Social vulnerability analysis of the event flood puddle (case study in Lamongan regency, East Java province)

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Abstract. This research was conducted in the flood plain Bonorowo in Lamongan East Java Province. The area was inundated almost every year, but people still survive and remain settled at the sites. This research is to identify and analyze the social vulnerability in the flood plains on the characteristics puddle Bonorowo. This research method is the study of the characteristics and livelihood strategies of the communities living on marginal lands (floodplains Bonorowo) are regions prone to flooding / inundation. Based on the object of this study is a survey research method mix / mix method, which merge or combination of methods of quantitative and qualitative methods, so it will be obtained a description of a more comprehensive and holistic. The results obtained in this study are; Social vulnerability is not affected by the heightened puddles. Social capital is abundant making society safer and more comfortable to keep their activities and settle in the region

1. Introduction

Vulnerability is made up of the characteristics of a person or group and their situation that influence their capacity to anticipate, to cope with, resist and recover from the impact of a natural hazard. The text of social vulnerability is a by-product of social inequalities. It is defined as the susceptibility of social groups to the impacts of hazards, as well as their resiliency, or ability to adequately recover from them[1][2].

Vulnerability is a condition or circumstance that reduces the ability of a person (group) in the face of threats from the outside (external shock). Vulnerability can be caused by environmental factors, economic, social, cultural, political, Physical and Psychological To build the resilience of nations and communities to disasters, required the identification and analysis of the vulnerability of nations and communities to disaster events[3]. According to the social sciences, vulnerability is the inverse of toughness (resilience), where the two concepts are two sides of a coin. The concept of resilience is widely consisted, among others; including the capacity of how to respond, how the ability to respond in a crisis/conflict/ emergency (emergency response)[4]. Furthermore, vulnerability, resilience, capacity and capability to respond in emergency situations, can be implemented at the level; individual, family, community and institutional (non-government organization or NGO) [5].

That is happen in Lamongan Regency. Lamongan regency of East Java province belonging to the territory Watershed (DAS) Bengawan Solo is always overflowing water during the rainy season. Lamongan has the region with the ground level height is lower than the surrounding area and lower than the height of the Solo River [6]. People who live in the flood plain Bonorowo at the time of the flood, will be affected by the earthquake. The impact varies depending on the resilience or resistance of each individual. If the resistance is weak, then there will be vulnerabilities. In this case will be discussed on social vulnerability resulting from the impact of the flood inundation [7].

Assessment of flood plain issues Bonorowo is done from the viewpoint of human relations and environment (human ecology)[8][9][10]. Studies in human relations standpoint and environment show that how people try to do the livelihood strategies in plain Bonorowo which is a form of floodplain land.
2. Methodology
The research uses descriptive method to approach and integrate quantitative and qualitative methods (mix method). Field data is interview data collected with questionnaire instrument or deep interviews (in depth interview). Primary data that have been collected performed cross tabulation (crosstab) of the variables which are then processed using SPSS Program. After each variable data is complete, it can then be further analyzed. The approach used in this study is a mixed approach / mixed method. The field data were taken in the form of interview data either by using the questionnaire and in-depth interview. Quantitative data from interviews was processed using Statistical then provided with data of qualitative in-depth interviews to strengthening the conditions in the field. A qualitative methodology as a research procedure that produces descriptive data in the form of words written or spoken of people and behaviors that can be observed. Analysis of data by area of interest through exploration of a study through literature studies and observations in the field to get an overview of the environmental conditions of actual flood plain and then be said to be vulnerable or not.

The study population was households (families) who resides in a puddle of high and low on the floodplain inundation Bonorowo. Total population reached 75,971 households with a total population throughout Lamongan is 1,261,972 inhabitants. While the number of 75,971 households a total population of 57 villages who live in the flood plain area Bonorowo.

Primary data collected is put in cross-tabulation with variables treated by using SPSS Program. After each data of variable is complete, the analysis continues further. The approach of research is mix method. Quantitative data of the interview is arranged by using statistics, then completed with qualitative data from in depth interview to strengthening the condition in the field. Introduce qualitative method as research procedure that results descriptive data with spoken and written language from people and their observable behavior.

