

## Disaster preparedness for tourist village organizers in disaster prone area of Merapi Yogyakarta

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### SUMMARY

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**Background:** A number of tourist villages in Sleman Regency are located in Disaster Prone Area (DPA). To minimize the risks of disasters, preparedness efforts are required. Some of the components of preparedness are: knowledge of disaster risks, policies and guidelines in relation to the preparedness to anticipate the occurrence of natural disaster, emergency plan for natural disasters, disaster alert system, and resources mobilization. Tourist Villages of Pentingsari, Nganggri, and Tunggularum are located in Merapi Disaster Prone Area (DPA). These three tourist villages were selected due to their high vulnerability and risk potential of Merapi eruption due to their locations in DPA III and DPA II. **Methods:** This is a qualitative study with case study design. The subjects of the study were tourist village organizers who had knowledge and understanding of tourist villages with the criteria of their positions in the tourist village organization. The sample taking technique applied to the subjects was the purposive sampling technique. **Results:** The level disaster preparedness in terms of knowledge parameter among some tourist village organizers was limited since only few things were understood. In terms of policy and guidelines parameter, these components were not available for the tourist village organizers. With regard to the parameter of emergency plan for the organizers, this component was limited since there were some lack of preparation in a number of components. In relation to the parameter of disaster alert system for the tourist village organizers, this aspect was found to be good. With regard to the parameter of resource mobilization for the tourist village organizers, it was found that this aspect was unavailable since there were not enough decent facilities. **Conclusions:** the level of disaster preparedness in the disaster prone area of Merapi Yogyakarta was still limited in dealing with the threats of Mount Merapi eruption disaster.

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## 1. Introduction

Mount Merapi is one of active volcanoes in Indonesia (Badan Nasional Penanggulangan Bencana, 2012). This is due to the still active eruption and increasing volcanic activities (Suharto et al., 2021). Volcanic eruptions have occurred for as many as 84 times from 1006 to 2010 with the 2010 eruption being the second largest after the largest one in 1872 (PVMBG, 2014). In 2010, Mount Merapi eruption resulted in the loss of 398 lives, displacement of 500.000 people, and destruction of 3000 houses (Sucahyo, 2020). The destruction effects include changes in biodiversity, loss of water catchment area, destruction of forest, closure of water sources and water channels, destruction of farms and plantation area, missing of road access, and missing of land ownership boundaries (Rahayu et al., 2014).

Behind those risks, Merapi offers stunning landscapes and cool weather. These conditions bring advantages for Merapi to be developed optimally as a tourist destination (Koerniawati, 2022). Merapi tourism is managed with a tourist design which is optimized by the community and for the community and has potentials in cultural and natural tourism. Therefore, Merapi becomes one of tourism icons of the Yogyakarta Special Region to attract visitors (Nirmala, 2020).

The tourist destinations which are currently developed extensively are tourist villages. A tourist village is a village zone with its own charms and uniqueness to attract tourists with traditional nuance and villagers' activities with local wisdoms (Sudibya, 2018). The common types of tourist villages are those with natural resources tourist villages, the ones with unique local culture, the ones with creativity features, and those combining various attractions (Mari, 2022). Based on the data of Tourist Village Network (Jadesta) of the Ministry of Tourism and Creative Economy (Kemenparekraf), there are 30 tourist villages in Sleman Regency, Yogyakarta Special Region Province, consisting of those in the categories of startup, developing, developed, and self-reliant (Badan Pariwisata dan Ekonomi Kreatif, 2022).

A number of tourist villages in Sleman Regency are located in the Disaster Prone Area (DPA). DPA is an area which has once been affected by a disaster or which is identified as prone to a disaster either directly or indirectly (Kementerian Energi Dan Sumber Daya Mineral Republik Indonesia, 2016). A DPA is defined or established by the National Agency of Disaster Management (NADM or BNPB) (Yanuarto, 2020). DPA I is an area which has a potential for lava or flood and it is also possible to be affected by hot clouds and lava streams (Pemerintah Daerah Kabupaten Sleman, 2011) with a spectrum of hot clouds of as far as 20 km (Badan Standardisasi Nasional, 1998). Whereas, DPA II is an area which has the potential to be affected by hot clouds, lava streams, and ejection of materials as well as ejection of incandescent stones (Pemerintah Daerah Kabupaten Sleman, 2011) with the range of hot clouds as far as 17 km (Sucahyo, 2020). DPA III is an area located close to hazard source which is often affected by hot clouds, lava streams, and ejection of materials as well as ejection of incandescent stones (Pemerintah Daerah Kabupaten Sleman, 2011) with the range of hot clouds as far as 8 km (Sucahyo, 2020).

