Strategy for community adaptation to flood-prone area in situ rawa besar settlement, depok city

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Abstract. Disasters provide damage caused by a series of events that are considered as triggers, and a series of social factors. One of social factor, namely the inability of the community to understand the disaster itself, is an obstacle that must be overcome so that the impact of the disaster will be reduced. Researchers choose the Situ Rawa Besar Settlement as a research site because the area is a densely populated settlement that surrounds the Situ area, which often has a high frequency of flooding during the rainy season. The analytical method used in this study is a quantitative descriptive approach, with surveying and random sampling. The results showed that the Situ Rawa Besar Settlement was inhabited mostly by people with a lower-class economy. For the level of public knowledge about flooding is at a sufficient and good level, with an average value of 58.00. Whereas the community adaptation strategy in the face of flood disasters is at a good level with an average of 33.03, with the most frequently agreed actions, namely maintaining the cleanliness of waterways followed by the need for knowledge about handling floods both before and after.

1. Introduction

Hydrological disasters such as droughts, landslides, tornadoes, tidal waves and floods are the dominant types of disasters that occur and continue to increase in various parts of the world [1]. Indonesia experienced various kinds of disasters. Today Indonesia also experiences flood events in various places and conditions. When compared with other countries, Indonesia is a country with a high vulnerability to flood hazards [2].

The high rainfall makes the occurrence of disasters, such as floods and landslides, increase [3]. Flooding is also exacerbated by other factors, as it is known that flooding is caused by natural factors, human factors also play a role in it [4]. This is also reinforced by the statement of environmental scientists who believe that population growth is exacerbated by the effects of climate change, which has contributed greatly to flood disasters [2].

Disasters provide damage as a series of events that are considered triggers, and a series of social factors. One of social factor, which is an obstacle, which is an obstacle that must be overcome so that the impact of disaster will be reduced [5]. Therefore, a strategy is needed to overcome these problems. Where strategy is the result of a process of learning that can increase the ability of the population to deal with disasters and also to rise the knowledge of the disaster [6].

Research is targeted at densely populated residential areas that prone to floods. Researchers chose settlements in the Big Rawa Situ because the densely populated settlements that occupied the area around Situ. During the rainy season the area around Situ is also cautious because it is an area prone to floods. It was known that during heavy rains with a long duration the area around the Situ experienced
several floods. The strategy undertaken by residents in the Situ area in the face of floods is the focus of this research.

2. Methodology

2.1. Place

A research is done around the area of Situ Rawa Besar, Depok City. This area is one of the areas in the city of Depok that has a fairly high building density of approximately 100 units and is included in the high population density and is located in flood-prone areas in Situ Rawa Besar during the rainy season. This makes settlements around Situ Rawa Besar, Depok Village, Pancoran Mas District, Depok City suitable to serve as a place for research on strategy for community adaptation for floods.

2.2 Methods

The analytical method that will be used is quantitative descriptive approach. Descriptive approach is a method of research in object in order to obtain the data events in present factually, then can see the relationship between investigated phenomena [7]. The determined population was all inhabitants surrounding the Situ Rawa Besar area. Based on the population, 30 samples were taken using a random sampling method with an error margin of 5-6%. Data collection is done by filling out a questionnaire consisting questions regarding the identity of respondents, knowledge about floods, and adaptation strategies.

3. Result and Discussion

The results obtained from the strategy research for community adaptation to flood prone areas in Situ Rawa Besar Settlement, Depok City were divided into 3 sub-discussions, namely conditions, knowledge about floods, and adaptation strategies facing flooding.

3.1 Condition

Settlement was inhabited by people with a lower middle class economy. This can be seen from the diversity of types of work owned by residents who inhabit the area such as scavenger, household assistant, street vendor, and so forth. Most residents are migrants, most of whom come from Java who try to find fortune in the city of Depok.

The population growth progress which is proportional with the need of settlement. The insufficiency of the capacity for suitable settlement has been used as a housing in the unsuitable area. There are lots of disaster-prone areas used as residential areas [8]. In this study, it was proven by land use that was not supposed to be used for settlements to be used as land for settlement. Most of the residents who live in the area are rent a house around Situ Rawa Besar which is prone to flooding. Based on the data obtained, residents claimed that flooding occurred during the rainy season caused by several factors, which are illustrated in the following graph.

![Graph showing causes of flooding](image)

**Figure 1. Causes of Flooding Occur (in percent)**

It is seen that the most water seeps out of ground factors occur in the area with a percentage of 54% and followed by a pile of garbage in water channel with a percentage of 27%. The border area of Situ
or lake is a water catchment area but it functions as a settlement [9]. Reasonable residents reside in the area because of their strategic location and low land prices or rents. Situ Rawa Besar is known as near the market, terminals, and schools so that it is classified as a strategic location, but because it is a flood-prone area so that land prices or rents are cheaper compared to the surrounding land. This is evidenced by one of the studies on housing in areas prone to flooding that will cause a decline in prices compared to outside the flood-prone areas [10].

