SOCIETY: Jurnal Pengabdian Masyarakat
Vol. 4, No. 3 (2025): May, pp. 458-466
E-ISSN:2827-878X (Online -Electronic)

Slope Conservation and Landslide Disaster Mitigation through the TANGKAS Program based on Community Participation in Jambeyan Village

Singgih Prihadia,1, Benyamin Ricky Rahmat Runjung a,2, Hesti Yulianaa,3, Karisma Dwi Melani a,4, Kartika Dewi Safitri a,5, Maharani Bintang Saputri a,6, Nariswari Putri Saharania,7, Nazwah Ummu Az Zahraa,8, Nurul Fitri Inayaha,9, Risam Kastamsaa,10, Thorriqul Astyo Dhanokoa,11

Geography Education Study Program, Faculty of Teacher Training and Education, Sebelas Maret University, Kentingan, Jl. Sutami No. 36, Jebres District, Surakarta City, Central Java 57126, Indonesia

[1]singgihprihadi@staff.uns.ac.id,[2]benyaminricky60@student.uns.ac.id,[3]hestiyuliana@student.uns.ac.id, [4]karismadmelani@student.uns.ac.id, [5]kartika.dewi.sftr101@student.uns.ac.id, [6]maharanibs03@student.uns.ac.id,[7]nariswari084@student.uns.ac.id,[8]nazwah124.com@student.uns.ac.id, [9]nurulfitrii@student.uns.ac.id,[10]kastamsarisam@student.uns.ac.id, [11]thorriqulastyo@student.uns.ac.id

ARTICLE INFO

Article history

Received :

Revised :

Accepted:

Keywords

landslide; slope conservation; disaster mitigation; community participation

ABSTRACT

Jambeyan Village in Sambirejo Sub-district, Sragen Regency, is a region highly prone to landslides, especially in slope areas that have not been optimally managed. This community service program aims to raise awareness and encourage community participation in slope conservation and landslide disaster mitigation through the TANGKAS program (Community Action-Based Landslide Response). The methods applied include socialization, evacuation planning workshops, installation of evacuation route signs, and participatory soil conservation education. The results show an increase in community understanding of landslide risks and disaster preparedness, as evidenced by active participation in evacuation simulations and the maintenance of protective slope vegetation. The TANGKAS program has proven effective in fostering local resilience and enhancing collaboration among villagers, local authorities, and external stakeholders in disaster risk reduction efforts.

SOCIETY: Jurnal Pengabdian Masyarakat
Vol. 4, No. 3 (2025): May, pp. 458-466
E-ISSN:2827-878X (Online -Electronic)

A. INTRODUCTION

Natural disasters are events that occur in nature without human intervention, which can cause damage to both the environment and people's lives. Natural disasters are often caused by natural changes that occur naturally in short and long periods of time. According to Law Number 24 of 2007 concerning disaster management, natural disasters are disasters caused by events or a series of events caused by nature, including earthquakes, tsunamis, volcanic eruptions, floods, droughts, hurricanes, and landslides.

Geographically, Indonesia is located in the Pacific Ring of Fire region where this region has very high geological activity. This is due to the meeting of three large tectonic plates in the world, namely the Indo-Australian, Eurasian, and Pacific plates. These three plates will move and collide with each other, causing geological activities such as earthquakes, volcanic eruptions, and land mass movements. Indonesia, as a country that has a strategic location on the Ring of Fire, makes Indonesia one of the countries that is very vulnerable to natural disasters Integration of Disaster Material at Elementary School Level in Ngargoyoso District, Central Java (Ammelia et al., 2022).

One form of vulnerability to disasters is also felt by the community in Jambeyan Village, Sambirejo District, Sragen Regency. This area is located in a hilly slope area with sloping land contours and uneven vegetation, so it has the potential to experience landslides, especially during the rainy season. Several points in this village even show signs of cracked soil and unstable slopes that endanger residents' settlements and agricultural land. This condition is a challenge in itself in efforts to maintain the safety and resilience of village communities against the risk of landslides.

