

Research article

Community Survival Strategy for Environmental Sustainability as Adaptation in Landslide Threatened Area: Evidence from Malang, Indonesia

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The upper part of the Jabung sub-district has a rough morphology due to agricultural land use. Rough morphological conditions can lead to landslides, especially in the Taji Village area. This study describes the local wisdom of people living in landslide-prone areas to protect the environment, which could help Taji Village remain sustainable. The methods used were field surveys, observations and in-depth interviews regarding community life strategies to survive in landslide-prone areas. The community's survival strategy is carried out in various ways, including as social activities that reflect mutual tolerance between members; land management in the form of floral arrangement on each part of the slope; and the use of certain areas as tourist attractions.

Keywords: community, strategy, adaptation, landslide, sustainability

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1. Introduction

The physical condition of an area's environment will affect people's lives. Environmental physical conditions are influenced by geomorphological and geological processes [1,2]. Extreme geomorphological processes will cause the formation of areas with rough morphology and sometimes cause potential disasters, one of which is the potential for landslides. However, the potential for disasters will be even greater due to human activities [3,4]. It is because humans can be the initiator of disasters. High density of society in disaster-prone areas has challenges to survive and live in harmony with nature [5]. The community must be able to survive in order to survive, including how to preserve the environment.

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Landslides are the third highest disaster in Indonesia. Landslides usually occur at the peak of the rainy season and in hilly areas [6,7]. The potential of a landslide can be identified by analysis of topographic position index and interpretation of imagery [8,9]. The threat of landslides is currently getting higher with the increasing number of people living on the slopes of the hills. Generally, landslides occur in rough geomorphology [10]. But on the other hand, landslide and geomorphological processes can be accelerated by human activities [11]. Most communities use mechanical and vegetative conservation and combine the two to preserve their environment [12].

The upper part of the Jabung District is part of the Bromo Tengger Semeru area which has an altitude of 1,200 meters above sea level with steep slopes. There have been many landslides in the upper part of Jabung District. Based on (Interview, 2020) most of the landslides that occurred were caused by cutting the slopes used for roads and settlements. Cutting the slope makes the slope unstable and automatically it will increase the potential of landslides [10]. Not only to cutting slopes, the potential for landslides is even greater if the land management is not in accordance with the physical conditions of the physical environment.

Landslide management without considering morphological characteristics can increase the potential for disasters [13]. Landslide mitigation efforts that are not understood by the community only have a short-term impact. People who live in areas that have a landslide threat have an adaptation strategy that is adapted to the physical conditions of the environment. Sometimes, people forget local values which are actually indigenous values that can be developed as adaptation values [14].

People who live in landslide-prone areas have strategies to survive. The strategy developed by the community of local wisdom developed by the community, including local wisdom in terms of social, economic and environmental management [15,16]. Local wisdom developed by the community is one of the strategies in the conservation of the area. Local wisdom developed by the community as part of conservation must be interpreted as an effort to protect the long term environment, not short term.

Most of the research on landslides discusses the method of making landslide maps, mitigation which is carried out based on structural and non-structural mitigation through socialization activities and disaster education for the community [17,18,19]. Studies on local community wisdom that have been carried out as an effort to survive strategies have not been widely carried out, especially local wisdom that has an impact on social, economic and environmental aspects. This paper will elaborate on the community's survival strategy as an adaptation to life in landslide-prone areas for environmental sustainability and the sustainability of the socio-economic life of the community.

2. Method

The methods used in this research are observation, field survey and deep interview. Observation activities and field surveys to identify and observe the socio-economic conditions of the Taji Village community. Observations were made thoroughly of several local efforts made by the community as a strategy to survive in areas prone to landslides. Researchers have also conducted grounded research equipped with participatory deep interviews to determine the effect of land management conditions by using various types of plants to improve community welfare. Observations made also include observations regarding the development of the Taji village as a tourist village which is part of the community's strategy for survival. The results of this study are to explain the community's survival strategy which includes living conditions and community livelihoods, agricultural land management strategies, and strategies to increase income through the development of coffee tourism villages.

The upper part of the Jabung sub-district is part of the Bromo Tengger Semeru area. Based on the morphological analysis of the Bromo Mountains, the upper part of the Jabung District that is in Taji Village, is the middle slope of the Bromo Mountains (Fig. 1). The subsurface material is influenced by the Bromo Volcano Material. Landslides and erosion are very intensively happening in the study area. Mostly, the land of this area is agricultural with woody plants and many kinds of horticultural plants such as cabbage, carrot, pre onion, cassava, chilies, and coffee.