3.2 Knowledge about Floods
As is known that strategy is the result of a process of learning that can increase the ability of the population to deal with disasters and knowledge of the disaster so that knowledge about the flood needs to be known as well [11]. Based on data that has been processed and collected, there are a variety of total scores, so that it will be easier if grouped into several levels, namely the level of low, sufficient and good, and high levels with an average score obtained that is equal to 58.00. The description can be seen in table 1 below:

| No. | Level           | Score          | Frequency | Knowledge                                                                 |
|-----|-----------------|----------------|-----------|---------------------------------------------------------------------------|
| 1   | Low             | $X < 29.911$   | 6         | Do not know the water absorption area, the causes of flooding, but know the impact |
| 2   | Sufficient and good | $29.911 \leq X < 86.089$ | 15        | Do not know the water absorption area, but know the causes of flooding and the impact |
| 3   | High            | $86.089 < X$   | 9         | Know the water absorption area, causes of flooding, and the impact.         |

At low levels, residents know the consequences caused by floods can be in the form of material or non-material injury. Also know that flooding can cause various diseases, especially skin diseases and diarrhea. However, it is very unfortunate because residents at low levels do not know about the causes that can trigger flooding, and also do not know about the area designated for water absorption areas. Whereas in the sufficient and good level, which constitutes the majority of the levels of all respondents, knowing the causes of flooding, one of which is the human factor also determines the frequency of flood events. However, at this level there is also no knowledge of the water absorption area which is the area surrounding the Situ Rawa Besar area. Finally, at the high level, the population knows well the cause of the flood, which is caused by flooding, and the water absorption area.

It can be concluded that the population knows more about the causes and effects and only a few know about the water absorption area. In fact, the Situ Rawa Besar area is a catchment area and its boundary around Situ or lake is a water absorption area. So it is not surprising that floods that occur during the rainy season in that region because the water absorption area is covered by dense settlements. The ignorance of the population about the function of the border of the Situ Rawa Besar also contributes to the factors that cause flooding in the region.

3.3 Adaptation Strategy
Adaptation strategies are the result of a learning process can increase the ability of the population to deal with disasters [6]. Previously it was mentioned about the knowledge of residents surrounding disasters area, the majority of which were at a sufficient and good level. Adaptation strategies also depend on the experience of the population experiencing the disaster. Where prevention strategies are focused on structural mechanisms to barrier access, information provision and punishment of offenders.
Contact with floodwater and prove useful, regardless of past experiences, which are experience and flooding, timely and context-specific [12].

Data shows that adaptation strategy in the face of flood disasters has a varied total score, so it will be easier if grouped into several levels, namely the level of low, good, and high levels with an average score obtained that is equal to 33.03. The agreed strategy is carried out occupant by the following description:

1. Strategy in a way of structural mechanism
   This strategy is done by modifying the house or area around the residence. Residents use a method such as building a house into 2 or more floors so that when the flood occurs, residents can temporarily evacuate to the upper floors which are not affected by the flood. Another thing to do is to make a small dam in front of the house as a preventive measure so that when the floods occur, it does not enter the houses.

2. Strategy by maintaining the cleanliness of waterways
   This strategy is carried out by maintaining and maintaining the cleanliness of waterways in the environment around the residential area. Because one of the factors that causes flooding is the pile of garbage in water channel, cleaning activities are needed in the area so that flooding can be minimized.

3. Strategy by increasing education about flooding
   This strategy is carried out by increasing population education for all after the flood. Knowledge of these floods includes the handling of floods both before and after, diseases caused by flooding, and how to maintain cleanliness and health when floods hit.

4. Strategies to change locations temporarily or permanently
   This strategy is carried out as a final step if the previous strategy still has a large impact on the population in the area. Refuge in a safe place during a flood and will return when the flood recedes, but if possible, move the location of the residence completely to reduce the impact of flooding in the area or lake.

Of all the strategies outlined above, residents are more inclined to agree to strategy by maintaining the cleanliness of waterways and also a strategy by increasing education about flooding. The villagers reasoned that one of the factors that caused the flooding was the pile of garbage in water channels that made the drains run silt and caused the overflowing water to flood into the surrounding settlements, so that residents felt the need to carry out cleaning activities in waterways so as to reduce the frequency of flooding. While the strategy by increasing education about flooding so that residents get more knowledge about flooding and how to overcome it so that the impact of losses can be minimized by the population [11]. However, many residents do not approve it because residents feel that there is no need to evacuate until they move to residential locations because of economic factors, which require not a small amount of money to move locations and also feel comfortable with the situation in the area that is.

4. Conclusion
The result of the analysis of from the strategy research for community adaptation to flood prone areas in Situ Rawa Besar Settlement, Depok City based on quantitative descriptive approach, conclude that: Settlement was inhabited by people with a lower-class economy. This can be seen from the diversity of types of work owned by residents who inhabit the area such as scavenger, household assistant, street vendor, and so forth. Most residents are migrants, most of whom come from Java who try to find fortune in the city of Depok. Residents claimed that flooding occurred during the rainy season caused by several factors, that the most water seeps out of ground factors occur in the area with a percentage of 54% and followed by a pile of garbage in water channel with a percentage of 27%.

For the level of public knowledge about flooding is at a sufficient and good level, with an average value of 58.00. Whereas the community adaptation strategy in the face of flood disasters is at a good level with an average of 33.03, with the most frequently agreed actions, namely maintaining the
cleanliness of waterways followed by the need for knowledge about handling floods both before and after.

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