To minimize the risks of disasters, efforts of preparedness are required. Preparedness is a series of activities to anticipate disasters by effective and useful organization and actions (Undang-Undang Republik Indonesia Nomor 24, 2007). Some of the components of preparedness are: knowledge of disaster risks, policies and guidelines related to preparedness to anticipate natural disasters, disaster alert system, and resource mobilization (LIPI – UNESCO/ISDR, 2006).

Tourist villages of Pentingsari, Nganggring, and Tunggularum are located in Merapi Disaster Prone Areas (DPA). This study selected these three tourist villages due to their high vulnerability and risk potential to the eruption of Mount Merapi since they are located in DPA III and DPA II. Preliminary studies in these tourist villages on 23 October 2022 with the chairmen of Pentingsari, Tunggularum, and Nganggring tourist villages revealed that Tunggularum was in DPA III, while Pentingsari and Nganggring were in DPA II.

The risks of Mount Merapi eruption disaster would be higher with a number of vulnerability present in tourist villages such as human vulnerability (visitors and vulnerable groups such as the elderly, pregnant mothers, and children), economic vulnerability (farm and plantation area), as well as physical vulnerability (facilities and infrastructures) (Badan Nasional Penanggulangan Bencana, 2012). The preliminary studies revealed that those tourist villages had not developed evacuation plan for visitors in case of evacuation. This study was aimed at analyzing the disaster preparedness among the tourist village organizers in the Mount Merapi disaster prone areas.

## 2. Methods

This study was a qualitative study with case study design. It was conducted in tourist villages of Pentingsari, Tunggularum, and Nganggring in Sleman Regency, Yogyakarta Special Region Province. The study was conducted from October 2022 to June 2023. The subjects of the study were tourist village organizers who had the knowledge and understanding of tourist village with the criteria of position in the tourist villages of Pentingsari, Tunggularum, and Nganggring. The informants of the study were the organizers of those three tourist villages who were responsible for all the activities in those tourist villages and who had better understanding of disaster preparedness with a minimum of one year service in the organization. The sampling technique applied for the subjects was the purposive sampling technique. The instruments used in the study were the researchers as human instruments, Focus Group Discussion (FGD), observation checklist, and document checklist. The tools utilized in this study were writing tools, handphone, voice recorder, and laptop computer. The data collecting techniques in this study were FGD, observation, and document analysis.

## 3. Results and Discussion

### 3.1. Level of Disaster Preparedness Knowledge

#### 3.1.1. Signs of Mount Merapi Eruption

The organizers of tourist villages have known the signs of Mount Merapi eruption such as drastic increase in the temperature around the mountain slopes, presence of cold lava flow in rivers, presence of thunderous sound, presence of animals coming down from the mountain especially monkeys, and sounds of sirens as a sign of the flowing down of lava from Mount Merapi.

*"In the area around my house, usually there are a lot of animals coming down from the mountain, especially monkeys." (Informant 3). "As far as I know, one sign of Mount Merapi eruption is the frequent presence of thunderous sounds." (Informant 1). Usually, another sign of Mount Merapi eruption is the increase in the temperature around the mountain slopes." (Informant 2). "As far as I am concerned, some signs of Mount Merapi eruption are the presence of extreme activities and then the presence of cold lava flow in rivers." (Informant 4).*

These results were the same as the ones from a study (Marfai et al., 2012) in the Bedog River Flow Area in Yogyakarta mentioning that there was insufficient knowledge of signs of Mount Merapi eruption among the people.

#### 3.1.2. Actions to Take in Case of Mount Merapi Eruption

The organizers of tourist villages have known that the actions to take in case of Mount Merapi eruption were proceeding to the assembly area, evacuating to shelter points, confirming the validity of the information of the eruption of Mount Merapi, upon confirmation then communicating the information to the people and then gathering them to assembly areas for evacuation to shelter points, sweeping through villagers' houses, then evacuating the people by giving priority to the elderlies and children under five years of age.

