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DOUBLE-TRACK RECOVERY STRATEGY TO ADDRESS THE SUSTAINABLE RECOVERY FOR COMMUNITIES IMPACTED BY THE SEMERU ERUPTION, INDONESIA

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Abstract

Sustainable recovery has become an emerging issue in cyclical disasters like the Semeru Volcano. This study aims to explore community recovery strategies of affected communities after the Semeru eruption through the track of socio-economic recovery and preparedness strengthening. This research uses a qualitative approach to pursue a community recovery strategy. The collected data were analysed utilising the Colaizzi method. This study has identified double systematic tracks employed by the communities to recover from the impacts of disasters and confront subsequent hazards. The first track involved reactivating social activities to restore social cohesion effectively within the relocated community. Concurrently, livelihood restoration occurs through adaptation and diversification. In the second track, the resilience of the community was strengthened. Preparedness continues to increase among individuals, families, and communities, both those undertaken independently and in collaboration with the government and non-government organisations. This study suggests that pursuing double tracks of socio-economic recovery and resilience enhancement represent a strategic way for achieving sustainable recovery. Hence, local governments can adopt double-track strategies to develop disaster-prone areas, particularly Semeru Volcano.

Keywords: Double Track, Communities, Semeru Eruption, Sustainable Recovery

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INTRODUCTION

More than 62 million people have been directly affected by disasters over the past two decades (UNDRR, 2023). In the long run, disasters can cause societal trauma that affects social order, including changes in societal dynamics, social norms, and collective well-being. Long-term losses also affect local economic sectors and broader development effects (Tasri et al., 2022). In extreme cases, disasters cause displacements and affect the demographics, social structure, and economic development.

Semeru is one of the most active volcanoes in Java, and it has a short cycle of events. On 4 December 2021, it experienced an eruption that significantly impacted various sectors on the housing, infrastructure, social, and economic sectors, with losses amounting to IDR 1.8 trillion (USD 110.6 million). Since March 2022, various government organisations (GOs) and non-government organisations (NGOs) have been carrying out post-disaster recovery efforts. However, eruptions occurred again in 2022 and 2023.

Sustainable post-disaster recovery management is an essential activity for disaster resilience. The principle of post-disaster recovery, as emphasised in the Sendai Framework for Disaster Risk Reduction (SFDRR), is to restore life to a better and safer level (Dube, 2020). Sustainable disaster recovery must involve community participation, considering social and cultural dynamics. Sustainable recovery also leads to increased community resilience to face impending disasters.

There is still little research on sustainable recovery, especially in aligning community strategies for recovery while facing cyclical disasters such as the Semeru Volcano Eruption. Researchers selected some previous studies to look at research gaps. Daly (2020) showed that in the case of the 2004 Aceh tsunami, sustainable livelihood programmes were ineffective. In the case of cyclone Aila on 25 May 2009 in Bangladesh, Islam and Wahab (2020) showed that although the recovery was led by the community, there was no preparedness. Zhou (2022) described the dimensions for a more comprehensive but non-cyclical disaster-sustained recovery, namely, for the earthquake on 12 May 2008 in China. For this reason, this study explored the initiatives of affected communities through a double-track strategy to recover from the 2021 Semeru eruption while facing the possibility of further eruptions.

This study was aimed at exploring the recovery strategies of affected communities after the Mount Semeru eruption through the tracking of socio-economic recovery and the strengthening of preparedness.

LITERATURE REVIEW

Community Participation in Sustainable Recovery

The literature on sustainable recovery describes critical principles for ensuring that sustainable post-disaster recovery is underway in disaster-affected areas. First, ensuring that rehabilitation and reconstruction planning leads to long-term planning (Irawan et al., 2021). Second, community participation should be ensured in post-disaster planning, decision-making, and management processes (Islam & Wahab, 2020; Tatebe & Miyamoto, 2021). Third, post-disaster implementation must have a disaster risk reduction perspective to deal with future disasters (Smith & Wenger, 2007). Finally, ensuring post-disaster implementation contributes to sustainable development indicators (Dube, 2020). Long-term post-disaster recovery requires ongoing support and resources to rebuild infrastructure, restore services, and provide ongoing support for individuals and families affected by disasters (Iuchi & Mutter, 2020).

