KRB III Merapi

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Land Conversion and Disaster Mitigation Models in Indonesia: Case Study at Disaster Prone Areas II and III of Mount Merapi, Sleman Regency

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Abstract

Mount Merapi is one of the most active volcanoes in Indonesia. In 2010 Mount Merapi erupted violently and caused many residents living around the slopes of Merapi losing their lives, homes, livestock and property. The government through Regent Regulation No. 20/2011 divided the slopes of Mount Merapi into three categories namely Disaster-Prone Areas (KRB/*Kawasan Rawan Bencana*) III, KRB II and KRB I. This study aims to identify the conversion of agricultural land into housing in KRB III and II and to analyze the factors which caused residents to be interested in living in KRB, as well as to review the appropriate disaster mitigation models for residents in the area. The research location is in Pakem and Turi Districts, Sleman Regency. The sampling technique used snowball sampling with eight informants. The results are as the following. 1) In Turi District, the dry land is changed into settlements which covering an area of 124.37 ha or 14.77 ha per year, while in Pakem District changes in the use of dry land into settlements are covering an area of 102.27 ha or 11.36 ha per year. The rate of increasing conversion of agricultural land into housing in the two districts is 11 per cent per year. 2) The factors which caused residents to be interested in building houses and feel comfortable living in KRB II and III Mount Merapi are environmental, economic and social factors. 3) The disaster mitigation model which can be applied at the research site is the community-based disaster mitigation model.

Keywords: land conversion, settlements, Disaster Prone Area (KRB) III, Disaster Prone Area (KRB) II, disaster mitigation

Introduction

Mount Merapi is one of the most active volcanoes in Indonesia, with a short eruption period of two to seven years. This mountain is located on the border of Central Java Province and the Special Region of Yogyakarta. The eruption of Mount Merapi on October 26 to early November 2010 has caused natural damage due to the hot cloud bursts which damaged the ecosystem and residential environment of residents around

Mount Merapi. In addition, this eruption took the casualties of approximately 277 people in the Special Region of Yogyakarta and 109 people in the Central Java region (National Disaster Mitigation Centre, December 12, 2010). In addition to the fatalities, there were also material and non-material losses in the form of houses and agricultural land which were destroyed by the hot lava released by Mount Merapi as well as the psychological condition of the victims of this eruption.

After the 2010 eruption of Merapi, the government through Regent Regulation No. 20/2011 divided the slopes of Mount Merapi into three categories based on the impact and risk of the eruption of the mountain on the lives of the people living in the vicinity, namely Disaster-Prone Areas (KRB/*Kawasan Rawan Bencana*) III, KRB II and KRB I. Map of KRB Mount Merapi acted as the technical reference for the surrounding area in carrying out disaster mitigation, especially in the event of an eruption (Ratnawati, et.al., 2013). KRB I is an area which has the potential to be hit by hot lavas/floods and is affected by the expansion of hot clouds and lava flows. KRB II is a disaster-prone area which consists of two parts: mass flow and material flow. Mass flow can be in the form of hot clouds, lava flows and lava, while the material flow is in the form of falling material and throwing stones (incandescent). KRB III is an area which is close to the source of danger so that it can be ascertained that it will be hit by hot clouds, lava flows, rock avalanches, throwing stones (incandescent) and heavy ash rain. The high level of vulnerability in KRB III turned this area to be forbidden for permanent housing.

Based on the Regent Regulation No. 20/2011 concerning Disaster-Prone Areas of Mount Merapi, the Sleman Regency Government, Special Region of Yogyakarta, prohibited the construction of new permanent housing in KRB III Mount Merapi, which was located in Turi, Pakem, Cangkringan, and Ngemplak Districts. KRB III in Merapi which covers an area of approximately 4,672 hectares is still allowed for residential use. However, it must be zero growth or without the development of new permanent buildings.

