



## MERAPI'S LAHAR BENEFIT AT PUTIH RIVER, MAGELANG

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### Abstract

Damage to settlements and agricultural land due to lahar in 2011 still leaves a mark that cannot be forgotten. The lahar disaster was caused by the collapse of the material from the eruption of Merapi Volcano which had accumulated in the upstream due to rainfalls having an average intensity of about 40 mm in 2 hours that occurs at rainy season from November to April. Putih River is one of river that effected by lahar disaster. This research wants to know community income before and after lahar disaster and usefulness of lahar material for community that affected by lahar disaster. The method to reach the aim are structure and in-depth interviews with people that effected by lahar disaster. The result is most of community that effected by lahar disaster has income increase by Rp12,500 until Rp100,000 per-day and the community can use the material lahar that deposit around Putih River by selling it as building material, and then they can build a building according Contractor, BPS, and Community standard.

**Keywords:** *Benefit, Lahar disaster, Putih River, Merapi Volcano, and Income*

### A. Introduction

Lahar classified as secondary hazard which the primer hazard is eruption from Merapi Volcano which can be in the form of scattering, lava flows, and pyroclastic glides. The Merapi Volcano eruption in 2010 was a higher eruption rate than the previous eruption in 2006, 5 times greater with the amount of material that came out in 2010 as much as  $\pm 150 \text{ m}^3$ , whereas in 2006 only issued as much as  $\pm 60 \text{ m}^3$  material (Kumalawati R. R., 2013).

Lahar is variant type of mudflow or debris flow that composed of pyroclastic material. Lahar in Putih River causes by material that Merapi Volcano which had accumulated in the upstream due to rainfalls having an average intensity of about 40 mm in 2 hours that start occurs at November 4, 2010 (Lavigne, 2000). There other river that effected by Lahar beside Putih river, there are Pabelan, Blongkeng, Lamat, Putih, Batang, Bebeng, and Krasak Rivers. Lahar hazard will be more dangerous when it concerns flat areas and densely populated areas.

Putih River is part of the Progo Watershed. Putih River is one of the western rivers that was badly affected by the lahar disaster caused by the eruption of the Merapi Volcano in 2010. Putih River is located between Blongkeng River and Krasak River, where Blongkeng River is in the northern part and Krasak River is in the southern part of the Putih River. Administratively Putih River is in 4 districts, namely Dukun District, Srumbung District, Salam District, and Ngluwar District.

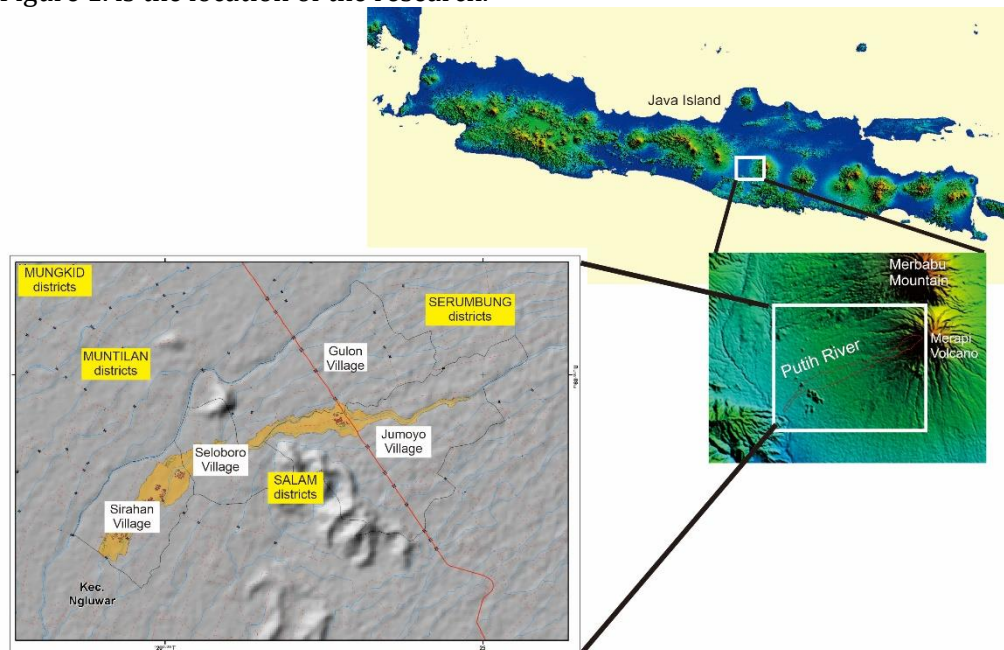
Lahar disaster caused damage to land use that occurred at several points, especially the area around the main river. Land use damage that occurred was dominated by mixed gardens with an area of 539,573.13 m<sup>2</sup> (56.73%), then a residential area of 125,936.63 m<sup>2</sup> (15.34%), rice fields with an area of 74,008.02 m<sup>2</sup> (9.02%), and moor covering an area of 64,552.50 m<sup>2</sup> (7.86%), and educational facilities covering an area of 16,837.01 m<sup>2</sup> (2.05%) (Kumalawati R. R., 2012).