In the context of community participation, people affected by disasters are not limited to participation in rehabilitation and reconstruction projects. They also have initiatives to recover from post-disaster situations to rise quickly (Dhungana & Curato, 2021). The forms of these initiatives do not depend on the presence or absence of rehabilitation and reconstruction projects. However, self-pursued recovery initiatives are still limited to the recovery orientation at the household level. At a higher level, community-led recovery initiatives are where community groups collectively design and manage recovery (Dhungana & Curato, 2021; Paripurno et al., 2022). In the broader spectrum of disaster management, this process is also called a coping mechanism by the community to solve problems and deal with stress (Bachri et al., 2023; Otsuyama et al., 2019).

Social capital formed from social bonds between individuals and groups within the community influences the post-disaster recovery process. Social networks, norms, and beliefs can spark cooperation and collective action among community members, ultimately improving their livelihoods (Feinberg et al., 2023; Sobhaninia, 2023). Furthermore, social capital helps address societal challenges, such as limited resources, geographic isolation, crises, and potential conflicts (Irawan et al., 2021).

Livelihood capacity and livelihood diversification also affect the sustainable recovery process (Liu et al., 2022), which depends on the recovery and expansion of economic activities and the development of various livelihood opportunities (Islam & Wahab, 2020). A livelihood is said to be sustainable if it can overcome and improve itself from stress and disaster, maintain or improve the capacity of assets, and provide a sustainable livelihood for the future (Liu et al., 2022).

Community Preparedness for Volcanic Disasters

Disaster preparedness is critical to sustainable recovery (Smith & Wenger, 2007). Lack of disaster preparedness can result in property damage and heavy human casualties (Kurata et al., 2022). Preparedness for volcanic eruption disasters is related to individual, household, and village preparedness. Household preparedness includes cognitive, physical-operational, financial, social, and psychological dimensions (Najafi, 2022). Meanwhile, village-level preparedness is influenced by governance, early warning information systems, and village contingency planning (Irawan et al., 2023; Kurniawan et al., 2022).

Knowledge of hazards is essential in perceiving the impact of disasters on the preparedness to respond (Kurata et al., 2022). Effective media and information dissemination are the most significant factors affecting preparedness for volcanic eruptions. So, the public is encouraged to seek information about volcanic eruption warnings from media and valid information sources (German et al., 2022). External knowledge is usually obtained from programmes and information provided by GOs and NGOs and the media (Kurniawan et al., 2022).

However, tacit knowledge and local knowledge that have been produced for a long time determine the level of preparedness (Firdaus et al., 2023). Local knowledge is formed because of the community's emotional attachment to its environment, which is called place attachment. Place attachment is a bonding between individuals or groups and their environment. The bond that is created between the individual and a place is shaped by the complexity of emotional, social, symbolic, spiritual, ecological, and cultural factors (Purnomo, 2017; Swapan & Sadeque, 2021). This bond triggers the community to continue to survive in its territory from generation to generation so that the intensity of economic activities and land use in the volcanic area continues to grow (Bachri et al., 2024). Intergenerational heritage also includes knowledge that is essential to maintaining the preparedness and resilience of community institutions in the volcanic region (Wardekker et al., 2023).

The discussion above is a brief overview of the current state of the literature review for this study to identify the recovery phenomena with a double-track approach to achieve a sustainable recovery. Recovery efforts must go hand in hand through a double-track strategy. The double-track strategy in this study led to the understanding that preparedness and recovery are no longer understood as sequences of a disaster (pre and post) but have become a unitary agenda, especially when facing cyclical disasters such as the Mount Semeru eruptions.