Although many disasters had occurred, the number of people who live and work daily in areas which are at risk of the dangers of hot clouds is increasing. The population inhabiting KRB III which are considered as areas historically known for being badly affected by pyroclastic flows and KRB II which are classified as areas can still be reached by falling loose materials such as bombs and lapilli continues to increase. Until 2010 before the big eruption occurred, the population in the area was approximately 100 thousand people in KRB III and 140 thousand people in KRB II (BPS, 2011). After the 2010 eruption of Merapi, from approximately 4,000 families who had lived in the KRB III area, more than 2,000 families have been persuaded by the government to occupy safer permanent residences. In 2018, there were 587 families living in KRB III (*Tempo*, 24 May 2018).

Based on the field facts, currently there are still residents who are desperate trying to build houses in their original settlements which were damaged by the 2010 Merapi hot clouds. The number is insignificant and the average settlements requested are semi-permanent housing. The reason people are still reluctant to live in permanent housing (*hunian tetap/huntap*) relocation provided by the government due to all of their livelihoods and land are on the slopes of Merapi or classified as KRB III. According a few residents, the shelter or *huntap* was just a precaution when the hot clouds of Merapi hit the *padukuhan* area in KRB III again. So just in case Merapi erupted again, they will come down and live in shelters (*Republika*, 02 January 2019). Meanwhile,

according to Dwi Antoro Widodo, et.al. (2017), people feel comfortable and secure to stay in their area even though the area is prone to Mount Merapi disaster due to environmental, economic, and social factors. Factors such as soil fertility, potential for sand, pebbles, stones, greater income than Sleman's regional minimum wage, their relatives still live in one location and are active in social activities such as social gathering, recitation, and other associations.

Based on the preview above, this research aims to review the agricultural land conversion into settlements in KRB II and KRB II Mount Merapi, Sleman Regency during the period 2011-2019, factors causing local people to be interested in staying in the areas, and the appropriate disaster mitigation models for the locals who live in the research location.

Literature Review

Land Use Conversion

According to Ritohardoyo (2009) in Trigus Eko and Sri Rahayu (2012), the definition of land use and land utilization is the same, that is about human activities above the land of earth to meet their needs. Land use/utilization is a complex mixture of various characteristics of ownership, physical environment, structure and use of space (Kaiser, et.al., 1995). The pattern of land use/utilization is the regulation of various activities. Social activities and activities to support the sustainability of life require the number, type and location. Land use is divided into two main types of use, namely agricultural land use and non-agricultural land use. Agricultural land will be including dry fields, rice fields, plantations, production and protected forests, grasslands and grasslands, in which land for livestock and fisheries are included (Arsyad, 1989). Meanwhile, according to Bintarto (1977) in Trigus Eko and Sri Rahayu (2012), there are three spatial forms of land use for settlements/housing, especially in rural areas, namely Nucleated Agriculture Village Community, Line Village Community, and Open country or trade centre community.

Based on Wahyunto, et.al. (2001) in Trigus Eko and Sri Rahayu (2012), the land use conversion is an increase in land use from one side of use to another followed by a decrease in other types of land use from one time to the next or a change in the function of a land use over the time. In its development, the land conversion will be distributed in certain places which have good potential. In addition to the distribution of the change in use, land will have patterns of land use conversion. According to Bintarto (1977) in Wahyudi (2009), the distribution pattern of land use change is basically categorized into a. Elongated pattern following the road, b. Elongated pattern following the river, c. Radial pattern, d. Scattered pattern, e. Elongated pattern following the coastline, and f. Elongated pattern follows the coastline and railroad tracks.

2010 Merapi Eruption and the Changes Following the Eruption

The explosive 2010 eruption of Merapi slightly deviating from the type of Merapi eruption, brought quite a number of casualties. The 2010 eruption of Mount Merapi was bigger than the eruption of the volcano more than 100 years ago in 1872 when it is calculated from the amount of volcanic material released. In the 1872 eruption, the

amount of volcanic material ejected during the eruption was around 100 million cubic meters, while in the 2010 eruption, the amount of volcanic material ejected during the eruption reached 140 million cubic meters (*Kompas* & Subandrio, 9/11/2010). The amount of volcanic material ejected is one of the important indicators for estimating the magnitude of the eruption index of a volcano. The catastrophic eruption of Mount Merapi has resulted in 386 deaths and 15,366 people being displaced in refugee camps in regencies/cities in Yogyakarta Special Region and Central Java Provinces. The displaced people are those who have lost their homes and are within the hot cloud danger zone radius (< 20 km). The eruption of Mount Merapi in Yogyakarta Province has caused damage and losses of up to Rp2,141 trillion which is dominated by the productive economy of Rp803.551 billion and the residential sector of Rp580,820 billion. In addition to those two sectors, the damage and loss assessment also takes into account the impact of damage and losses on three other sectors, namely the socio-cultural sector, settlements and infrastructure (Ratnawati, et.al., 2013).

