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International Conference on Disaster Management

PROCEEDING BOOK VOL.2



Social and Technological Innovation on Disaster for Industry 4.0

INDONESIA DEFENSE UNIVERSITY, BOGOR

18 - 19 JUNE 2019



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*THE
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The People Resilience of Gamber Village to the Sinabung Eruption in Karo North Sumatra

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12. **Abstract.** Gamber Village located at the foot slope of Mount Sinabung in the south east direction. Mount Sinabung is one of active volcano in Karo North Sumatra Indonesia that erupt in 2013 until now. It give impact to the society which live close to the Mount Sinabung, including in Gamber Village. The research objective are (1) to find out the physical characteristics of Gamber Village, (2) to describe the socio-economic characteristics of the Gamber Village community, (3) to analyze hazards of Sinabung Eruption in Gamber Village, and (4) to analyze the people resilience of Gamber Village to the Sinabung eruption. The method which used in this research was a qualitative method. The physical characteristics and hazards of Sinabung Eruption were analysed based on interpretation of Google Earth imagery and field survey. Moreover, the socio-economic characteristics and the people resilience were assessed by interviews. Then, the research result were analyzed descriptively. The results of this research show that the physical characteristics of Gamber Village is located at the foot slope of Sinabung Volcano in the south east direction. This village covered by pyroclastic material after eruption in 2016. The socio-economic characteristics of Gamber Village is most people in Gamber Village work as farmer in farmland near their village. After eruption in 2016, some people were lose their farmland. The hazards of the eruption of Sinabung Volcano in Gamber Village are pyroclastic avalanches and flow of hot clouds. The resilience of people in Gamber Village increased from 2010, 2013 – 2016 and 2016 – now. The increasing of people resilience showed from the knowledge and education, risk assessment, and disaster preparedness and response.

1. Introduction

Volcanic eruption has become a serious natural disaster threat in Indonesia. Volcanic eruption in Indonesia from time to time continue to increase in incidence. One of them is the eruption of Sinabung Volcano in Karo District, North Sumatra Province. Sinabung Volcanic Eruption that occurred on August 29, 2010 was the beginning of the beginning of the reappearance of Sinabung Volcano activities after not showing eruption activity in 1600. This type of volcano is converted from type B to volcano with type A. The increase in activity that occurs reaches a climax after an explosive eruption which ejects volcanic materials.

Sinabung Volcano Eruption began to occur again in September 2013 with increasing intensity. the status of Sinabung Volcano was raised from the Standby (level III) to Caution (level IV) on November 24, 2013 [1]. Caution (level IV) status is the highest level of volcanic activity because it has indicated an increase in the eruption intensity. The Caution (level IV) status has the potential to cause widespread spread of material measuring 3 - 4 cm in length which is estimated to be able to reach 4 km. On February 1, 2014, Sinabung Volcano issued a hot cloud that moved to the southeast. The hot clouds caused 16 victims who were in Sukameriah Village [1].

Furthermore, the status of Sinabung Volcano was decreased from the Standby (level III) to Caution (level IV) on April 8, 2014. Moreover, the activity of Sinabung Eruption has been increase again. It caused that the status of Sinabung Volcano was raised again from the Standby (level III) to Caution (level IV) on 2 June 2015 until now [1]. With the condition of Sinabung like this, the highest hazard status, some people still have activities and live in the red zone, including in the village of Gamber. Especially the people of Gamber Village, some people refused to be evacuated. They still survive in the village of Gamber.

The Sinabung Eruption that occurred on May 21, 2016 was followed by a glide of hot clouds. The hot clouds on May 21, 2016 reaches Gamber Village. It caused 9 casualties in Gamber Village. Therefore, it is very important to conduct research on people resilience of Gamber Village in facing the Sinabung Eruption. The purposes of this research are (1) to find out the physical characteristics of Gamber Village, (2) describe the socio-economic characteristics of the Gamber Village community, (3) to analyze hazards of Sinabung Eruption in Gamber Village, and (4) to analyze the people resilience of Gamber Village to the Sinabung eruption. Figure 1 shows the research location in Gamber Village Karo North Sumatra.

