Community strategies in the development of Merapi permanent settlements

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Abstract. Merapi relocated settlements have been inhabited since 2012, two years after the Merapi Volcano eruption. Despite the adequate facilities, the land and house are not enough to accommodate the additional family members. Adapting to the condition, the community made several improvements in the physical condition of the permanent settlement. This study aims to determine the community's strategies in the Karangkendal and Plosokerep resettlement area in developing their dwellings. The observation includes the community's methods in enhancing the existing housing and its funding strategies in developing houses in general. Employing a case study approach, observation and in-depth interviews conducted with the head of the family and the head of the local hamlet. Based on the analysis, most of the community in the Karangkendal and Plosokerep resettlement area prefer to develop their existing houses. Although several residents consider leaving the resettlement area, most of them remain to stay and develop the existing house because building a new house requires a lot of money. They spend their private savings that are soon considered as the community's financial strategy. To fulfill that demand, the community needs external support. For instance, the government could provide revolving funds or build a coop that effectively supports housing improvement.

1 Introduction

The eruption of Merapi Volcano in 2010 caused severe damage to the hamlets, which included disaster-prone areas of Merapi Volcano. There are 28 hamlets in the Cangkringan district with 2,411 houses damaged [1]. In Cangkringan Subdistrict, three villages were severely affected: Umbulharjo Village, Kepuharjo Village, and Glagaharjo Village. Of these three villages, nine hamlets cannot be occupied because they are directly affected by the eruption of Merapi Volcano.

After the eruption, determination of the disaster-prone area of Merapi Volcano was made considering the damaged area of the disaster. The classification of the disaster-prone area is divided into KRB (*Kawasan Rawan Bencana*) I, II, and III, with different consequences. The most dangerous area is KRB III, or the area directly affected by the eruption of Merapi Volcano in 2010. The government's decision not to allow the area as residential. This policy led to the permanent relocation of residents' dwellings provided by the government or the community independently.

After almost eight years of living in permanent settlements, the residents currently face new problems. Those whose family members increase either through marriage or by adding children or grandchildren need a new space in their house.

The land area of 100 m² with a house area of 36 m² is insufficient to accommodate the growing number of their family members. While the initial land is in a

disaster-prone area, it cannot be occupied according to the agreement when they got a permanent settlement. The people who live in the permanent settlement have agreed that the land left in the disaster-prone area remains their property, but they promise not to build in the area by being compensated in the form of permanent housing with a certificate of ownership.

This study examines the community strategies in the Karangkendal and the Plosokerep permanent settlement in developing their residential area. The observation including the strategy of developing the existing permanent settlement conducted by the community. In addition, this research also focuses on funding strategies carried out by the community in developing the house.

1.1 Housing development

An area or building can develop physically by three models [2]:

- a. Horizontal development
This development grows outward while maintaining the height of the building. Horizontal development can occur in areas where there is vacant land around the building.
- b. Vertical development
This development is carried out by increasing the height of the building and usually occurs in downtown areas with expensive land prices.
- c. Intercystal development

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This development means an inward development. In other words, this development is carried out by compacting an area or using the space between buildings and not increasing the height of the building[2].

A house that develops physically can be referred to as a growing house. A growing house has grown from a house with a small area to a larger one [3]. The growing area occurs because it is adjusted to the financial capacity of each household. Self-growing houses can be developed vertically and horizontally and can be developed without the need to dismantle the initial building, only by adding new spaces. However, this will be more difficult if the initial house design does not adhere to the principle of a house that will grow[3].

A study on growing houses developed by Perumnas, stated that it usually increases its occupants' space requirements [4]. The most added room is the bedroom because of the incompatibility of the number of family members with the facilities offered apart from other rooms [4]. The increasing number of occupants is one of the solid factors for residential development.

This growing house is one of the efforts in the provision of homes to meet the needs of its residents. In general, the housing supply scheme, consists of:

- a. Industrialized housing, where there is a process of production, distribution, and consumption of products in the form of houses.
- b. Petty commodity, where small-scale housing developments are organized by architects/foremen with a few workers. One part of this petty commodity is a self-help housing process where producers and consumers are the same parties. Self-help housing is usually carried out by low-income people who do not have enough funds to buy a house as a commodity or employ a supervisor and several handypersons. Several household members can do self-help housing according to the knowledge known to the household [5].

In Indonesia, there are types of self-help housing. Self-help housing in Indonesia depends on the age of household members, development process, and demographic profile [6]. Regarding the post-disaster settlement, the provision of post-disaster permanent shelter requires adequate funding. Even the United States federal government has not been able to provide proper funding schemes for the victim of Hurricane Katrina in 2005 [7]. These conditions impact the natural disasters refugees returning to their initial living places. They assume that the financial and resources are adequate in the initial place. However, the place is not safe from the next disaster.

Self help housing means personal fulfillment in the community where people want to express their aspirations or needs without relying on bureaucracy[8]. Self-help is a gradual process regularly, starting with the basic structure then adding parts of the house with higher standards and material selection [8].

1.2 Post disaster settlements

The destructive natural disaster of the Merapi Volcano eruption in 2010 caused material losses and claimed lives. The main impact is that the hamlets directly affected by the eruption of Merapi Volcano are

designated as uninhabitable areas as a form of protection against eruptions that may occur in the future. The consequence is post-disaster housing needs to be relocated. The first response to post-disaster housing damage is to organize emergency sheltering to accommodate temporary refugees [9]. After the conditions are gradually safe, permanent settlements can accommodate refugees with more decent conditions. Damage to dwellings that are usually inhabited makes the need for permanent settlement while the initial house is repaired or the option to relocate to permanent housing. The fourth phase is permanent housing, where people can return to their old house that has been repaired or relocated to a new, safer house, as in the case of permanent housing due to the 2010 eruption of Merapi Volcano.