Merapi Areas Spatial Policies

The Regency Government of Sleman has formulated three policy strategies in the distaster reduction concept in relation to the land use in Disaster-Prone Areas of Mount Merapi. Following the detailed policy formulation.

1. To control the activities in the disaster-prone areas in order to reduce the disaster reduction of Mount Merapi volcano;
2. To control the activities taking place in the disaster-prone areas by restricting the regulation on building and environmental arrangements;
3. To develop the infrastructure to reduce the disaster risks.

The policies of Regency Government of Sleman are issued in the Regent Regulation No. 20/2011 concerning the Disaster-Prone Areas. The regent regulation regulated the provisions of areas which are prohibited for occupancy and which are limited to occupancy in certain areas (see Table 1).

Table 1. Zoning Regulations in Disaster-Prone Areas

No	Activities	Disaster-Prone Areas III	Disaster-Prone Areas II	Disaster-Prone Areas I
1	Settlement	X*)/L	L	L
2	Disaster management	A	A	A
3	Utilization of water resources	A	A	A
4	Forestry		A	A
5	Agriculture	A	A	A
6	Conservation	A	A	A
7	Fisheries	A	A	A
8	Science	C	C	C
9	Research	C	C	C
10	Tourism	C	C	C

Source: Regent Regulation No. 20/2011
Note: A = Allowed L = Limited C = With Conditions X = Prohibited

*) = For nine *Padukuhan* Pelemsari, Pangukrejo, Kaliadem, Petung, Jambu, Kopeng, Kalitengah Lor, Kalitengah Kidul and Srunen (Cangkringan District)

Table 1 shows that residential areas are prohibited in nine *padukuhan*, namely Pelemsari, Pangukrejo, Kaliadem, Petung, Jambu, Kopeng, Kalitengah Lor, Kalitengah Kidul, and Srunen. The nine *padukuhan* are located in Cangkringan District. Meanwhile, for areas other than those nine *padukuhan*, housing are still allowed for those which already exists and was not seriously damaged during the 2010 eruption, there is no development (zero growth), and the people who live in those houses are willing to be evacuated when the status of Merapi Volcano is alert.

Besides being prohibited from developing new residential areas, in KRB III it is also prohibited to perform trading and services in the settlements. Meanwhile it is still possible in the KRB III area to perform disaster management activities, utilization of water resources, forestry, agriculture, conservation, and fisheries. Furthermore, science development, research, and tourism activities are allowed on condition that these activities are not leading to residential activities and these activities are prohibited when the status of Mount Merapi volcano reaches the alert status, except for activities in the context of disaster management.

KRB III of Mount Merapi is located about 5-8 km from the peak of the mount and it is an area located close to the source of danger which is often hit by hot clouds, lava flows, rock slides, throwing stones (incandescent) and heavy ash rain. Due to the high level of vulnerability, this area is not allowed to be used as permanent housing. The determination of KRB III boundaries is based on the history of Merapi activities in the last 100 years (Bappenas & BNPB, 2011; Ratnawati, et.al., 2013). There are 3,612 families in Central Java and the Special Region of Yogyakarta who live in KRB III and need relocation to a safer place (Ni'am, 2014), both from the threat of eruptions and the cold lava of Mount Merapi.

