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Evaluation of community-based settlement reconstruction program: Case study in post-disaster recovery of 2010 Merapi volcano eruption in Cangkringan district, Sleman regency, Yogyakarta Province

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ABSTRACT

Merapi eruption in 2010 destroyed 3,083 houses in *Sleman* Regency. After passed through emergency phase, Government of Indonesia conducted resettlement reconstruction program for 2,083 houses in *Sleman* Regency.. This study aims to evaluate the settlement reconstruction program after *Merapi* 2010 eruption in *Cangkringan* District, *Sleman* Regency Yogyakarta province by factors abstracted from previous researches. Field survey held with the household questionnaires distributed to communities to evaluate the program by factors abstracted before. This study found out that community empowerment and community oriented, transparency and accountability, coordination of stakeholders are the supporting factors for *Merapi* 2010 eruption resettlement program. Meanwhile, Social condition of beneficiaries and miss-perception about Community-Based Settlement Reconstruction identified as constraining factors in this program.

1. Introduction

Natural disasters have been become a serious threat to human living for many centuries. From 1900 until 2015, up to 13,755 disasters happened all around the world, with the total death victim up to 35 million people and total losses reached out US $2.81 trillion (EM DAT, 2016). Indonesia is among the top 35 countries that have high mortality risks from multiple hazards with about 40 percent population living in areas at risk (Dilley et al, 2005). Up to 20,100 disasters occurred since 1900 until 2015 in Indonesia (BNPB, 2016). From that number, Volcano eruptions occupied 11th position with 127 events. Nevertheless, number of death victims of volcano eruption stand on second position with 23,555 people died.

Mount *Merapi*, an active stratovolcano with a height of 2,980 meters above sea level, geographically lies on 70 32.51 South Latitude and 110 26.51 East Longitude (Siebert et.al, 2010). Located at a border between Central Java and Yogyakarta Special Region, *Merapi* is one of the most active and dangerous volcanoes in Indonesia (Thouret et.al, 2000). On November 2010, Mount *Merapi* erupted, considered as the biggest eruption in 100 years (Jousset et.al, 2013).

Damages caused by the *Merapi* eruption impacted settlements, infrastructure, social, economic and cross-sector activities, causing disruptions to activities and public services in the area *Merapi*. At *Sleman* Regency, 277 people reported died because the eruption. The value of damage and losses suffered caused by this disaster reached Rp. 3.63 trillion (BNPB, 2011). In housing or settlements sector, total 2,682 houses in

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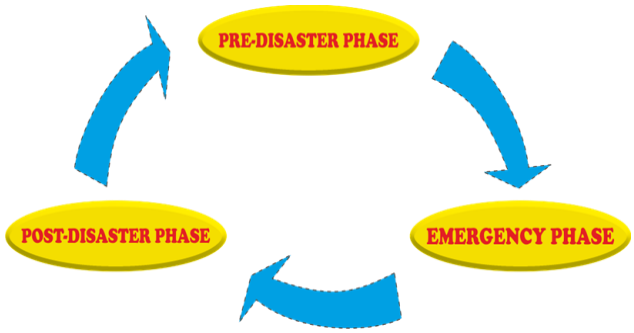
Sleman Regency heavily damaged. Meanwhile, 174 houses reported destroyed in Central Java Province (DPUP *Sleman*, 2013).

Disaster Management has been regulated in Indonesia by Disaster Management Act No.24/2007, which state about 3 (three) phases in disaster management. The phases are Pre-Disaster Phase, Emergency Response Phase and Post-Disaster Phase.

Figure 1. Disaster Management Phases Diagram



Source: Act No. 24/2007, Disaster Management

In emergency phase, victims of *Merapi* eruption placed in temporary shelter, called Huntara *(hunian sementara*). They live spread in to several locations, based on their origin of village before the eruption. These temporary shelter made from woven bamboo walls (in Javanese we called it *gedhek*).

After passing through emergency response phase, Government of Republic Indonesia conducted several post-disaster programs to rehabilitation and reconstruction. Based on The Action Plan, this program was planned held from 2011 until 2013, with budget estimation Rp. 1.3 trillion (BNPB, 2011).

One of the main program was settlement environment rehabilitation and reconstruction, which re-built for more than 2,000 houses that destroyed because *Merapi*'s eruption. It was not only houses that ruined would be re-build, but also with its environment and infrastructure. Therefore, it was a very complex task for government to handle.