RESEARCH METHODOLOGY

This research used a qualitative approach known as phenomenology to focus on the perceptions of People Affected by the Semeru Eruption (PASE) to reveal the facts that arose on the ground. The PASE of various backgrounds and

occupations, who had all been affected by the Mount Semeru eruption and relocated to Bumi Semeru Damai (BSD), were interviewed to obtain their stories and document their experiences. Purposive sampling was used to locate the affected communities living in BSD based on their village of origin and current occupation. The provincial BPBD officer, District BPBD officer, and Mount Semeru monitoring post officer were interviewed to validate the support provided by the government. Site checks were conducted at the locations mentioned by the interviewees to obtain a first-hand picture and validation. The purpose of the study was explained to the interviewees, and formal consent was obtained by having them sign a consent form. The list of interviewees is shown in Table 1 using codes for reasons of confidentiality of the interviewees. Figure 3 shows a site-check map of crucial points in the participants' stories.

Table 1: A List of the Research Participants

	Code	Sex	Age Range	Occupation	Interview Date
1	S012023-F	F	51-60	Merchant	October, 2023
2	L092023-M	M	51-60	Farmer, Village Volunteer	September, 2023
3	SA032024-F	F	41-50	Women's Group	March, 2024
4	N032024-M	M	41-50	Chairman of KUBE	March, 2024
5	SR022024-M	M	51- 60	Hamlet Coordinator	February, 2024
6	RO302024-M	M	31-40	Sand Miner Labourer	March, 2024
7	LI052024-M	M	41-50	Supervisory Post	May, 2024
8	AN052024-F	F	41-50	District BPBD	May, 2024
9	AR042024-M	M	31-40	Provincial BPBD	April, 2024

Data collected through semi-structured interviews and face-to-face Focus Group Interviews (FGI) regarding a series of open-ended questions led to sustainable recovery strategies. The critical questions are: 1) What is the impact of disasters and relocation? 2) How to restore livelihoods? 3) How do we knit social bonds? 3) What is the current knowledge of disaster risk? 4) How can preparedness and mitigation be pursued? The semi-structured interview technique is versatile and flexible, and it allows new questions to arise because of the answers given by the resource person. This way, information mining can be done more in-depth during the session.

This study uses analysis with the Colaizzi technique. The six steps we have taken according to the stages of Colaizzi are shown in Figure 1. The steps are as follows; 1) Transcribing the interview results using semi-verbatim techniques and extracting significant statements into a code. 2) Formulate general restatements or meanings for each significant statement extracted from the participant's narratives. 3) Aggregating formulated meanings into groups of similar types/clusters. 4) synthesizing all theme clusters into a comprehensive description of the experience articulated by participants. 5) Identifying the

fundamental structure of the phenomenon through an analysis of the exhaustive description of the phenomenon that aligns with the study's aims. 6) Validating through a follow-up appointment with participants to validate the essence of the information with participants.

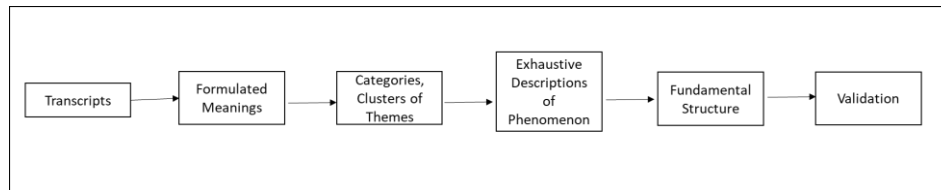


Figure 1: Stages of Colaizzi in Research Adopting Shosha
Sources: Shosha (2012)

ANALYSIS AND DISCUSSION

Disaster Impact, Relocation, and Efforts to Defend the Area

The PASE experienced a very significant impact due to the Mount Semeru eruption in 2021. They acknowledge the impact of this eruption, the largest of its kind, since the 1976 Kebondeli disaster, which resulted in 110 deaths. According to data from the Regional Disaster Management Agency (BPBD), the eruption on 4 December 2021 resulted in severe damage to 1107 houses, moderate damage to 95 houses, and light damage to 657 houses, including damage to environmental infrastructure. Also, the damage and losses to transportation infrastructure, water resources infrastructure, irrigation networks, clean water, and sanitation infrastructure amounted to IDR1.3 trillion (USD81 million). In addition, the economic and social sectors suffered damage and losses of IDR111.6 billion (USD6.97 million), including impacts on agriculture and animal husbandry, industries, tourism, MSMEs, health facilities, educational facilities, and places of worship.