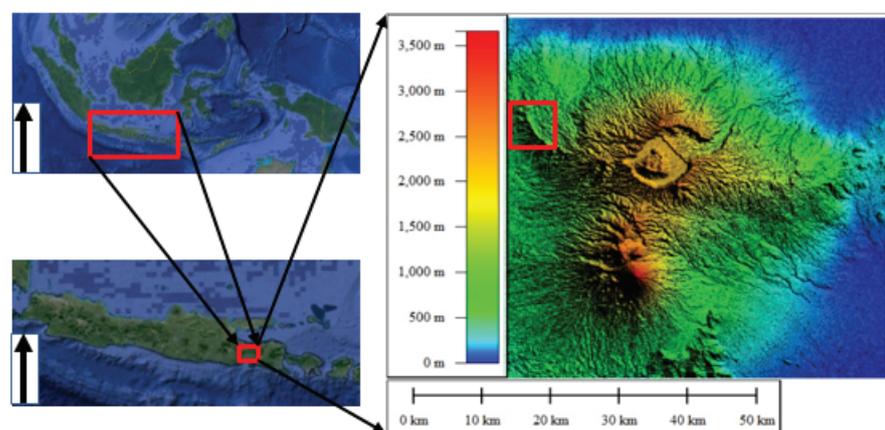


Figure 1: Research Area.

3. Result and Discussion

3.1. Community Life and Livelihood

The upper part of Jabung District is part of the Bromo Tengger Semeru (BTS) area. Social characteristics, socio-cultural and cultural values are diverse. The existence of community activities and interactions causes the formation of patterns of life and community livelihoods. Observing the pattern of people's lives and livelihoods such as community interactions with nature and interactions among people. The existence of community interaction aims to survive daily life and is also part of landslide conservation efforts.

The upper part of the Jabung sub-district, precisely in Taji Village, is carrying out their interactions based on the family system. One of the activities that are part of the family system that is formed is mutual cooperation in building a house, which is carried out together from the start of the house being built until the house is ready for occupancy. During the process of building houses, the community does not receive salaries. The kinship system and the culture of mutual assistance emerged because the people located at the very top of the Jabung District realized that they lived in landslide-prone areas. The family system that is formed in this area can also be seen from the settlement pattern where in one settlement cluster consists of people's houses that still have family relationships. The community divides the settlement for their biological family such as children and relatives, so that in building a residence for the family they use the family cluster system.

Community activities that reflect the life of mutual assistance and community culture, such community service once a week and the existence of a disaster response forum. Community service which is carried out once a week is a routine activity carried out by the community. Community service activities are carried out aimed at maintaining environmental cleanliness and establishing kinship at the RT/RW level. The people of Taji Village are very aware that their area is an area prone to landslides, so other activities that are routinely carried out are related to disaster education in the form of education on signs of landslides, actions taken when landslides occur and actions taken after landslides occur (Interview, 2020).

The level of welfare is an important part of people's lives and livelihoods. The level of welfare is a condition of the fulfillment of all forms of life needs in the form of basic needs such as food, clothing, housing, education, income and spirituality (religiosity). Every individual in society will take all actions to achieve a better standard of living so that their welfare increases. The people of Taji Village are mostly Muslim and have a high level of religiosity. One of the indicators to determine the level of religiosity is the

presence of places of worship in the form of mosques and prayer rooms. Each hamlet in Taji Village has at least one prayer room/mosque which is used as a place of worship (Survey, 2020). The spiritual activities carried out regularly by the Taji Village community are able to increase kinship and mutual assistance, especially when a landslide occurs. Spiritual activities sometimes serve as additional media for delivering information related to village information and disaster information. The community interaction in the Taji Villages can be the one solution for landslide disaster risk management [20,21].

The type of work most of the people of Taji Village are farmers who are affected by land cover. The condition of land cover in Taji Village is mostly in the form of mixed gardens with woody plants and horticultural crops (Fig.2). The condition of land cover in the form of woody plants and horticulture affects people's income. Horticultural crops are divided into daily, monthly, annual and seasonal income. The type of vegetation that has the most influence on people's incomes is horticulture with the types of horticulture in the form of cabbage, carrots, coffee, and pre onions (Fig. 2).