*"Regarding actions to take in case of Mount Merapi eruption in Pentingsari Tourist Village, the first is to confirm the clarity and validity of the information. Once this is clear, the information is then distributed to the people who are then proceeded to assembly areas and evacuated to shelter points. If some people are still left in their houses, then sweeping is conducted." (Informant 3). "The action to take by the Nganggring Tourist Village is to evacuate by giving priority to the elderly and children." (Informant 5).*

These results are inconsistent with the study (Suwandi, 2018) in Yogyakarta mentioning that in case of Mount Merapi eruption the actions to take are wearing protective glasses and masks, avoiding disarakan prone areas, keeping paying attention to the guidelines from the authority during the gathering in shelter points, and making sure to be present in shelter points which are far from disaster threats.

#### 3.1.3. Secondary Disaster of Mount Merapi Eruption

The tourist village organizers have known that the secondary disaster of Mount Merapi eruption was the cold lava flood, volcanic dust, thunderous vibration resulting in landslide, death of animals such as fishes, dried soil, extended drought, destruction of farms, and drying out of water spring sources.

*"The most common thing happening after Mount Merapi eruption is the presence of cold lava which results in the death of fishes." (Informant 3). "As far as I know, then*

there is volcanic dust after Mount Merapi eruption.” (Informant 4). “After Mount Merapi eruption, there are landslide in areas alongside the rivers due to thunderous vibration.” (Informant 1). “There is also another effect of Mount Merapi eruption, namely drying of the soil.” (Informant 6). “Usually there is extended drought which makes it difficult to find forage or plants for goats.” (Informant 7). “There is also another effect, namely the destruction of farms due to volcanic dust from the eruption.” (Informant 2).

The Merapi DPA tourist village organizers’ knowledge regarding the secondary disaster from Mount Merapi eruption in the form of cold lava flood was consistent with a study (Gosal et al., 2018) in Tomohon mentioning that heavy rainfall on a volcano peak may result in cold lava flood.

#### 3.1.4. Source of Information of Mount Merapi Eruption

The tourist village organizers obtained the information of Mount Merapi eruption from sirens, social media accounts such as the twitter account of BPPTKG and live YouTube, Pasal Merapi Community, Handy Talky (HT), and mosque loudspeakers.

“The sources of information of Mount Merapi eruption are the sirens, social media accounts such as BPPTKG twitter account, as well as Pasal Merapi Community. The elderlies usually obtain the information from HT.” (Informant 7). “The source of information of Mount Merapi eruption is usually the announcement from the mosque loudspeaker.” (Informant 5). “There is also information of Mount Merapi eruption from a live YouTube channel namely freecom.” (Informant 3).

These results were consistent with a study (Santoso, 2014) mentioning that the initial alert information accessed by the people were from various media and sources such as Handy Talky (HT), handphone, radio from communities such as KFM, Lintas Merapi FM, MMV FM, and television (TV).

### 3.2. Availability of Policies and Guidelines on Disaster Preparedness

#### 3.2.1. Policies and Guidelines on Disaster Preparedness

According to the tourist village organizers, policies and guidelines regarding preparedness for Mount Merapi eruption were not available.

“There are no policies and guidelines regarding preparedness for the Mount Merapi eruption disaster in this tourist village.” (Informant 2).

Based on the observation on the Merapi DPA tourist villages, there was no policies and guidelines regarding disaster management which were out in easily accessible places for reading. This result was inconsistent with a study (Handitcianawati et al., 2018) in SMA Muhammadiyah 1 Klaten mentioning the ownership of documents regarding policies and guidelines for disaster.

#### 3.2.2. Socialization of Policies and Guidelines on Preparedness for Mount Merapi Eruption

Socialization of policies and guidelines on preparedness for Mount Merapi eruption was unavailable.

“Socialization of policies and guidelines on preparedness for Mount Merapi eruption was unavailable, either at the hamlet or village level.” (Informant 3).

Based on the document analysis, there was no decree of disaster management policies, proof of socialization of policies and guidelines, as well as documents of disaster preparedness.

#### 3.2.3. Mitigation Team for Mount Merapi Eruption Disaster

Tourist Villages in the Mount Merapi DPA did not have a mitigation team for the Mount Merapi eruption disaster.

“The team for disaster mitigation in the tourist village has not been established.” (Informant 7). “In Tunggalurum there is no team for disaster mitigation, just parking and security team consisting of Tunggalurum citizens.” (Informant 1). “There is no disaster mitigation team in Pentingsari Tourist Village, just Security Division.” (Informant 4).