Policies regarding the KRB II are that these areas may be permitted with activities in the name of disaster management, utilization of natural resources, forestry, agriculture, animal husbandry, fisheries, plantations, conservation. Meanwhile, science, education, research and nature tourism activities are permitted on condition that they follow government instructions if the status of Mount Merapi is on standby. These areas can also be designated as limited housing for residents in the districts where the residence is located. In addition, this area can also be developed for the construction of infrastructure and facilities with a scale of community service in one district. Meanwhile, according to the government's policy in KRB I, the Government of Sleman is allowing the development of disaster management activities, utilization of natural resources, forestry, agriculture, fisheries, plantations, conservation, science, education, research, and nature tourism (https://bappeda.slemankab.go.id/).

KRB II which is located about 10 km from the peak of Merapi consists of two parts, namely a) mass flow in the form of hot clouds, lava flows and lava, and b) ejection in the form of falling material and throwing stones (incandescent). In KRB II, the community is required to evacuate if there is an increase in volcanic activity in accordance with the recommendations of the Centre for Volcanology and Geological Hazard Mitigation until the area is declared safe again (Bappenas & BNPB, 2011; Ratnawati, et al., 2013).

KRB I is an area which has the potential to be affected by lava/floods with the possibility of being exposed to the expansion of hot clouds and lava flows. Lava is a mass

flow in the form of a mixture of water and loose material of various sizes originating from the height of the volcano. From the 2010 eruption of Mount Merapi, from around 130 million m3 of the lava, approximately 30 to 40 per cent of the lava enters Gendol River in the form of hot clouds, while the rest goes into other large rivers which have their headwaters at the top of Mount Merapi (Bappenas & BNPB, 2011; Ratnawati, et.al., 2013).

Cangkringan District in Sleman Regency is included in the three areas, namely KRB I, KRB II and KRB III. The Sleman Regency Government has designated nine *padukuhan* in Sleman Regency area as Disaster-Prone Area (KRB) III which are not suitable for use as residential areas, but these areas are still inhabited. The nine *padukuhan* are Palemsari and Pangukrejo in Umbulharjo Village; Kaliadem, Petung, Jambu, and Kopeng in Kepuharjo Village; and Kalitengah Lor, Kalitengah Kidul, and Srunen in Glagahharjo Village. However, there are three *padukuhan* of which refuse to be relocated. The three *padukuhan* are Kalitengah Lor, Kalitengah Kidul and Srunen, which are all located in Glagaharjo Village (Herianto, et.al., 2012). Based on the 2016 monograph of Glagaharjo Village, the population in the three *padukuhan* is 1,317 people, which consists of 506 people in Kalitengah Lor, 336 people in Kalitengah Kidul, and 475 people in Srunen.

Research Methods

This study uses a descriptive qualitative approach. As for the research location, it is located in Turi and Pakem Districts. Both districts are located in KRB III and II Mount Merapi, Sleman Regency.

Snowball sampling technique is used to get an idea of the factors which cause people to still be interested in building houses and living in the research location. There were eight informants who were willing to be interviewed. Initially, the researcher contacted one informant in Donokerto Village (Turi District) and one informant in Purwobinangun Village (Pakem District). Then from these informants, the researcher got other informants whose built their houses and lived in the research location after the big eruption of Mount Merapi in 2010.

Data is collected by performing observation and interviews. Meanwhile observations were made by field observations in the research area, especially in Pakem and Turi Districts, which include KRB III and II of Mount Merapi. As for the qualitative data, it is obtained through in-depth interviews with several informants who built houses and lived in KRB III and II after the 2010 Merapi eruption.

Results and Discussion

Population in KRB III dan II of Merapi Mount in Sleman Regency

Based on Table 2, the number of people living in KRB III and II is quite large in number. In Turi District, there are 3,223 people who still live in KRB III and 4,006 other people live in KRB II. In Pakem District, there are 7,645 people who still live in KRB III and 1,328 people in KRB II. Meanwhile in Cangkringan District, there are 4,621 people who still live in KRB III and 3,433 people in KRB II. Vulnerable groups, namely children

under five and the elderly, which are as listed in Table 2 need to have more attention, especially during the eruption of Merapi. Therefore, it is necessary to make better disaster mitigation in order to minimize the loss of life and property in the area if at any time Merapi erupts again.