Figure 2: The agricultural crops with agroforestry System in research area a) Coffee and Chili; b) apple, Cabbage, Pre Onion; c) Pre Onion and Chili, d) Apple, Chili and Pre Onion.

3.2. Community System in Study Area (Agroforestry System)

The livelihoods developed in Taji Village are largely reflected by the agroforestry system. Almost all agroforestry systems in the study area are aimed at increasing incomes and to obtain sustainable incomes for the community. The livelihoods of the people in Taji Village are categorized into daily income, weekly income, monthly income, and annual income based on the benefits of vegetation. Agroforestry systems include land use systems with horticultural crops in agricultural settings. The Taji Village community has managed an ecologically based dynamic agricultural system to increase social, economic and environmental benefits.

In particular, agroforestry is very important for farmers and other rural communities because it can increase food supply and income. The agroforestry system is a multi-functional system that can provide various economic, socio-cultural and environmental benefits. The application of agroforestry in the research area is a form of local wisdom

carried out by the community. The application of agroforestry as one of the wise solutions for reducing the risk of landslides. The application of agroforestry has a role in food security at the village level and is also part of conservation efforts. The problem of potential landslides that occur in the research area has influenced community behavior in managing land. For people who live in areas prone to landslides, problems regarding land use will affect people's income. This is because people's livelihoods are very dependent on the ability of the land.

The awareness of the people living in landslide-prone areas causes the community to be more selective in the process of land management, including determining the type of cultivated vegetation. The process of landslides will affect the morphology of the slopes, so for areas prone to landslides that are still active, the community cultivates cassava plants. Meanwhile, the slopes formed after the landslide that are not active are used by the community for horticultural crops using an agroforestry system. Plant cultivation in the use of active and inactive post-landslide land is part of local wisdom.

Theoretically, vegetation can affect landslides because of the mass of the load [22,23,24]. However, the application of vegetation as an effort to reduce the risk of landslides cannot be used in all areas prone to landslides but must be adapted to the physical conditions of the area. Vegetation application without proper crop management can exacerbate landslides. Woody vegetation planted in thick soil conditions can increase the potential for landslides.

3.3. Utilization as a Tourist Place

The upper part of Jabung District, especially in Taji Village, is an area with volcanic landforms. For areas with volcanic landforms, they have fertile soil characteristics, so that most of the land use in this area is in the form of agriculture with agroforestry techniques. The condition of the landscape in the research area has an impact on the socio-economic conditions of the community, so that most of the community has a job as a farmer (interview, 2020).

For the community, besides having to adapt to areas prone to landslides, the people in the research area are also able to optimize the potential of the area. The geomorphological process in the research area has an impact on soil fertility, so that people use horticultural plants such as coffee, bre onions, cabbage, carrots, and chilies for cultivation. The technique of planting crops is done with an intercropping system. Most of the plants that are carried out using the intercropping technique are coffee plants.

The potential of the research area has been well received by the community. Currently, most people cultivate coffee as a characteristic of Taji Village. The potential developed by the community is by pioneering Taji Village as a tourist village with superior quality Arabica coffee and panoramic views with an altitude of 1,200 meters above sea level (Fig. 3). Currently, many interesting places have been built that can be used by visitors to enjoy coffee and enjoy the view of Taji Village. Based on the results of the interview, it was explained that there were more than 50 visitors who enjoyed the typical coffee of Taji Village during holidays. The number of visitors to enjoy Taji's specialty coffee has an impact on the development of Taji Village as a tourist village. This is because people began to develop various kinds of processed cakes made from coffee.

The community has been able to optimize the potential of the village even though it is prone to disasters. This optimization is carried out by the community and the village government by empowering housewives to be creative in producing various preparations from coffee production. The Taji Village Government is also very serious about village development. This is evidenced by the formation of a tourism awareness group (Pokdarwis) in this region. The strategy of developing Taji Village as a tourist village also has a socio-economic impact on the community.

4. Conclusion

The people who live in the upper part of the Jabung sub-district have a strategy to survive. The strategies carried out are in the form of community life with a family system, socio-religious activities that reflect mutual assistance, optimizing land use in the research area, implementing a multi-strata plant planting system on every slope, and optimizing regional areas by developing tourist villages. The strategy carried out by the upper community of Jabung District, especially for Taji Village, is able to have a positive impact on people's lives and livelihoods from an economic, social and environmental perspective. Some strategies developed by the community can be adopted by other areas that have the same characteristics as the conditions in the research area.

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