It was not easy to conduct a massive rehabilitation and reconstruction program like this. Relocating a community, its economic activities, and its social networks and relations, as well as its natural physical and built environment (buildings, infrastructure, and facilities) is a complex process with significant impacts—direct and indirect—on the population and on governments (Correa et.al, 2011).

Since regulation decided that, the activity of rehabilitation and reconstruction of housing and settlements were to be conducted through the approach of community relocation from "Disaster Prone Areas" (KRB) III to safer area, the old location of settlement restricted to be reconstructed. Relocations were conducted on land owned by the community themselves (self-relocation) or on land prepared by the local government (collective relocation) and were conducted in stages in accordance with land availability and community readiness to participate in the relocation (*Rekompak*, 2012).

Based on the experience in previous disaster management (Aceh Tsunami in 2004 and Bantul Earthquake in 2006), BNPB Director Regulation No. 5 Year 2011, concerning the "Action Plan for the Rehabilitation and Reconstruction of areas post-*Merapi* 2010 eruption disaster", stipulated that the activity of rehabilitation and reconstruction of housing and settlements were to be conducted through the approach of community relocation from "Disaster Prone Areas" (KRB) III to safer areas through the *REKOMPAK* scheme.

Using *REKOMPAK* scheme, reconstruction not only rebuild houses but also settlements environment. Sanitation, water supply, road, green space and other facilities built on the new area. This multi-dimension project should be completed by community empowerment.

Several discussions about post-disaster settlement reconstruction mentioned about factors that influence the failure or success of the settlement reconstruction program. For example, Ophiyandri et.al (2013) proposed 12 critical success factors (CSFs) for community-based post-disaster settlement reconstruction program. However, one limitation of this research was that it focused only on the perspectives offered by government agents and experts and did not reference the views of affected citizens; another was that the case study referenced by the paper was limited to only a single post-disaster location. Nevertheless, no attempt has been made to review comprehensively the factors of post-disaster settlement reconstruction across multiple disaster type, which would be useful.

This paper aims to evaluate the settlement reconstruction program after *Merapi* 2010 eruption in *Cangkringan* District, *Sleman* Regency Yogyakarta province by factors that abstracted from previous researches.

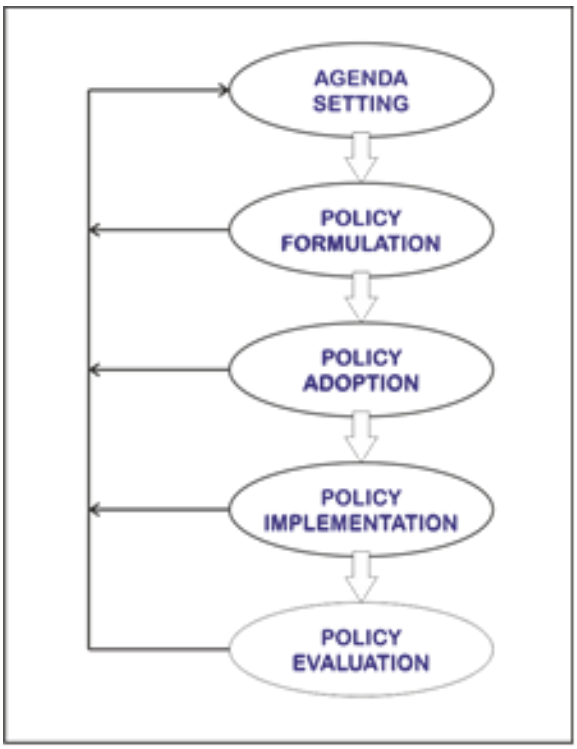
2. Theory

2.1. Policy Evaluation

There are several definitions of policy evaluation discussed among scholar. Dye in Widodo (2013) argued that the process of public policy includes identification of the policy problem, agenda setting, policy formulation, legitimating of policies, policy implementation and policy evaluation.

On the other hand, the main phases of public policy process explained by Dunn (2000), these phases are agenda setting, policy decision or policy formulation, policy adoption, policy implementation and policy evaluation.

Figure 2. Phases in Public Policy



Source: Dunn, 2000

Subarsono (2008) described that evaluation is to assess the activity level of policy's performance. Policy evaluation is to measure the success and failure of the implementation of public policy.