According to Muta'ali (2013:228), landslides are a type of mass movement of soil or rocks, or a mixture of both, down or out of a slope due to disturbances in the stability of the soil or rocks that make up the slope (Muta'ali, 2005). Landslides occur when the top layer of soil rich in organic matter and water, along with rocks, is released from the core of a mountain or hill. This process can be fast or slow, but both can cause major damage to the environment and settlements below. In addition, landslides can be exacerbated by a combination of factors,such as continuous rain that inundates the soil and aggravates the already saturated soil layer, as well as land conversion that reduces soil-retaining vegetation.

In mountainous areas, landslides often occur as a result of ground movement triggered by natural and human factors. Heavy rainfall, earthquakes, and soil erosion are natural factors that can worsen slope stability. Human factors, such as deforestation and unsustainable agricultural practices, also increase the potential for landslides. Slopes that

Steep areas are increasingly vulnerable to ground movement, especially if the soil becomes saturated due to rain, making it easy to shift due to gravity.

The losses from landslides are not only physical, such as damage to houses, roads, and bridges, but also have social and economic impacts. Loss of life, psychological trauma, and disruption to economic activities are serious problems. Communities living in landslide-prone areas often live in fear and stop their activities for a long time. Therefore, disaster mitigation efforts are very important to reduce losses and increase community resilience.

According to Rahman (2015), landslide disaster mitigation can be divided into two main approaches, namely structural mitigation and non-structural mitigation. Structural mitigation includes the construction of physical infrastructure and the use of technology to minimize the impact of disasters, such as compiling a database of landslide-prone areas and creating an early warning system. Meanwhile, non-structural mitigation emphasizes more on spatial management and increasing community capacity, which includes knowledge, attitudes, emergency planning, and mobilization of local resources (Gema Publica, 2015). Slope conservation techniques, such as planting soil-retaining vegetation, terracing, and creating drainage systems, are also very important to reduce erosion and stabilize the soil. Monitoring and early warning are important parts of mitigation to give people time to evacuate when soil conditions begin to become unstable.

Slope conservation aims to prevent landslides by stabilizing the soil. One effective technique is terracing, which is the creation of steps on a slope to slow the flow of water and reduce erosion. Planting vegetation such as vetiver grass or hardwoods also helps strengthen the soil structure and increase water absorption. Another technique used is the creation of small drainage channels (rorak) that drain water in a more controlled manner, preventing water from accumulating on the surface of the slope.

However, these mitigation efforts will not succeed without active community participation. Participation essentially concerns every mental and emotional or behavioral aspect of a person as a citizen and member of society, however, what attitudes and behaviors can we truly interpret. Participation has its own scope and level. It depends on which angle we look at it from and the expectations that exist regarding the desired behavior (Haikal, MF (2022)).

Communities living in landslide-prone areas have valuable local knowledge and experience. Therefore, it is important to involve them in the planning and implementation of mitigation programs. Education about the dangers of landslides and the importance of slope conservation should be carried out to increase awareness and participation. Communities can be involved in mutual cooperation activities, such as planting trees and repairing drainage channels. In addition, the formation of disaster awareness groups can help monitor slope conditions and

provide early warnings if there are signs of landslides.

With active participation, communities not only become beneficiaries of mitigation, but also become agents of change who play a role in managing disaster risks in their areas. This involvement also strengthens social solidarity to face disasters together.

B. METHOD

Slope conservation and landslide disaster mitigation activities through the TANGKAS program were carried out on Monday, April 28, 2025 in Dukuh Gempol RT 07 Jambeyan Village, Sambirejo District, Sragen Regency. This activity was carried out by planting avocado tree seedlings in landslide-prone areas involving students and the Dukuh Gempol community in a mutual cooperation manner. This program was implemented using observation and lecture discussion methods through socialization regarding the TANGKAS program. The observation method was used to observe the location to determine the condition of the slope and determine vulnerable points that require vegetative intervention. Based on the results of the observation, the type of tree seedlings was selected according to the land conditions, in this case the avocado tree was chosen because it was considered to be able to adapt well in slope areas and had economic value for the community. The lecture method was used to provide an overview and understanding of the TANGKAS program.