Purpose-based data analysis is conducted by exploring the area of research through literature study and field observation to get the real portrait of flood plain condition, so it shows whether it is vulnerable or not. The purpose-based research is conducted by exploring the vulnerability context of the people of Bonorowo in Lamongan affected by fluctuation and climate change in their livelihood. The vulnerability level is decided on composite index of variables of social, economy, environment, and institution. The composite index is the values or scores of variables. The population of research is the number of families (KK) who live on Bonorowo flood plain. The number of population in Bonorowo reaches 75,971 KK and the total population in Lamongan is 1,261,972 people. To deciding the number of samples, the research applies Slovin’s formula.

\[ n = \frac{N}{N + d^2} \] (1)

\[ n = \text{Number of samples} \]
\[ N = \text{Total population} \]
\[ d = \text{Error tolerance (0.10)} \]

According to Eq.1 then it can be calculated as follows:

\[ n = \frac{75971}{75971 \times 0.10^2 + 1} = \frac{75971}{760.71} = 99.86 \text{ KK rounded to 100 KK} \]

The number of samples in the research is 100 KK with accuracy at 90% confidence level considering the vast area of research.

3. Results and Discussions
The social vulnerability of the people who live on Bonorowo flood plain can be seen based on age, number of family members, education level, social relationship, social interaction and compassion. Many of them are at productive age, families with the most number of dependents from 4 to 5 peoples, elementary school graduates, relative families in neighborhood with good relationship, and actively involved in social activities.
96% of respondents in the area of research are younger than 65 year age and 4% are older than 65 year age. It means the most number of respondents are in a group of prime age or middle age which is productive. The group is considered to be able to do physical works for fulfilling their life necessities. On the other side, people above 65 year old are vulnerable and merely capable of doing light job with few working hours.

Furthermore, there are 3 elementary school drop outs among 42 respondents who live on the land with low-level floodwaters and 2 elementary school drop outs among 58 respondents who live on the land with high-level floodwaters. The average education level of them is junior high (SMP) and senior high school graduates (SMA) whereas only 9 of 58 respondents who live on the land with high-level floodwaters have undergraduate degree.

Social vulnerability is found on the analysis of age, number of family members, education level, social relationship and compassion. Education has an important role to improve access to knowledge and connections cannot be avoided. This of course will make it easier for someone in their livelihood activities, including land management are still a lot to agricultural activities. Improved land management and use of land for productive farming can help a person improve farm productivity and increase welfare[12]. It is identified in the Table 1.

### Table 1. Social Vulnerability Based on The Classification of Floodwater Level on The Area of Research in 2014

| Classification of Floodwater Area | Social Vulnerability | Total |
|-----------------------------------|----------------------|-------|
|                                   | Vulnerable | Not Vulnerable |       |
| Low                               | 5 (11.9%)   | 37 (88.1%)    | 42 (100.0%) |
| High                              | 8 (13.8%)   | 50 (86.2%)    | 58 (100.0%) |
| Total                             |            |                | 100   |

*(Resource: The Result of Primary Data Processing, 2014)*

If the floodwater level gets higher, the group of respondents with social vulnerability increase in number. Table 1 shows social vulnerability on the land with low-level floodwaters is 11.9% which is vulnerable and 88.1% not vulnerable. But, social vulnerability on the land with high-level floodwaters is 13.8% which is vulnerable and 86.2% not vulnerable. It tells that most of the people living on both areas are not under social vulnerability. The result of statistical analysis with Chi-Squared test gives no correlation or significant influence between social vulnerability and the classification of floodwater level on the area. Floodwaters left by floods do not give much effect to social condition of people in Bonorowo.

### 4. Conclusion

The research identifies that the higher the floodwaters, the greater the group of respondents with social vulnerability. On the opposite, the group of respondents increases in number as the floodwater level falls. In some places, most of the people are not vulnerable in spite of the floodwater level. Thus, people in Bonorowo have not experienced social vulnerability because there are a lot of social investments in the area of research.

The most valuable asset is social investment because of overwhelming. There is no financial investment in any accounts since people are not used to save money in the bank. But, they lack human resources with many of them are unskilled in the area of research.

The research locates the choices of livelihood strategies in the area of research such as sifting the function of agricultural fields when floods come in order to make shrimp or fishponds on high floodwater area, creating job diversification, employing their family members such as wife and children to work out of agriculture sector, and running business loan. Floodwaters left by flooding from river
Bengawan Solo or raining have not changed people’s mind to leave their homes. They prefer staying to leaving since floodwaters on their land are considered blessings.

The recommendations of the research especially dedicated to local authorities as decision makers and for the advancement of sciences are:

People who live in flood prone plain Bonorowo is not necessarily relocated considering their willingness to stay and live in the area. It would be better if the government supports their shrimp or fish farming business whenever floods overflow their fields.

Skill development for the people is needed to overcome their economically so that they can innovate and collect extra income by optimizing any resources. At last, non-government should be empowered and trained because it has important role for endorsing community efforts. Opening more job opportunities for people in Bonorowo will encourage them to cope with competition in free trade era.

5. References

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