Table 2. Number of Population in KRB III and KRB II Merapi Mount in Sleman Regency

District	Disaster-rone areas III	Disaster-prone areas II
1. Cangkringan	3668	2838
Vulnerable group	953	595
Total Cangkringan	4621	3433
2. Pakem	5871	1000
Vulnerable group	1774	328
Total Pakem	7645	1328
3. Turi	2013	3399
Vulnerable group	1210	601
Total Turi	3223	4000
Total	**15489**	**8761**

Source: http://www.slemankab.go.id/

Land Use Conversion in KRB III and II Merapi Mount in Sleman Regency

The land need for housing is increasing along with the rapid population growth, but the availability of land is running low. This also happens in the slopes of Merapi on which the residential land is increasing from year to year, both in KRB III and KRB II.

Turi District has an area of 43.09 km2 (4,309 ha) and consists of four villages, namely Bangunkerto, Girikerto, Wonokerto, and Donokerto Villages. Girikerto and Wonokerto Villages are included in KRB III and II, while Donokerto Village is categorized as KRB II and KRB I of Mount Merapi.

Based on BPS (2011), the land use in Turi District is dry land and in a total of 2,330.71 ha or 54 per cent of the total area of Turi District, while residential land is 1,325.25 ha or 30 per cent of the total area of Turi District. The area of rice fields is 345.98 ha (8.02 per cent) and another land use is 306.86 ha (7.12 per cent).

Another data from BPS (2019) shows that the land in Turi District is assigned for the use of paddy fields, settlements, fields and others. The most land use is dry land/land covering an area of 2,147.58 ha or 49.8 per cent of the total area of Turi District. Meanwhile, the residential area is 1,449.62 ha or 33% of the total land area in Turi District. The area of rice fields is 272 ha (6.31%), and 439.80 ha (10.20%).

Thus, it can be seen that in the span of nine years (2011–2019), in Turi District, there has been a change in the use of paddy fields and dry fields into settlements covering an area of 124.37 ha or 13.8 ha per year. Another statement can be mentioned that the rate of increase in the conversion of agricultural land into housing is 11 per cent per year. Meanwhile, the change of paddy fields and dry fields into other land uses, such as vacant land, which is likely to become a settlement covering an area of 132.94 ha or 14.77 ha (see Table 3 and 4).

Table 3. Settlements Land Area Change in Turi District (2011-2019)

Village	Disaster-prone areas	Settlement Land Area (Hectares)		
		2011	2019	Change
Bangunkerto	II	277.15	294.05	16.90
Donokerto	II	249.41	323.60	74.19
Wonokerto	III	504.58	522.00	17.42
Girikerto	III	294.11	310.00	15.89
Total		**1325.25**	**1449.62**	**124.37**

Source: Yunita (2021)

Table 4. Land Use Change in Turi District (2011-2019)

Land Use	Land Use Change (Hectares)		Change
	2019	2011	
Paddy fields	272.00	345.98	-73.98
Settlements	1449.62	1325.25	124.37
Dry filelds	2147.58	2330.71	-183.13
Other	439.80	306.86	132.94
Total	**4309.00**	**4309.00**	

Source: Yunita (2021)

Pakem District has an area of 43.84 km2 (4,384 ha) and consists of five villages: Hargobinangun, Purwobinangun, Candibinangun, Harjobinangun, and Pakembinangun. Hargobinangun and Purwobinangun Villages are included in KRB III of Mount Merapi. Meanwhile, the other three villages are included in KRB II of Mount Merapi.

Based on Pakem District in Figures (2020), in 2019 the agricultural land in Pakem District was 3,192 ha which consisted of 2,874 ha rice fields, 295 ha corn fields, 23 ha sweet potato and peanut fields. Meanwhile the residential and other land area are 1,192 ha.

The researchers did not receive the land use data in Pakem District in the years before 2019 due to time constraints and others. So, to determine the increase in land conversion, the researchers used assumptions from the data in Turi District. The area of residential land in 2019 in Pakem District is 1,192 ha and it is assumed that in 2019, there has been an addition of 102.27 ha of residential land. Also based on that assumption, in 2011 residential land in Pakem District was 1,294.27 ha.