C. RESULTS AND DISCUSSION

Based on the Final Report Data of the Sragen Regency Disaster Risk Study for 2023-2027, landslides in the Sambirejo District area showed a high hazard class with a total hazard area of 4,578.49 Ha. The TANGKAS Program is a work program in the form of an environmental conservation initiative that focuses on planting trees in landslide-prone areas and critical slopes. The TANGKAS (Plant Trees to Strengthen Nature and Save Slopes) Program was implemented on Monday, April 28, 2025 in Dukuh Gempol RT 07 Jambeyan Village, Sambirejo District, Sragen Regency. Planting avocado trees in Jambeyan Village is an appropriate program considering that Jambeyan Village has experienced several landslide disasters with steep hilly conditions, high rainfall and the activities of some people who clear land by cutting down trees carelessly so that it has the potential to cause landslides on steep slopes (Sedijani P., et al, 2022). With the program in an effort to prevent and reduce the impact of landslide hazards in Jambeyan Village, preventive measures are needed by the surrounding community. When a disaster occurs, the loss of life and damage caused is due to a lack of preparedness and the absence of an early warning system. With good preparation, the community will be better able to take appropriate and quick action in dealing with disasters (Ismayani N & Febrianto H,

2020).

Figure 1. Group Photo of Residents of Dukuh Gempol RT 07 Jambeyan Village.

The implementation of the TANGKAS program involves collaboration between students and the local village community. The tree planting activity began with remarks by the Secretary of Jambeyan Village, Mr. Tri Joko Sulistyo, Head of RT 07 Dukuh Gempol, Mr. Sardi and the Head of the MBKM Jambeyan Village Executive, Mr. Risam Kastamsa. Then continued with a brief socialization activity related to the TANGKAS program to the community which aims to provide a basic understanding of the importance of planting trees as a disaster mitigation effort. The socialization material was prepared based on references from the National Disaster Management Agency (BNPB, 2020) which emphasized that planting trees with deep and spreading roots can significantly reduce the risk of landslides in hilly areas. After the socialization session, the activity continued with the planting of 60 avocado seedlings, consisting of two superior varieties, namely butter avocado and miki avocado. These two varieties were chosen not only because of their strong roots to hold soil on slopes, but also because they have high economic value, so that they can provide long-term benefits to the surrounding community both in terms of the environment and the economy.

SOCIETY: Jurnal Pengabdian Masyarakat
Vol. 4, No. 3 (2025): May, pp. 458-466
E-ISSN:2827-878X (Online -Electronic)

Figure 2. Handover of Tree Seedlings by Students to Residents of Dukuh Gempol RT 07 Jambeyan Village

Figure 3. Tree Seedling Planting Process by Students and Residents of Dukuh Gembol RT 07 Jambeyan Village

The TANGKAS program has a number of unique features that distinguish it from common environmental conservation or disaster mitigation activities. First, the TANGKAS program is specifically designed to address landslide risks through a strong participatory approach, where communities are involved not only as implementers but also as planners and main drivers. Community involvement in disaster mitigation, also known as community-based disaster mitigation, means activities carried out in an organized manner by residents to prevent and minimize the impact of a disaster. (Sarwadi, R et.al., 2023). This is different from conservation programs in general which are top-down in nature.

*Down*and often only involves the community as a workforce in tree planting. Second, this program uses types of vegetation that not only function ecologically as slope reinforcements, but also have long-term economic value, such as avocado trees, which are chosen because of their strong roots.strong and the fruit has a selling value (Widiyastuti, A & Priyono, S., 2023).

In contrast, many other conservation activities only plant perennials or ornamental plants without considering the economic benefits for residents. In addition, TANGKAS is equipped with educational activities in the form of socialization to increase public awareness and knowledge about disaster risks and

how to deal with them, as recommended by BNPB and proven effective in increasing community preparedness (Arinata et.al, 2023). Many similar programs do not include educational elements or only do so in a limited way. The TANGKAS program contains educational and cultural values, the word "TANGKAS" which means alert and capable, is the hope that the community will be more responsive and responsible in maintaining the balance of nature, especially in facing the threat of environmental degradation. The tree planting activity in the TANGKAS program was enthusiastically welcomed by the Dukuh Gempol RT 07 community, in (Widiyastuti, A & Priyono, S., 2024) explained that with the planting of these trees, it is hoped that they can grow big and bear fruit so that they can be enjoyed later and have an impact on reducing landslides in the future.