Based on these conditions, the researchers formulated objectives: knowing community income before after lahar disaster and usefulness of lahar material for community that affected by lahar disaster.

## B. Methodology

### 1. Research Design

Putih River located at Magelang Regency, precisely in Salam District, consisting of Jumoyo, Gulon, and Sirahan Villages. The choice of location is due to the significant impact of the lava disaster. Figure 1. is the location of the research.



**Figure 1** Research Location

Identification of community livelihood transition is done by structured interviews and in-depth interviews. The interview sample was determined based on the population of the people affected by the 2011 lahar disaster which amounted to 979 houses with stratified random sampling technique based on the level of lahar hazard. The sample size used in this study uses the rules stated by (Suharsimi, 1966) which states that if the number of subjects is large, which is more than 100, it can be taken between 10-15%. Researchers took 15% with smaller errors, so that 119 houses were obtained as samples.

The usefulness of lahar material is measured by the income approach of respondents who make changes in livelihoods associated with the use of the results of changes in livelihoods specifically to the livelihoods of lava material miners to build damaged homes. The price of building a house is obtained from a study conducted by Kumalawati, (2014) with the distribution based on the standard price of building per-m<sup>2</sup> determined by PU, Contractors, BPS, and the community as well as the type of building being built. Table 1 below explains the standard price comparison per m<sup>2</sup> of housing construction.

**Table 1.** Standard price of building houses per m<sup>2</sup>

No	Building Type	PU (Public Works)	Contractor	BPS	Community
1	Permanent	Rp2,441,700	Rp1,250,000	Rp1,300,000	Rp1,000,000
2	Semi-Permanent	-	-	-	Rp600,000
3	Non-Permanent	-	-	-	Rp300,000

## 2. Instruments

Primer data such as structured interviews and in-depth interviews obtained using questioner, as many as 119 respondents that effected lahar disaster, for more information researcher also interviews village chief to get the overall condition of its citizens after the lahar disaster. Secondary data such as Lahar boundary 2011, administrative boundary, standard price of building houses per m<sup>2</sup>, land use damage, etc. researcher get from study of literature

## 3. Technique of Data Analysis

Evaluation of income is known by the method of before and after comparisons (Patton and Sawicki, 1991 in (Arikunto, 2002), which is to compare the income of the community before the impact of the lahar disaster and after the impact of the lahar disaster, so that it is known that changes in the level of income of the people affected by the lahar disaster have increased or decreased so that it is known that the condition of the community affected by the post-disaster lava disaster which is mining whether it is able to utilize lava material for sustainable life.

Price standards at table 1 used in the lahar benefit level analysis based on the per-m<sup>2</sup> building construction approach are all price standards (PU, Contractors, BPS, and Community) for permanent building types only.

## C. Findings and Discussion

### 1. Findings

According to result of interviews the increase in income can be seen in the comparison of community income before and after the lahar disaster shown in Table 2, it has an increase in income, where as many as 30% of respondents before the lahar disaster have an income of Rp25,001 - Rp50,000 after the lahar disaster has an income of Rp37. 501 - Rp75,000, which is an increase in income between Rp12,500 - Rp25,000. There were 13% of respondents who experienced the highest increase from Rp25,001 - Rp50,000 to Rp12,000 - Rp150,000 (the lowest level of income before lava crossed with the highest level of income after lava) or experienced an increase in income of Rp87,000 - Rp100,000 Only 1% of respondents did not experience an increase in income, with a decrease of-Rp12,500. Total the community that experienced an increase in income is 99%, just 1 % community that not experienced an increase in income.