Dye in Parsons (1995) offers an excellent broad definition when he notes that policy evaluation is "learning about the consequences of public policy":

> *"Policy evaluation research is the objective, systematic, empirical examination of the effects on-going policies and public programs have on their targets in terms of the goals they are meant to achieve"*

Became one stage of policy process, policy evaluation has several purposes. Wibawa in Nugroho (2009) described policy evaluation purposes, i.e:

- explanation
- compliance
- audit
- accounting

Therefore, according to Wibawa (1994) policy evaluation, in principle, is used to evaluate four aspects of the public policy process, which are:

- The policy making process
- The implementation process
- The consequences of the policy
- The effectiveness of the policy impact

2.2. Disaster and Disaster Management

There were various perceptions about disaster; because of the complexity of events, disaster can be described in many ways (El-Masri and Tipple, 2002). Singh (2008:) stated, "A disaster is the consequence of natural hazard (e.g. volcanic eruption, earthquake, and landslide) which moves from potential in to an active phase, and as a result affects human activities.

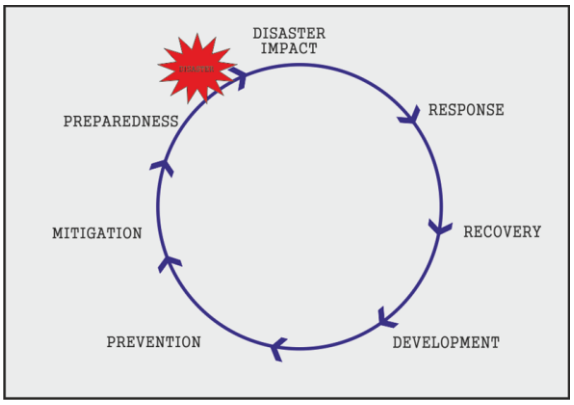
Another opinion from McEntire (2001), disaster can be seen as the negative effects of interaction between triggering agents – natural environment, human activity, or the combination of both – and vulnerability. According to Kumar in Moe and Pathnarakul (2006) disaster can be describes as the full predicament situations happen to the individual or communal.

The most comprehensive definition of disaster is combination of hazard that may come from human act or natural phenomena with the vulnerability condition (UNDP, 1992). According to Weichseigartner (2001) the vulnerability concepts itself is still fuzzy. It is happen because even though in the framework of disaster management, vulnerability can be seen from different point of view. Firstly, technically vulnerability is described as the potential exposure, or damage potential, of the hazard. Secondly, vulnerability is seen as the social coping ability, or resistance, to given hazard. It means that vulnerability is measured from coping ability, or resistance, to the given hazard. It means that vulnerability is measured from the society loss susceptibility point of view. Therefore, vulnerability is not only technical issue but also social issue.

Hyogo Framework (ISDR) stated that vulnerability can be defined as condition determined by physical, social, economic and environmental factor or process, which increase the susceptibility of a community to the

impact of hazards. Moreover, Carter (2008) explained the basic format of the disaster management cycle as Figure 3 follow.

Figure 3. Disaster Management Cycle



Source: Carter, 2008

3. Research Method

For the first step, this research abstracting factors that affected in settlement reconstruction from previous researches. These researches collected from several types of disaster and countries. From 32 researches in post-disaster settlement reconstruction collected, nine researches dropped. Moreover, authors then reviewed 23 studies left and abstracted some factor that have an important influence in post-disaster settlement reconstruction.

Furthermore, from the factors that abstracted before, we applied into part of household questionnaire on *Merapi* 2010' eruption community-based settlement reconstruction program in *Cangkringan* district case.

Cangkringan District is a one of 14 district in *Sleman* Regency, geographically located at the southern part of *Sleman* Regency, Yogyakarta Special Region with 20,904 inhabitant (BPS, 2015). Situated on *Merapi* mountain slope, consist of villages (*Umbulharjo, Kepuharjo, Wukirsari, Argomulyo,* and *Glagaharjo*); *Cangkringan* district has vulnerable risk disaster of *Merapi* eruption. We chose *Cangkringan* district as research location because this district worst affected of *Merapi* 2010 eruption, especially in settlement sector. *Merapi* eruption in 2010 destroyed 2,647 houses in *Cangkringan* district (DPUP *Sleman*, 2013).

The field survey (household questionnaire) held in *Cangkringan* District, *Sleman* Regency, Special Region of Yogyakarta at June 8–16, 2017. Based from the sample calculation by Slovin' formula (Omodanisi et.al, 2013), from 2,682 victims of *Merapi* eruption, there were total 97 questionnaires needed. In this study, 155 questionnaires distributed to respondent on the field survey. The questionnaires were directly asked from communities and 152 questionnaires completed filled by surveyor and analyzed, representing 98% of total questionnaires. These questionnaires drafted in local national languages, Bahasa Indonesia, even sometimes surveyors had to translate into local languages (Javanese) in the field. The survey used stratified sampling technique where respondent selected from several communal and scattered settlements at 5 villages in *Cangkringan* district.