As a result of the eruption, the PASE could not stay at home, perform routine tasks, or carry out social community activities. For approximately three months or even up to a year, they lived in refugee camps, relying on assistance from GOs and NGOs. Their primary source of livelihood, agriculture, suffered huge losses; the land could not produce, their livestock died, and activities such as sand mining ceased, as conveyed by the following interviewees.

"Semeru has a lot of land for residents to plant salak fruit. The Pronojiwo residents, who were the largest producers of salak fruit, suffered heavy losses due to the Semeru eruption. Their cattle died and they could not farm the land." - L092023-M.

The participants from the BPBD explained that the relocation policy was implemented because the affected area could not be occupied as it was in the red zone. Before the relocation was carried out, the government consulted with the PASE. As a result, the government decided to relocate the PASE to Sumbermujur Village, about 6-7 km from their original location, as shown in Figure 2. Then, the government provided an area of ± 81.55 Ha for occupation by the 1951 households. This policy, referred to as Regency Decree No. 188.45/191/427.12/2022, concerned the relocation master plan for the PASE. According to the government, this was the best location as the land was available and ready for occupation, the people would have access to their livelihoods, and it was away from the red zones.

"When determining Sumbermujur Village as the location for relocation, the Regency worked very quickly. Land use permits from the Minister of Environment and Forestry were quickly obtained for the forest areas. Dialogues with residents, those who would be relocated and the native residents of Sumbermujur, were also carried out; although there were protests and disapproval from residents, a solution was found so that the Ministry of Public Works and Public Housing (PUPR) could quickly begin constructing the houses and complete them in less than three months." - AN052024-F.

The residential relocation and construction process was carried out by the government through the PUPR Ministry and NGOs with a target of three months between January and March 2022 for completion. The Central Government built the main building (permanent structure) using the panel method. Non-government organisations (NGOs) built the kitchen side in a semi-permanent building. The government admitted that they did not involve the PASE in the development process and preferred to use externally trained personnel due to the demands of the rapid target and administrative issues. The resettlement of the PASE from the refugee camp to the relocation area was completed following the verification and validity of the data through joint inspections by the village government, local government, and central government. In addition to building 1951 houses, the government also built public facilities, places of worship, fields, schools, trade stalls, and health facilities.

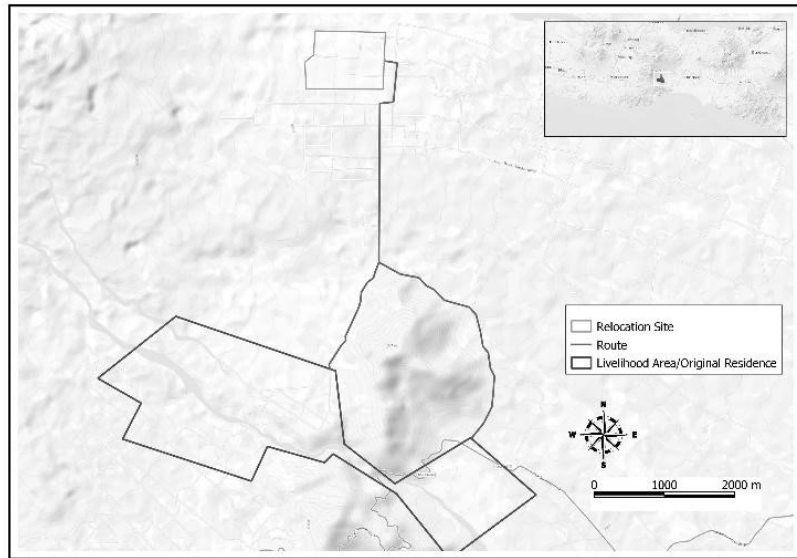


Figure 2: The location of the PASE's place of origin and the relocation area.
Source: Analysis (2024)

The PASE are still motivated to maintain the area and remain in the disaster-prone area because of their attachment to the environment, a bond that was built in the past. The ancestors of the PASE built their social life order, livelihood systems, land heritage, and shelters on the slopes of Mount Semeru. The long-standing bonds of shared identity, culture, and experiences among the PASE have fostered bonds with the environment and in collective action. This condition is a powerful representation of the wisdom of the Javanese people, who value the heritage of their ancestors and ties to the life-giving environment (Hasan et al., 2023). The bond between the Javanese people and the environment is also expressed by their livelihood patterns that depend on the natural potential: arable land and mining resources (Sardjuningsih et al., 2023). Human bonding with the environment strongly refers to place attachment (Swapan & Sadeque, 2021).