Based on document analysis, there was neither organization structure for disaster mitigation not information of main job description and functions. This was consistent with a study (Hafida, 2019) on Sidorejo Village where no team was available for the mitigation of volcano eruption disaster.

### 3.3. Instruments for Emergency Situation Plan

### 3.3.1. Plan for Evacuation, Rescue, and Saving for Mount Merapi Eruption

The plan for evacuation, rescue, and saving in a tourist village is executed by gathering people in an assembly area and then proceeding them for evacuation to a shelter point.

*“Regarding evacuation, rescue, and saving plan, people are gathered first in an assembly area and then directed to a safer location.” (Informant 4).*

Based on the document analysis, in Merapi DPA tourist villages there was no document regarding the plan for the preparedness for Mount Merapi eruption disaster such as evacuation procedures, assignment of assembly area, and evacuation route. This was consistent with a study (Kamurahan & Christian, 2021) regarding evacuation plans for volcano eruption in Lelle Tourist Village, Sangihe Islands, North Sulawesi which was good.

### 3.3.2. Emergency Necessity Plans

According to the tourist village organizers, emergency necessities were valuable documents, gold, personal medicines, clothes, cash money, and valuable goods.

*“The plan for emergency necessities to be prepared are valuable documents, gold, personal medicine, and sufficient clothes.” (Informant 4). “Preparation of cash money is required in case of Mount Merapi eruption so that when something happens we don’t have to worry.” (Informant 3).*

Based on the document analysis, in Merapi DPA tourist villages there was no document regarding preparedness plan for emergency necessities in case of Mount Merapi eruption disaster. This was inconsistent with the study (Kamurahan & Christian, 2021) mentioning that the people of Glagaharjo Village, Cangkringan District, Sleman Regency, Yogyakarta Special Region Province had strategic public savings to fulfill basic needs in the event of a volcano eruption disaster.

## 3.4. Effectiveness of Disaster Alert System

### 3.4.1. Flow of Information of Early Alert of Mount Merapi Eruption

The tourist village organizers have known that the flow of Information of early alert of Mount Merapi eruption was from BPBD (Regional Disaster Management Agency), then there were SAR teams or Tagana, and then distributed to the people.

*“Regarding information flow in this tourist village, the main one is from BPBD, then there is joint SAR team or Tagana in the village or hamlet, then there is the person in charge in the hamlet, and the last is distribution to the people.” (Informant 3).*

Based on the document analysis conducted with the key Informant, the tourist village did not have flowchart of information on early alert. This was inconsistent with a study (Marti, 2019) in the Hamlet of Kinahrejo, Cangkringan, Sleman, Yogyakarta, regarding the flow of early alert information on preparedness for Mount Merapi eruption disaster, the information was obtained from the BPBD and BPPTKG then proceeded to the Heads of Hamlets, and then distributed to the people with the assistance from young people in the hamlet. This was consistent with this study of tourist village organizers.

### 3.4.2. Media to Distribute Information

The information media used the tourist village organizers were HT, handphone, social media such as WhatsApp, SMS, telephone, and mosque loudspeakers.

*“The information media usually used are sirens but they are not heard in Pentingsari Tourist Village, so that we usually use HT, WhatsApp groups, and mosque loudspeakers.” (Informant 3). “Other media to distribute information to people regarding Mount Merapi eruption are SMS and phone calls.” (Informant 2).*

Based on the observation results, there were “kentongans” (traditional tube percussion instruments) in Pentingsari and Nganggring Tourist Villages, but there were no sirens. Meanwhile, there were both kentongans and sirens in Tunggularum Tourist Village. This was consistent with a study (Lestari et al., 2016) mentioning that the media used by BPBD Karo, Karo Regency, North Sumatera to distribute information of Mount Sinabung eruption were social media, local and non-local mass media, radio, HT, and SMS (Short Message Service) Gateway.

### 3.4.3. Sources of Information about Activities or Status of Mount Merapi

Information about activities or status of Mount Merapi eruption was obtained by the tourist village organizers from the social media such as WhatsApp, mosque loudspeakers, HT, mouth-to-mouth communication, and “kentongans”.