In the questionnaires, respondent asked to rate the level of importance and satisfaction for factors abstracted before based on a five-grade Likert scale:

Table 1. Measurement in questionnaire

Likert scale	Importance	Satisfaction
1	very not important	very not satisfied
2	not important	not satisfied
3	moderate	moderate
4	important	satisfied
5	very important	very satisfied

Factors classified as "important" and "satisfying", if the mean of factors has to be equal or more than four, which shows that the level of importance and satisfaction has to be more than "moderate". The validity criterion based on two factors: respondents name on the list of *Merapi* 2010 eruption victim list that officially released from *Sleman* Regency government and knew about settlement reconstruction program, no matter if they accepted or not accepted the program.

Respondent selected proportionally from 5 villages in *Cangkringan* District. From Table 2, we can see the characteristic of respondents.

Table 2. Characteristic of respondents

Information	**Number**
Man	106
Woman	46
Farmer	63
Trader	7
Officer/Formal Labor	32
Informal Labor	26
Others	24
<30 y.o	12
31 - 40 y.o	27
41 - 50 y.o	37
51 - 60 y.o	49
61 y.o <	27
Primary School	64

Junior High School	24
High School	57
Academy/University	7

4. Result and Discussion

Several factors of settlement reconstruction abstracted from previous research about post-disaster settlement reconstruction. These factors represented various types of disaster, such as volcano eruption, landslide, earthquake, tsunami and flood. The factors that abstracted are:

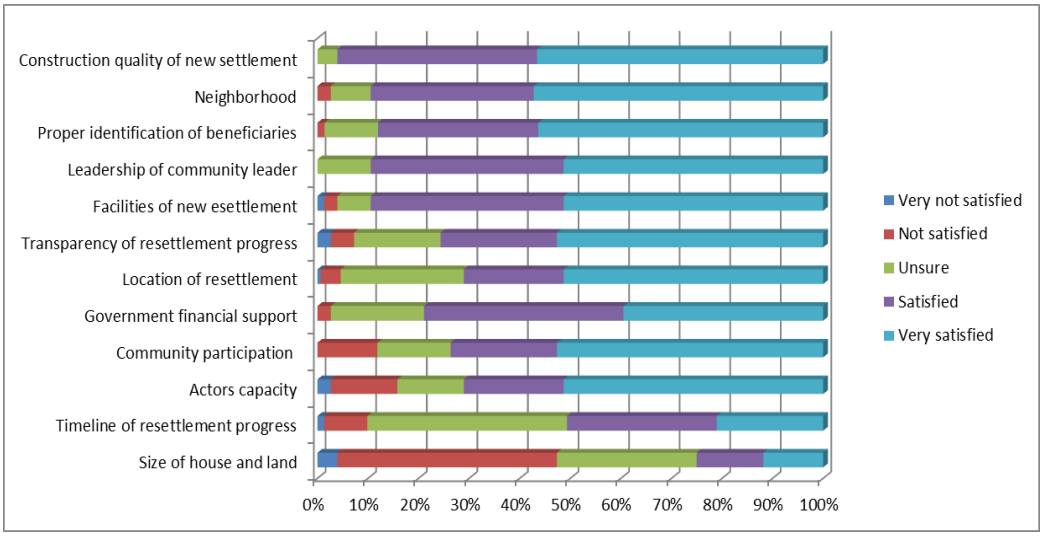
- location of resettlement
- timeline of resettlement progress
- construction quality of new settlement
- public facilities of resettlement
- neighborhood
- community participation
- transparency of resettlement progress
- leadership of community leader
- government financial support
- actors capacity
- proper identification of beneficiaries
- size of house and land

From field survey data collected, responses to the household questionnaires analyzed statistically.

Table 3. Factors in *Merapi* 2010 eruption settlement reconstruction by communities

Factors	Mean	SD	Sig	95%CI	
				Lower	Upper
Community participation and empowerment	4.533	0.650	0.000	4.380	4.740
Transparency of resettlement progress	4.520	0.780	0.000	4.360	4.760
Facilities of new resettlement	4.507	0.775	0.000	4.270	4.735
Government financial support	4.507	0.765	0.000	4.320	4.658
Location of resettlement	4.493	0.780	0.000	4.220	4.568
Neighborhood	4.474	0.880	0.000	4.280	4.552
Size of house and land	4.309	0.797	0.000	4.160	4.456
Proper identification of beneficiaries	4.303	0.890	0.000	4.060	4.421
Leadership of community leader	4.112	0.798	0.000	3.980	4.231
Actors capacity	4.039	0.779	0.000	3.850	4.198
Construction quality of new settlement	3.987	0.786	0.000	3.770	4.165
Timeline of resettlement progress	3.954	0.987	0.000	3.770	4.140