In the relocated area, the PASE have limited access to land for farming or at least supervise the land daily because they have moved away. Their new residence, a 36-m² building close to their neighbours, does not provide them with the rural landscape they were used to. The design of the relocation area does not allow for produce from fields, which are usually in the backyard of the house building. In addition, most of the PASE are separated from their relatives or neighbours.

"Yes, how else? We are already traumatised by the past events. So, we chose to live here even though we could not farm around the houses like we did in Curah Kobo'an. The neighbours and relatives do not all live in the same block. Now, we are also confused about the status of the land we left behind, the one the government said we should not live on." – S012023-F.

Community Efforts to Recover

The findings of this study showed that what the PASE have done to recover after the eruption has been to restore livelihoods adaptively. In addition, the PASE believe that social capital is the path to a quick recovery from the crisis caused by the eruption (Figure 3).

Social cohesion has begun to grow through community group activities, worship, and mutual assistance in the new neighbourhood. There are at least four places of worship, three social facilities, a football field, and a family park. In addition, they also continue to visit the destroyed houses and farms on their original land to maintain their heritage and ancestral ties. The resource person mentioned the importance of social capital for the recovery process.

"Here, the social facilities are quite tight. It is crucial to show group activities. If activities such as yasinan have begun to run, ladies and gentlemen. That is very important for srawung." - SA032024-F.

Social capital is a significant supporting factor in recovery (Ómarsdóttir et al., 2022). The PASE have been able to transform their social relationships and social ties into social capital. Social bonds, reciprocity, and collective attitudes are essential in providing opportunities for communities to recover from disasters more effectively and to increase resilience before, during, and after disasters (Sobhaninia, 2023; Szreter, 2004).

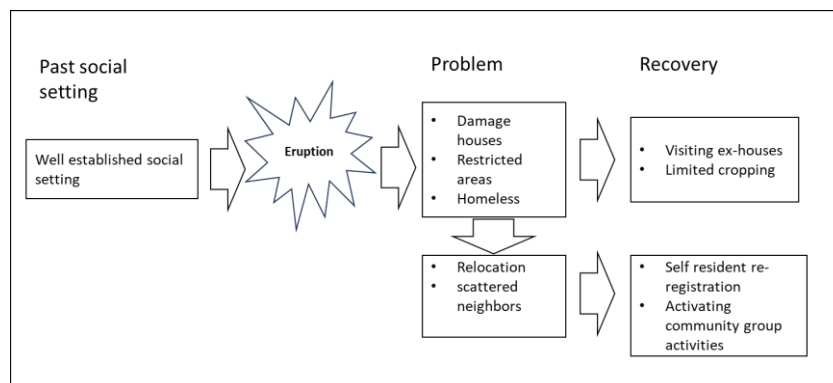


Figure 3: The PASE's Social Recovery Strategies

Source: Analysis (2024)

For the PASE, their social capital is formed from their social ties. Social capital in the community is the basis for building resilience because it is crucial for improving the overall welfare and development (Monteil et al., 2020). Social norms and beliefs can spark cooperation and collective action among community members through social networks, ultimately improving their livelihoods (Feinberg et al., 2023). Furthermore, social capital helps address societal challenges, such as limited resources, geographic isolation, crises, and potential conflicts (Sobhaninia, 2023).

This research also found that the PASE have adaptive livelihood strategies for recovery. As presented in Figure 4, they no longer just work to restore farmlands. They think adaptively by doing more than one type of work to replace another in a crisis. The farmers are trying to change the function of their land and are carrying out agricultural activities while working, sometimes not in the fields, as sand labourers. They have also been considering increasing the selling value of their agricultural products.