*“Sources of information about the status of Mount Merapi are usually social media such as WhatsApp and also mosque loudspeakers or sweeping.” (Informant 1). “There are also some who use HT to get information about the status of Mount Merapi.” (Informant 4). “In Nganggring, people use mouth-to-mouth communication and also kentongans.” (Informant 5).*

This study was consistent with a study (Retnowati, 2014) mentioning that the people of Umbulharjo Village, Cangkringan District, Sleman Regency, Yogyakarta Special Region Province obtained information about the activities or status of Mount Merapi from Handy Talky (HT) with the radius of 20 to 30 kilometers, sirens, regional community radio, television, and social media.

#### **3.4.4. Obstacles or challenges for Information about Mount Merapi Eruption**

According to the tourist village organizers, the challenges for the information of Mount Merapi activities or status were uncontrolled information, hoaxes, miscommunication, and delayed delivery of information.

*“The challenges for disaster alert system are usually the uncontrolled flow of information or hoaxes from housewives.” (Informant 7). “Regarding the challenges in Pentingsari, there are miscommunication and delayed delivery of communication in relation to the Mount Merapi eruption.” (Informant 3).*

This is consistent with a study (Subrata & Putuhena, 2012) mentioning that the people in Bojonegoro found challenges in the delivery of information in sending messages due to weak transmission signals.

### **3.5. Efficiency in Mobilization of Resources**

#### **3.5.1. Training on Preparedness for Mount Merapi Eruption Disaster Conducted Incidentally or Periodically**

Training on the preparedness for Mount Merapi eruption disaster was conducted periodically in Pentingsari Tourist Village but never conducted in Tunggularum and Nganggring.

*“Regarding training on disaster mitigation in the tourist village, it has never been conducted, just a simulation and first aid training for accident and the training has also been conducted periodically in the hamlet.” (Informant 3). “In Nganggring Tourist Village, training on disaster mitigation has never been conducted, but such training has been provided to the farmers association periodically.” (Informant 7).*

This is inconsistent with a study (Pambudi et al., 2021) mentioning that the people of Hargobinangun located in Merapi DPA have been provided with the training periodically.

#### **3.5.2. Simulation of Mount Merapi Eruption Disaster Preparedness for Visitors**

Simulation of Mount Merapi eruption disaster preparedness for visitors and tourist village organizers has never been conducted.

*“Simulation of disaster mitigation of Mount Merapi eruption has never been conducted in the tourist village.” (Informant 5).*

This was consistent with a study (Budiatiningsih & Rosyidie, 2022) in Sleman Regency Yogyakarta mentioning that most of visitors have never participated in simulation of disaster preparedness.

#### **3.5.3. Prepared Facilities and Infrastructures**

The facilities and infrastructures which have been prepared in the three Merapi DPA tourist villages were first aid kit in every house, bunker, storey post, evacuation signage, and assembly area.

*“The facilities and infrastructures which have been prepared are first aid kit for every house, stretcher in front of the camping ground, signage for evacuation routes, and assembly areas in the hamlet level.” (Informant 4).*

Based on the observation, Pentingsari and Tunggularum Tourist Villages had evacuation routes along the streets which were easily visible such as in the camping ground and auditorium. There were also large assembly areas with easy to read signage. There were evacuation signage. There were no disaster-ready bags and transportation. There were communication instruments in the form of HT, shelter points, but no fire extinguisher. Meanwhile, based on the observation, Nganggring Tourist Village had evacuation routes but not located in the tourist village area, there was an assembly area but no signage, there was evacuation signage but not specifically

assigned for the tourist village, there was no disaster-ready bag, no transportation, there were communication instruments in the form of HT, there was a shelter point in Girikerto Village but there was no fire extinguisher. These results were inconsistent with a study (Fitriwalni & Alhadi, 2022) in Mount Talang, Tolok Regency, stating that the facilities and infrastructures were not sufficient due to the limited funding from the government.

#### 4. Conclusion

Disaster preparedness among the organizers of tourist villages in the disaster prone areas of Mount Merapi is still low. This can be seen from the unavailability of disaster mitigation plans by the tourist village organizers. In addition, there is no procedure to evacuate visitors in case of eruption. This should become the attention and precautions for all the parties. In spite of being located in eruption prone areas, the existence has not been accompanied with good preparedness. The parties such as the government, BPBD of Sleman Regency, and Sleman Tourist Office are expected to support and accompany tourist villages in the Mount Merapi eruption disaster prone areas to be able to prepare the plans and improve the disaster preparedness of the tourist villages.

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