D. CONCLUSION

Indonesia is a country prone to landslides due to its geographical location in the Pacific Ring of Fire and its topography consisting of many hills and mountains. Landslides occur due to a combination of natural factors such as high rainfall, erosion, and tectonic activity, and are also exacerbated by human activities such as illegal logging and uncontrolled land conversion. The impacts that can be caused not only damage infrastructure, but also disrupt the social and economic life of the community. To reduce this risk, slope conservation-based mitigation efforts are needed that involve active community participation. The TANGKAS (Tree Planting to Strengthen Nature and Save Slopes) program implemented in Dukuh Gempol RT 07, Jambeyan Village, is one form of real implementation of participatory mitigation. This program is carried out by planting avocado tree seedlings involving local residents, preceded by location observation and socialization regarding the importance of vegetation as a slope retainer. The results of the activity showed a positive response from the community and provided educational, ecological, and economic impacts. With direct community involvement, this program is expected to be able to strengthen environmental and social resilience in dealing with landslides in the future.

E. REFERENCE

Astini, NKS (2020). Utilization of Information Technology in Elementary School Learning During the Pandemic. Lampuhyang Journal (Quality Assurance Institute of Hindu Religious Education College Amlapura), 11(2), 13–25.

Public Echo. (2015). 1(1), 1–14.

Haikal, MF (2022). Community Participation in Natural Disaster Mitigation to Reduce the Risk of Landslides in Megamendung District, Bogor Regency. Thesis, Syarif Hidayatullah State Islamic University Jakarta.

Haqien, D., & Rahman, AA (2020). Utilization of Zoom Meeting for Learning Process during Covid-19 Pandemic. SAP (Article ArrangementEducation), 5(1), 51–

56.https://doi.org/10.30998/sap.v5i1.6511.

Ismayani, N., & Febrianto, H. (2020). Landslide Prevention Through Land Conservation in Simpang Empat District, Karo Regency. Azimut Journal, 3(SMAR), 9. https://doi.org/10.31317/jaz.v3ismar.628

Muta'ali, L. (2005). Potential for Regional Development and its Relation to Spatial Planningin the Merapi Slope Area of the Special Region of Yogyakarta Province. In Indonesian Geography Magazine (Vol. 19, Issue 1, pp. 63–88).

Muta'ali, Lutfi, (2013). Regional and City Spatial Planning. Yogyakarta: Gadjah Mada University Press.

Putra, AWS, & Podo, Y. (2017). Factors that influence the level of community knowledge in mitigating natural disasters such as landslides. Urecol*6th*, 305–314. http://journal.unimma.ac.id/index.php/urecol/article/view/154

9 Pramono, IB (nd). Floods and Landslides.

Prapti Sedijani, Miko Erniati, Nurwidianti, Siska Yulia Hermana, & Jumriani. (2022). Planting a Thousand Trees as an Effort to Prevent Floods and Landslides in Eyat Mayang Village, Lembar, West Nusa Tenggara. Journal of Community Service for Masters *Education Science*, *5*(2), 335–340. https://doi.org/10.29303/jpmpi.v5i2.1837

Rahman, AZ (2015). Landslide Disaster Mitigation Study in Banjarnegara Regency. Journal of Management and Public Policy, 1(1), 1–12.

Constitution Republic Indonesia Number 24 Year 2007 About Disaster management.

A. Widiyastuti, S. Priyono (2024). Empowering Residents Through Avocado Planting on Critical Land for Greening and Economic Improvement in Giriasih Village, Purwosari, Gunung Kidul. IBSE Journal of Community Service. (Vol. 2, Issue 1, pp. 1-8).

Arinata, E. Nusantoro, M. Mulawarman et al (2023). Landslide Disaster Knowledge and Preparedness Improvement Program for Elementary School Students. GANESHA: Community Service Journal. (Vol. 3, Issue 1, pp. 90-96)

SOCIETY: Jurnal Pengabdian Masyarakat
Vol. 4, No. 3 (2025): May, pp. 458-466
E-ISSN:2827-878X (Online -Electronic)