"Due to the eruption, garden products cannot be sold, so farmers are considering processing fruits, such as salak and bananas, into advanced products. This is a strategy to obtain income from selling these processed products. Salak is processed into chips, and bananas in addition to being chips, can be processed into jam. In Supiturang Village has many types of salak fruit. Among the salak fruits, the most famous are Salak Pondoh and Salak Gula Pasir. Both types of salak are very suitable for processed salak chips. This innovation can increase the added value of the products by up to 70%." N032024-M.

Besides agriculture and sand mining, some heads of families have become migrant workers, moving to islands outside Java to become construction workers (unskilled labour). At the same time, those who choose to stay in the resettlement houses are trying to take advantage of the narrow houses and yards to sell/trade.

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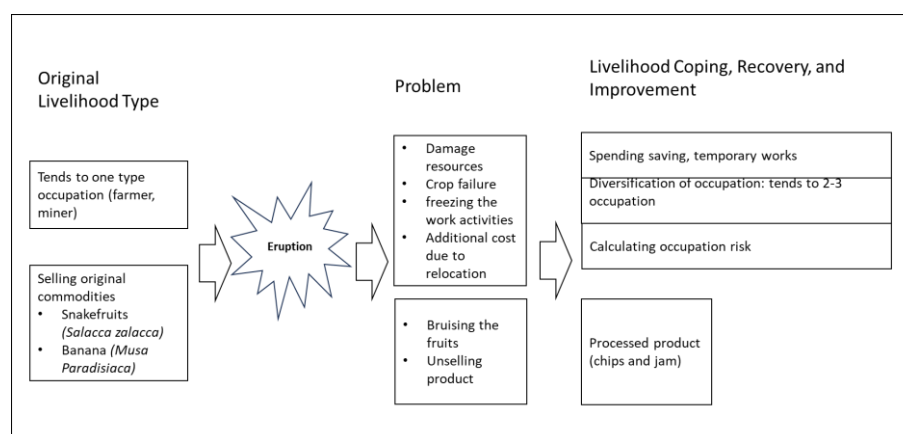


Figure 4: The PASE's Livelihood Recovery Strategies
 Source: Analysis (2024)

In addition to restoring livelihoods, this strategy is also an effort to restore assets because they have spent their savings and sold their remaining assets during their stay in the camp. This adaptive method also provides them with a choice of daily, weekly, and seasonal sources of income. Furthermore, the adaptive efforts made by the PASE are a strategy to increase their resilience in the face of cyclical disasters. Diversification of livelihoods in various professions, such as agriculture, non-agricultural work, and other occupational activities have become a key strategy to reduce the impact of a crisis and increase resilience (Liu et al., 2022).

The PASE have calculated the risk of crop failure if an eruption were to strike again and the high cost of restoring the land affected by the eruption. There must be enough income and savings to deal with a crisis. That is why they have also become miners, whereby, once they go down into the mine, they can earn IDR100000-200000 (USD6.25-12.53). However, it looks as though the miners have enough income compared to those waiting for an income from their crops. Other family members who are living in the house try to earn additional income by offering sewing, washing and other services that earn them a daily income of IDR20000-50000 (USD1.25-3.13).

In another track, the PASE are striving to strengthen in parallel their capacity and knowledge in dealing with disasters by accessing the information and training conducted by GOs and NGOs. Although they have lived with the threat of eruptions for decades, the 2021 eruption provided a different experience. They recognised the increasing importance of information and early warnings about eruptions and the arrival of the lava flow, especially when they began to move into the rice fields/gardens and sand mining areas. The PASE who are active in the sand mining area must equip themselves with mobile/smartphone

devices because early information about potential eruptions/lava flow can be obtained there. Information is disseminated through mobile short message service (SMS) and, most intensively, through a WhatsApp group.

"An EWS has been built. The community, especially miners, can access it through a WA group and a siren has been installed."– L092023-M.

