional budget, it will be a burden to the Bandung District Government. Given the frequency of flooding in Baleendah Village is quite high. Another strategy that can be applied is to implement a disaster micro-insurance system. But in this application special studies are needed, so that they are right on target. There are not many disaster micro-insurance systems in Indonesia. Some of them that have been implemented are agricultural insurance due to floods and droughts, and fire insurance. Sanitation is an infrastructure that is also very important to keep disaster victims healthy. Need for sanitation that is resistant or friendly to flood disasters.

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