**Table 2.** Comparison of Community Income Before and After Lahar Disaster

Level of income before lahar disaster	Level of income after lahar disaster				Total
	≤37,500	37,501 - 75,000	75,001 - 112,000	112,001 - 150,000	
≤ 25,000	0%	3%	1%	0%	4%
25,001 - 50,000	0%	30%	28%	13%	72%
50,001 - 75,000	0%	1%	7%	4%	13%
75,001 - 100,000	0%	0%	0%	10%	10%
<b>Total</b>	<b>0%</b>	<b>34%</b>	<b>37%</b>	<b>28%</b>	<b>100%</b>

Usefulness lahar material according to table 3 and 4 is known that the use of land material by building houses of various versions (PU, Contractors, BPS, and Communities) to build houses with the "PU" version cannot be fulfilled by miners. Only three standard versions of the price of building a house (Contractor, BPS, and Community) can be achieved by miners. Sirahan and Jumoyo Village can utilize lahar material to build houses in three standard versions of the price of building houses (Contractors, BPS, and Communities)

**Table 3.** The difference price for building houses by PU and Contractor standard

Village	Difference in PU standard		Difference in Contractor standard	
	Lowest	Highest	Lowest	Highest
Jumoyo	-Rp24,885,000	Rp200,340,000 <sup>-</sup>	Rp34,700,000	Rp38,000,000
Seloboro	-Rp74,001,600	Rp213,771,600 <sup>-</sup>	-Rp16,800,000	-Rp37,400,000

<b>Sirahan</b>	<b>-Rp1,501,200</b>	<b>-Rp73.262.700</b>	Rp41,400,000	Rp82,850,000
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**Table 4 The difference price for building houses by BPS and Community standard**

Village	Difference in BPS standard		Difference in Community standard	
	Lowest	Highest	Lowest	Highest
<b>Jumoyo</b>	Rp32,200,000	Rp28,000,000	Rp47,200,000	Rp88,000,000
<b>Seloboro</b>	- Rp19,200,000	-Rp44,800,000	-Rp4,800,000	-Rp400,000
<b>Sirahan</b>	Rp39,600,000	Rp76,300,000	Rp50,400,000	Rp115,600,000

According table 3 and 4 from the highest income that the community in Jumoyo Village can reach is RP88,000,000 (community standard) the same as building a house area 88 m<sup>2</sup>, the lowest income is Rp34,700,000 (contractor standard) the same as building a house area 34,7 m<sup>2</sup>. For Sirahan Village its highest income and larger house that can be build. Where the highest income is Rp115,600,000 (community standard) the same as building a house area 115,6 m<sup>2</sup>, the lowest income is Rp41,400,000 000 (contractor standard) the same as building a house area 41,4 m<sup>2</sup>.

## 2. Discussion

Before lahar disaster most of the community livelihoods are farmer and farmworker, after lahar disaster, they rice field buried by lahar, so they mine lahar material to recover the rice field. But after the rice field recovers, they continue mine lahar material and planting rice. That the reason why the community income rises after the disaster.

Usefulness lahar material can be reached by the community that live at Sirahan and Jumoyo Villages, this is because the village was one of the villages that were badly affected at the beginning of the lava (2011), so that it had an impact on the amount of lava material that had accumulated either in rivers, agricultural land, or on the road. The community uses this condition to benefit from lava material, where almost all people in Sirahan village conducted mining in 2011 to 2013. Until now in Sirahan village there are still many who do mine but not as much as miners from 2011 to 2013.

## D. Conclusion

According to the research 99% of the community that effected lahar disaster experienced an increase in income. That spread at Sirahan and Jumoyo Villages. Usefulness of lahar material according to community standard to build a house can be reach by the community who live in Sirahan and Jumoyo Village. They can build a house area 41,4 m<sup>2</sup> until 115, 6 m<sup>2</sup> using Community standard to build a house.

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