The WhatsApp group, which is a means of disseminating early warnings, is comprised of local government officers, decision-makers, the Semeru volcano monitoring post officer, village heads, and miners. In addition, the central government built an early warning system (EWS) in 2023. This early warning relies on sensors that detect volcanic activity and then, disseminate this warning through three sirens that can be controlled by the PVMBG, BPBD, and village heads. The early warning flow is illustrated in Figure 5.

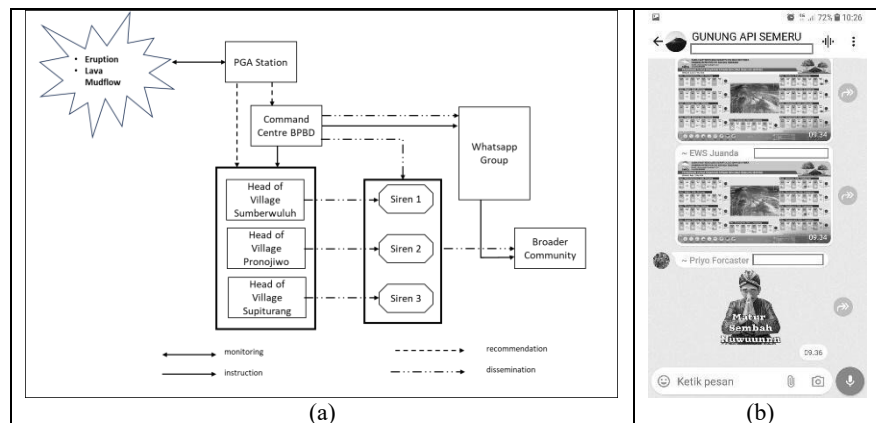


Figure 5: (a) The Flow of the EWS for Eruptions and Rain Lahars and (b) the WhatsApp Group
Source: Analysis (2024)

Strengthening the preparedness capacity is also done through socialisation activities and disaster-resilient village programmes. The programmes are carried out by GOs and NGOs targeting village governments and community representatives to build capacity for managing community-based disaster risks. The community has recruited volunteers to raise preparedness.

Table 2: The PASE’s Preparedness Strengthening Programme

Programme	Time	Powered by
Disaster resilient village	2022	NGO & GO
Regular socialisation	Regular	GO
EWS development	2023	GO
Mini simulation	2022, 2023	GO & University
Development of Semeru eruption contingency plan	2023	GO

Source: BPBD Lumajang District

The discussion above shows that this research has clearly shown that the recovery sought by PASE has gone through many ways while facing the threat of disaster simultaneously. Researchers grouped various ways taken by PASE to recover in double-track. The first track is efforts to recover social capital and diversify economic livelihoods adaptively. Second, simultaneously build preparedness capacity to respond appropriately to potential impending disaster risks. PASE has an understanding and awareness of the surrounding disaster conditions. This understanding triggers the community to increase preparedness. The practice of double-tracking through disaster recovery and preparedness in tandem enables recovery from long-term disasters.

CONCLUSION

This research clearly showed that the strategy of the PASE for recovering from disaster impacts is not only an adaptive strategy for diversifying livelihoods and efforts to recover social capital but also for increasing knowledge about disaster mitigation and preparedness to deal with cyclical disasters. There is no longer a boundary between pre- and post-disasters. A sustainable recovery strategy is carried out by recovery along with preparedness efforts.

Recovery through double-tracking leads to sustainable recovery efforts. Track 1 involves restoring the socio-economic aspects. After the eruption, livelihoods have been restored by diversifying the livelihoods (trading, farming/farming, mining sand) rather than depending on only one type of occupation: farming or sand mining. In addition, social cohesion has begun to grow in the relocation community through community group activities and worship because the setting of the social environment is very much different than in their hometown. Track 2 involves understanding the risks and improving the level of preparedness—a pattern of public awareness of disaster risks for themselves and their production sources. The PASE have also increased their knowledge about disaster mitigation and preparedness behaviour for future disasters.

This study recommends that local and national governments strengthen specific skills so that the PASE can have various other skills at work. Innovation and robust market access are necessary to add value to the product.

Simultaneously, agencies must strengthen the resilience of the PASE by building effective EWSs that can reach everyone and developing preparedness skills through periodic drills.

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