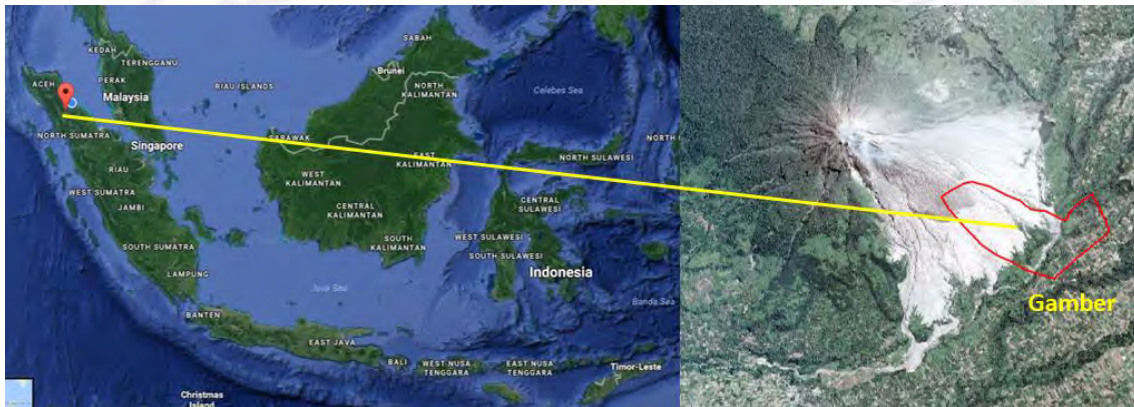


Figure 1. The research location in Gamber Village Karo North Sumatra

Methods

The research method was a qualitative method. The physical characteristics and hazards of Sinabung Eruption were analysed based on interpretation of Google Earth imagery and field survey. Moreover, the socio-economic characteristics and the people resilience were assessed by interviews. Then, the result of this research were analyzed descriptively.

Results and Discussion

1.1. Physical Characteristic of Gamber Village

Gamber Village located at the foot slope of Sinabung Volcano in the south east direction. This village took place in 4 km from the peak of Sinabung and in the south-east of Sinabung Volcano. The elevation of this village is about 1.236 meter above sea level with an area of 286 Ha. This village is crossed by the Lau Borus River, which is one of the rivers that originates at Sinabung Volcano. This river also accommodates and flows the materials of Sinabung eruption.

In general, the area of Gamber village consist of farm land and non-agricultural (settlement) area. The farmland in this village cover 266 Ha while the settlements have an area of 20 Ha. The people of Gamber village plant some commodities like vegetables (carrot, chilli, cabbage, cauliflower, etc.), fruits (banana, orange, terong belanda, avocado, etc.) and coffee as well. However after Sinabung erupted in 2016, for about 50 percent of farmland were damaged because this area was blanketed with pyroclastic material of Sinabung eruption. At the same time, the

people in Gamber village must leave their village and evacuate to safer areas. The condition of Gamber village before and after Sinabung eruption in 2016 are showed in Figure 2.



Figure 2. The condition of Gamber Village before and after Sinabung eruption 2016

1.2. Social Economic Characteristic of Gamber Village

Gamber is one of the villages affected by the eruption of Mount Sinabung. The Sinabung Eruption that occurred in 2010 caused the people of Gamber to flee for a month in Kabanjahe. After a month of evacuating the Gamber community, they returned to Gamber Village and returned to their normal activities. Eruptions that occurred again in 2013 made the people return to refuge for a week. Volcanic eruptions can be occurred during days, months and even years; hence evacuations also can be longer periods of time [2]. Mount Sinabung is categorize the long term period of eruption. The type of Mount Sinabung is a strato-volcano. Volcanoes, especially those associated with strato-volcanoes that have a potential for major eruptions, often represent ongoing hazards [3].

Gamber's community is a unique and stubborn society. The government established Gamber village as a red zone since 2013 and placed the community in the evacuation post. However, the people of Gamber remained back and active in Gamber Village during the day and returned to the evacuation post at night. In fact, about 10% of the population insists on staying there even though the government has cut off electricity. The community survived using generator sets after the government cut off electricity. When the government took down the apparatus to evacuate the people of Gamber Village to a safe place, the community would hide inside the house or run to the agricultural land to avoid evacuation.

Gamber's community is actually aware of the threatening danger if they are still active and living in the red zone. The Mount Sinabung continues to erupt and never know when it will be end. It causes the community to become bored. They decided to return to their village to do their activities for economic reasons. In addition, the inconvenience of staying in the evacuation post also caused the community to return to Gamber Village. The unfulfillment economic needs are more frightening than the Sinabung eruption. Generally, the people in red zone never think about volcanic hazard when they thought about problems facing their communities [4]. In addition, the Gamber's communities were very confident that their village on the other side of the Lau Borus

River would not be reached by hot clouds. Until 2016, Gamber Village was hit by a hot cloud and killed 9 people. Since then the Gamber community has not lived in the village of Gamber.