Based on the land use data in 2011 and 2019 as mentioned above, it can be stated that during nine years (2011–2019), in Pakem District there has been a change in the use of dry land into residential areas covering an area of 102.27 ha or 11.36 ha per year. In other words, it can be said that the rate of increase conversion of agricultural land into housing is by 11 per cent per year.

Based on the land conversion data in the Turi and Pakem Districts as described above, it can be seen that in the nine-year period (2011-2019), on average there has been conversion of agricultural land into settlements covering an area of 13.07 ha per year, both in KRB II and KRB III.

There are many factors which cause people to be interested in building houses in the research location. This resulted in an increase in the area of residential land. The factors which motivate people to live in disaster-prone areas are described in the following sub-chapter.

Factors Causing People to be Interested in Building Houses in KRB III and KRB II of Mount Merapi, Sleman Regency

The zoning of KRB II and III of Mount Merapi is stated in the Regent Regulation No. 20/ 2011 concerning Disaster-Prone Areas. In this regard, since the issuance of the regent regulation, the construction of new housing in KRB III area is prohibited. Meanwhile, in KRB II, it is still permissible to build permanent housing on a limited basis only and it is for residents who live in the same sub-district. Likewise, for those who had already lived in KRB III and II before the 2010 eruption of Merapi, they are still allowed to live in the area, but there is no development of their settlements, either upward or side ward.

The results of interviews with people who built houses in KRB III and II Mount Merapi can be seen in Table 5 below.

Table 5. Interview Results of People Living in KRB III and KRB II Pakem and Turi Districts (2021)

No.	Informan	Location	Disaster-prone areas	Land and house area (m2)	Year of land and house ownership	Reasons for buying land in disaster areas
1.	RY (54 years old)	Village: Purbowinangun, District: Pakem	III	400	2016	The air is cool, built a small house and farm
2.	YH (50 years old)	Village: Purbowinangun, District: Pakem	III	400	2017	The place is cool and beautiful, for retirement homes, land prices are still cheap
3.	AN (47 years old)	Village: Purbowinangun, District: Pakem	III	400	2016	Land prices are still cheap, for investment in old age
4.	HR (45 years old)	Village: Purbowinangun, District: Pakem	III	800	2019	The air is still cool, land prices are still cheap, villas are built, road access is good
5.	AZ (41 years old)	Village: Purbowinangun, District: Pakem	III	500	2015	Good road access, the environment is still beautiful, houses are built for rest, fertile land for agriculture
6.	TZ (33 years old)	Village: Donokerto, District: Turi	II	800	2019	Land inherited from parents, built a house adjacent to the house of parents and relatives
7.	AA (31 years old)	Village: Donokerto, District: Turi	II	800	2019	Land inherited from parents, built house and rental houses

8.	BD (37 year old)	Village: Donokerto, District: Turi	II	800	2017	Land inherited from parents, built a house adjacent to the house of parents, fertile land for agriculture

Based on Table 5 above and as stated by Yunita (2021), it can be said that there are several reasons to make people interested in building houses and living in KRB II and KRB III Mount Merapi. The reasons are stated as the followings. It is comfortable, that their homes are inherited from their parents, it is close to relatives, the land is cheap, the area has good road access, and the environment is still beautiful. These findings are in line with research conducted by Dwi Rustiono Widodo, et.al. (2017), which stated that 61.6 percent of the people feel comfortable and secure in staying in their area even though the area is prone to disasters. The main environmental factors are soil fertility, potential for sand, pebbles and stones. Meanwhile the economic factors can be seen from 56.9 percent of the population have greater income compared to the regional minimum wage of 1.4 million rupiah per month. There are also 92.7 per cent of them who have relatives still living in one location and 95.4 per cent are active and participate in community activities, such as social gathering, recitation, and other associations.

Based on the statement above, it can be stated that the comfort and tranquility of staying in the disaster-prone area of the Merapi eruption is determined by environmental, economic and social factors as described above. This is also reinforced by data on the distribution of the population in KRB III and KRB II, which are still high, namely 15,489 people (KRB III) and 8,761 people (KRB II) (See Table 2.).