Figure 4. Satisfaction of communities in *Merapi* 2010 eruption reconstruction program



From Table 3, we can conclude that community participation and empowerment is the most important factor in *Merapi* 2010 eruption resettlement program. In *Rekompak* scheme, communities are the main actor of community-based settlement reconstruction. This scheme, according to Kartasasmita (2008) performed three main activities of community empowerment:

a. Trained communities in identification, analysis and decision making process to fulfil their needs in settlements;
b. Create small infrastructure of community settlements and community economic productivities through empower local human resources in houses and infrastructure construction;
c. Increase community capability, especially in planning, build and maintenance of their houses and settlement.

For respondents, transparency also an important factor in the settlement reconstruction program. Steps in Community-Based Settlement Reconstruction in *Cangkringan* District also highlight the core of empowerment for the poor (Narayan, 2002) through follows elements:

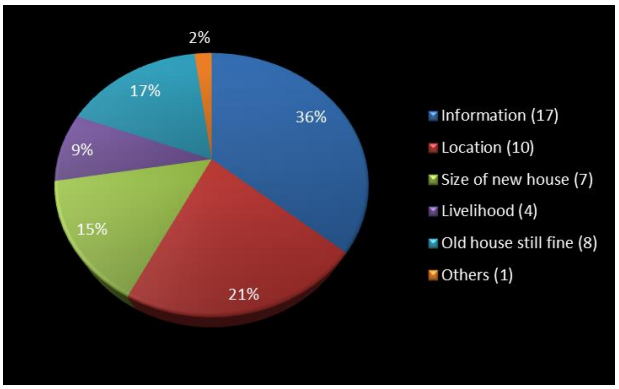
- Access to information.
  Every step in *Rekompak* scheme was published and socialized properly to every beneficiary and other stakeholder.
- Inclusion and participation
  Every beneficiaries and NGOs also participated
- Accountability
  Funds transferred directly to beneficiaries' group bank account. All communities member can easily access the use of funds.

On the other hand, Figure 4 shows us the satisfaction of respondent. It can be concluded that people did not satisfied with the size of house and land given. Every beneficiary got 36 m^2 houses and 150-m2 land. This condition affected on their lifestyle. They used to live on the big house and land, and now they have to live side by side with their neighbor.

Reason why people rejected the program showed in Figure 5. Miss-information about the program reached 36%. At the beginning of the program, there was much wrong information about the program. For example, people thought that they would lose their house and land if they accepted the resettlement.

Location also became the reason for people to refuse the settlement reconstruction program. They tend to live near their old settlement, because they have their livelihood there.

Figure 5. Reason for not accepted the program



5. Conclusion

This study found out post-disaster recovery of 2010 *Merapi* eruption, concerning the community-based settlement reconstruction in *Cangkringan* District can be summed up some of the following:

1. Based on the overall result of the study, it can be concluded that community-based settlement reconstruction in *Cangkringan* District met its aim. Total 2,083 houses reconstructed, spread into 12 communal settlements and scattered independent houses from 2,682-targeted beneficiaries candidates. Settlement infrastructure also reconstructed in *Cangkringan* District. This program used *Rekompak* scheme, adapted from a previous successful post-disaster recovery in Aceh and Bantul. This scheme placed community as the main actor in settlement reconstruction. Every phase in Community-Based Settlement Reconstruction in *Cangkringan* District such as planning, construction, control and evaluation, involved community. Communities take an important role in this scheme. The impact of this program to the community is exquisite. Beneficiaries could live in new houses and settlement properly. Their capacity in planning, procurement, monitoring and evaluation of construction project also improves surprisingly.
2. Impacts of this community-based resettlement reconstruction program to beneficiaries overall are worthwhile. Beneficiaries can return to their normal life in their new houses and settlements, without worries about risk from the *Merapi* Mountain because they live in safer areas than before. However, there are several negative impacts such as dense settlements and new livelihood.

3. Supporting factors in community-based settlement reconstruction in *Cangkringan* District are:
   a. Community empowerment and community oriented
   b. Transparency and accountability
   c. Coordination of stakeholders

   Constraining factors in community-based settlement reconstruction in *Cangkringan* District are:
   a. Social condition of beneficiaries
   b. Miss perception about Community-Based Settlement Reconstruction.

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