Gamber village was included in phase II or independent relocation with three other villages, namely Gurukinayan Village, Berastepu Village, and Kutatonggal Village. Phase II relocation is different from phase I. Relocation phase I is intended for Sukameriah Village, Bekerah Village, and Simacem Village. In the first phase of relocation, the eruption victims of Mount Sinabung were placed in a residential area in Siosar by the government. Independent relocation is left to the community to find land for their own relocation sites, the government only supervises. Before implementing independent relocation, the government provided assistance amounting to 5.6 million rupiah per household per year. The fund is set at 3.6 million rupiah to rent a house and 2 million rupiah to rent agricultural land.

In 2017 the Government provided a relocation fund of 110 million rupiah per household, with an estimated 55 million rupiah for housing and 55 million rupiah for buying agricultural land. The funds are channelled when residents in groups have acquired land for their relocation sites and the government facilitates its infrastructure in the form of permanent residential. However, the government also allows if there are residents who choose not to be in Permanent Shelter.

As a result, after the relocation was completed, the Gamber community did not reside in the same location. A total of 69 households chose to settle in Keci-Keci I permanent residences, 60 households in Keci-Keci II permanent residences, 20 households chose to stay in Lau Mangir permanent residences, and as many as 10 households chose to settle outside the permanent residences that the Government had built. Even though they are not in one location, their population administration is still one, which is below Gamber Village.

After relocation, the people of Gamber Village generally continued farming as before the eruption and relocation occurred. Farmers are the only livelihood that suits them. Some of the training outside farming field provided to the community as an alternative outside farming was unsuccessful. They feel that they are not talented other than farming, so the community only focuses on agriculture. Some people whose agricultural land has not disappeared because of the eruption are still carrying out agricultural activities in Gamber Village. Some others, even though the agricultural land has disappeared but still rents land in Gamber Village and other red zones.

The main reason is that the land purchased using funds provided by the government is insufficient and some have not yet been produced. Another reason, the cost of renting agricultural land in the red zone is cheaper than land the safe zone. In addition, agricultural land in red zone can be rented annually. If outside the red zone, rent for agricultural land is generally more expensive and must be rented for more than one year. This is certainly burdensome for some people to finally be decided to remain active in the red zone. Besides they are farming on their own land or rent, at certain times people also work on other people's land as farm workers (its call *aron* in Karo language) to fulfil their daily needs. For one day working hours, every person will get a salary of 80-150 thousand rupiah, depending on the type of work done. This explanation is suitable to general opinion that volcanic areas are often places of great natural beauty, rich farmland, and bountiful recreational opportunities. The positive aspects of living in volcanically active areas further complicates how people perceive risk. It's due to the perceived benefits of residing in these areas may work to outweigh the risks posed by a potential eruption [4].

1.3. Hazard of Sinabung Eruption in Gamber Village

Sinabung Volcano eruption hazards are divided into 2 types, namely primary hazards and secondary hazards. The primary danger of the Sinabung Volcano eruption consists of hot clouds, lava flows, pyroclastic fall or avalanches, and volcanic ash. While the secondary hazard of Sinabung Volcano eruption is lahar flow [1].

The threat of the eruption of Sinabung Volcano in Gamber Village are pyroclastic avalanches and flow of hot clouds. Since the end of 2013, Gamber Village has been designated as a red zone from

the eruption of Sinabung (Figure 3). Based on the PVMBG recommendation, in Gamber Village there should be no community activity because it is dangerous from the threat of hot clouds, incandescent lava, bombs, lapilli, thick ash and other material from eruptions. The Karo government evacuated the Gamber community to refugee camps in a safe area. But there are some people who return to Gamber Village. They do not believe the threat of hot clouds to their villages. Until the eruption on May 21, 2016, Gamber villagers believed that hot clouds arrived in their villages. There were 9 victims died from being blown by hot clouds.