Disaster Mitigation Model in KRB III and KRB II of Mount, Sleman Regency

Disaster mitigation is an action taken to prevent or reduce the impact caused by a disaster. Mitigation is the foundation of disaster management in which the implementation of mitigation is highly complex because it requires the support of many parties. According to Nur Isnainiati, et.al. (2014) disaster mitigation carried out on the slopes of Merapi, Sleman Regency is in the form of structural and non-structural mitigation.

a. Structural and Non-Structural Mitigation

Structural mitigation is efforts to reduce the level of vulnerability towards a disaster through disaster-resistant buildings. This mitigation is carried out by construction of physical infrastructure using various disaster-resistant technological approaches. Some of the structural mitigations carried out around the slopes of Mount Merapi are as follows. 1) Construction of houses according to disaster-prone area standards, 2) construction of *sabo* dams for handling lava flows along rivers which have the potential to be affected by lavas, 3) procurement of early warning systems, 4) construction of refugee barracks, and 5) provision of fleets evacuation.

Non-structural mitigation is a mitigation effort which is carried out in addition to the construction of physical infrastructure. The form of this mitigation can be done through the formation of regulations by the government and other things. Some of the non-structural mitigations carried out around the slopes of Mount Merapi are as

follows. 1) Monitoring the observation of the status of Mount Merapi, 2) disseminating information via radio or community radio, 3) making collaborative maps of disaster-prone areas, 4) socializing in the form of scientific explanations of the actual condition of Mount Merapi, and 5) increasing community capacity through Village Disaster Resistant program.

Disaster Mitigation based on Community

In order to carry out structural and non-structural mitigation, the Sleman Regional Government always involves the community, NGOs, the private sector and related agencies. In the implementation of mitigation, the Sleman Regional Government carries out a community-based disaster risk reduction mitigation strategy, so that in various matters related to mitigation activities, the community is always included. Moreover, for people who live on the slopes of Mount Merapi consider Mount Merapi as a blessing, instead of a threat.

In addition to the participation, people living in the slopes of Merapi have also had initiatives to make themselves empowered in dealing with disasters. This is due to the fact that people are starting to realize that they should live in harmony and side by side with the dangers of the eruption of Mount Merapi. The community forms communities which participate in mitigation activities. Not only forming a community, the people also took the initiative to equip themselves in order to obtain accurate information. This initiation can be seen from the community's voluntary purchasing the handy talky (HT) independently even though tools based on the local wisdom, such as ringing the gong when a disaster occurs, is still practiced.

In implementing community-based disaster mitigation for the eruption of Mount Merapi, the government should always involve the people and communities in various mitigation activities. This community-based approach is expected to reduce the resistance to disaster mitigation activities.

Conclusion

Based on research on the land conversion and disaster mitigation models in KRB II and II of Mount Merapi, which in this case are in Turi and Pakem Districts, Sleman Regency, several things can be concluded as follows.

1. In Turi and Pakem Districts for a period of nine years (2011-2019), there has been a change in the use of dry land into settlements which covers an area of 13.07 ha per year. The rate of increasing conversion of agricultural land into housing in the two districts is 11 per cent per year.
2. The factors which cause residents to be interested in building houses and feel comfortable living in KRB II and III of Mount Merapi are environmental, economic and social factors. Environmental factors, such as soil fertility, potential for sand, gravel and stones, good road access, and the beautiful environment, are dominant. Meanwhile the economic factors are, such as the majority of the population earn more than the district regional minimum wage and land prices are still cheap. As for the social factors, factors such as residents have relatives who still live in the same location, the fact that they inherited homes from their parents, the residents are

active and participating in community activities, for examples social gathering, recitation, and other associations, are mentioned.

3. The implementation of the disaster mitigation program for the eruption of Mount Merapi in Sleman Regency, especially in Pakem and Turi Districts can run well due to the support of several factors, such as coordination, community participation, community initiation, collaboration between the government and the private sector/NGOs, and information. The disaster mitigation model which can be applied at the research location is a community-based disaster mitigation model.

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