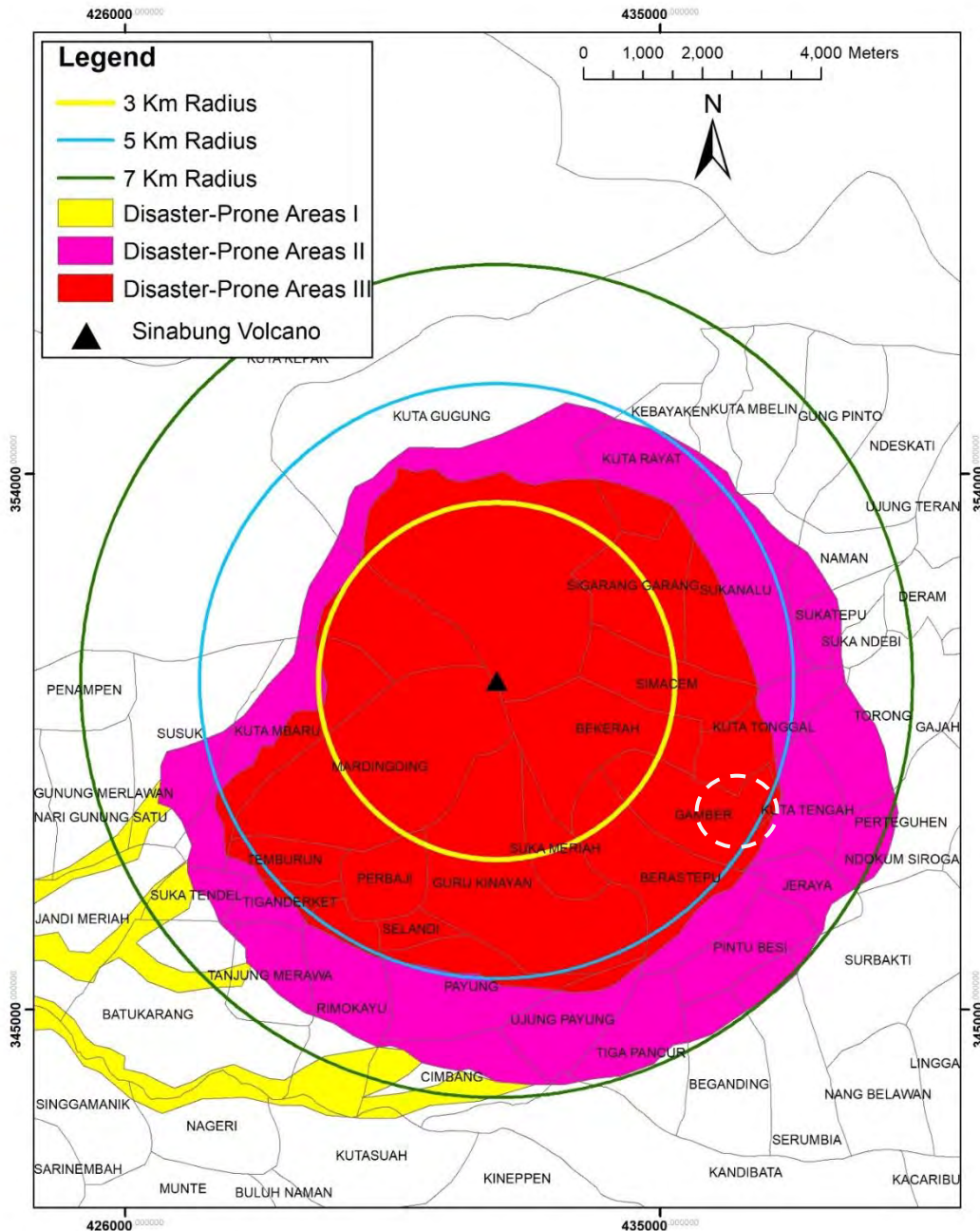


Figure 3. Gamber Village was included in red zone of Sinabung Volcano

1.4. The People Resilience of Gamber Village to the Sinabung Eruption

The resilience of Gamber’s community is determined by Twigg (2007) [5]. Twigg (2007) stated that to determine the resilience of community can consider 5 components consist of governance, risk assessment, knowledge and education, risk management and vulnerability reduction, disaster preparedness and response [5]. Determination of resilience of people in Gamber Village is divided in to 3 phases namely 2010, 2013 – 2016, and 2016 – now.

After in dormant phases, in 2010 The Sinabung Volcano erupted its material to its surrounding. Some villages within 4 km of the peak of Sinabung Volcano evacuated to safer place. One of the village was Gamber Village. People in Gamber Village evacuated to Kabanjahe for a month. They stayed in mosque, church dan refugee barracks. Most people of Gamber are farmer who have farm in the foot slope of Sinabung Volcano. Therefore, during evacuation they did not do activities in the farmland. After 1 month, the people of Gamber Village return to their village because the activity of Sinabung already decreased.

In 2010 was the first time Sinabung had erupted after for about 400 years showing no activity. This has an impact on people's attitudes in facing the eruption of Sinabung. In addition, there is very little knowledge about volcanic eruptions. Previously the people of Gamber village never seen Sinabung volcano erupt so they were very afraid to the phenomenon. This makes it easier for evacuation process to safer places. The government was shocked with the eruption of Sinabung. This had an impact in dealing with refugees because Local government are not ready to handle it. In 2010, the Regional Agency for Disaster Management (BPBD) in Karo district had not been formed, so the coordination to handle volcanic eruption was not well structured.

In 2013, it occurred Sinabung eruption again which cause Gamber Village be appointed as red zone. Therefore, people in Gamber Village have to evacuate. Between 2013 and 2016, disaster management of Sinabung eruption has begun to run well by forming BPBD in 2014 although the mechanism of disaster management was not clear. In 2016, the government had a plans to relocate Gamber’s community to Keci-Keci I Village, Keci-Keci II Village, and Nang Belawan Village.

In 2017, people in Gamber Village started to relocate to Keci-Keci I Village, Keci-Keci II Village, and Nang Belawan Village. From 2016 to 2019, the volunteer which help the community have organization which called Beidar. From three phases, it can be concluded that the resilience of people in Gamber Village increase. However, the mechanism of disaster management is still not clear. The relisience of people in Gamber Village The component of resilience of Gamber people showed in Table 1.

Table 1. The components of Resilience

| Thematic Area | Capacity | Year | | |
|---------------|-------------------------------------|---|--|--|
| | | 2010 | 2013 – 2016 | 2016 – now |
| Governance | Policy and planning capacity | <ul style="list-style-type: none"> - BPBD had not been formed - The mechanism of disaster management was not clear - There were no plans to handle the impact of Sinabung eruption | <ul style="list-style-type: none"> - BPBD has been formed in 2014 - The mechanism of disaster management was not clear - There is a plans to relocate Gamber’s people | <ul style="list-style-type: none"> - BPBD has a role to handle disaster - The mechanism of disaster management is still not clear - The relocation of people in Gamber Village to Keci-Keci I and II and Nang Belawan |
| | Physical and environmental capacity | <ul style="list-style-type: none"> - Basic services such as water | <ul style="list-style-type: none"> - Basic services such as water | <ul style="list-style-type: none"> - Basic services such as water |

| Thematic Area | Capacity | Year | | |
|---|--|---|--|--|
| | | 2010 | 2013 – 2016 | 2016 – now |
| | | were not optimal | were not optimal | were not optimal |
| Risk Assessment | Hazard/risk data and assessment | - not all relevant stakeholders are involved in the disaster risk assessment | - All relevant stakeholders are involved in the disaster risk assessment | - All relevant stakeholders are involved in the disaster risk assessment |
| Knowledge and Education | Public awareness, knowledge and skills | - The community were not involved in risk assessment - The community did not have knowledge and skills about eruption hazard | - The community were not involved in risk assessment - The knowledge and skills of the community were limited | - The community were not involved in risk assessment - The knowledge and skills of the community were limited |
| | Information management and sharing | - Government is committed to share information to community | - Government is committed to share information to community | - Government is committed to share information to community |
| | Education and training | - The people and student did not get training | - The government and non-government provide training to the community and student | - The government and non-government provide training to the community and student |
| Risk Management and Vulnerability Reduction | Sustainable livelihoods | - Livelihoods are dominated by the agricultural sector - Do not able to create diversification of livelihoods | - Livelihoods are dominated by the agricultural sector - Do not able to create diversification of livelihoods - There is training but the community is not interested. | - Livelihoods are dominated by the agricultural sector - Do not able to create diversification of livelihoods - There is training but the community is not interested. |
| Disaster Preparedness and Response | Organisational capacities and coordination | - Regular training do not exist | - Regular training do not exist | - Regular training do not exist |
| | Participation, voluntarism, accountability | - There are group of volunteer but still not organised | - The volunteer already well organised | - The volunteer already well organised |

Conclusion

Based on the result and discussion, it can be summarized that:

- The physical characteristics of Gamber Village is located at the foot slope of Sinabung Volcano in the south east direction. This village covered by pyroclastic material after eruption in 2016
- The socio-economic characteristics of Gamber Village is most people in Gamber Village work as farmer in farmland near their village. After eruption in 2016, some people were lose their farmland.
- The hazards of the eruption of Sinabung Volcano in Gamber Village are pyroclastic avalanches and flow of hot clouds.
- The resilience of people in Gamber Village increased from 2010, 2013 – 2016 and 2016 – now. The increasing of people resilience showed from the knowledge and education, risk assessment, and disaster preparedness and response.

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