Post-disaster settlement is one of the most important things that must be provided [10]. The house is the core of routine household activities, and without a house, the household cannot run properly and will impact the daily activities of household members. The provision of post-disaster permanent settlement in the United States often depends on market mechanisms [10]. However, this impacts low-income communities because they cannot access quality housing, living in low-quality houses. These low-income communities can live on marginal lands at low prices, are not licensed, and can return to disaster-prone areas so that when a disaster strikes again, they are a community that is very vulnerable to disasters.

The process of developing permanent housing ranges from 2 years to indefinitely if the relocation program is poorly designed or poorly implemented [11]. Meanwhile, several stages of relocation [12] consists of:

- a. Emergency response, consisting of identifying victims, saving lives in the event of a disaster, distributing basic needs for victims, and providing settlement;
- b. The transitional phase, consisting of clearing debris and dirt from affected areas, relocating victims from refugee camps to temporary shelters by providing basic needs, reconstructing and repairing shelters and public facilities.
- c. The development phase, this long-term phase seeks to provide permanent shelter/safe relocation housing for affected communities, facilitate affected communities in relocation shelters with basic infrastructure, improve the living standards of affected communities in new locations, and develop an ideal relocation residential environment to be inherited to the next generation [12].

In this case, the community's development of permanent housing is in the development phase. The community prepares for the long term by trying a strategy so that the residents' children and grandchildren can live properly with on-site residential development and off-site strategies. The relocation process is building shelter and introducing new living spaces for affected communities to reduce danger in the future [13]. In this process, community activities and the built space will adjust to each other. However, this adaptation does not run in a short time without the availability of the community's basic needs.

In developing the permanent settlement, physically, the existing permanent settlement can be developed in

several ways. However, the limited land area where the house has an area of 36 m² and each household's land, which is only 100 m², also becomes an obstacle in carrying out on-site development. In addition, if many houses need to develop, the three growth schemes above can occur in one shelter area. This condition could cause quality degradation of the settlement area if no policies regulate it.

The criteria for livable houses according to Permenpera Number 22 of 2008 concerning Minimum Service Standards in the Public Housing Sector at the Provincial and Regency/City Levels states that one of the parameters for the feasibility of a house is to meet a minimum area of 7.2 m²/person to 12 m²/person [14]. This standard means that a permanent residence with an area of 36 m² can only be filled by three to a maximum of five people. If the family member increases, the house needs several adjustments, or it becomes less livable. One of the first settlement adaptations from the area was the shape adaptation of the house that was adapted to the behavior and daily culture of the community [15]. One of these behavioral patterns is adding walls to increase private space since the relocation house has limited space.

The physical condition of Merapi's permanent settlements is quite different from the initial living area [16]. The permanent settlements does not have a front and back yard and with an area of only 100 m² for each household. However, the residents are satisfied with the conditions of the shelter because there are adequate facilities, both in the form of community halls, communal cages, children's playrooms, mosques, and so on.

2 Methodology

This study employs a case study approach. The data was collected through observation and in-depth interviews with the head of the family or local hamlet. A case study is a method that thoroughly investigates a program, event, activity, process, or several individuals [17]. This study explores the strategies adopted by households in two permanent settlements in developing their dwellings.

The two permanent settlements chosen are Karangkendal and Plosokerep. Karangkendal permanent settlement was chosen because the relocation process of housing is carried out with the full awareness of all residents where residents find their relocation land. The development process is carried out with the assistance of the Rekompak program. Meanwhile, the Plosokerep permanent settlement is a residential development process that relies more on the process driven by Rekompak with the involvement of residents who are not as much as the development of the Karangkendal.

The data collection method in this study is observation and in-depth interviews with the head of the family or the head of the local hamlet to determine the need for residential development. The sampling technique used purposive sampling by asking community leaders and village heads first to find out the family with the following criteria:

- a. A family who was relocated after the eruption of Merapi Volcano in 2010;

- b. Having four or more family members;
- c. Permanent dweller.

Based on the in-depth interviews with community leaders and village heads, respondents (n=14) met these criteria. The next step is to observe the physical changes of permanent settlement modification to adapt to the increasing number of family members. The observations were done by looking at developments that might be carried out outside the shelter area. In addition, in-depth interviews were conducted to deeply determine the residential development process carried out by residents, from funding, construction, and adaptation to post-construction development.

The data obtained in the observation process was analyzed using descriptive analysis to determine the existing resettlement improvement strategy, housing preferences outside the resettlement area, and financial strategy. The existing improvement strategies are considered as the pattern of resident's adaptation to develop the area since 2012. Meanwhile, the housing location preference outside the resettlement area could be analyzed to find the desired location for the community. Moreover, financial strategies are explored to determine community effort to obtain funding for housing reconstruction.

3 Results and discussions

3.1 Relocation process

The Karangkendal and Plosokerep permanent settlements were built for the residents of two hamlets in Umbulharjo Village, whose places were directly affected by the Merapi Volcano eruption in 2010. However, in both places, there are differences in the relocation process.

The residents of Pelemsari Hamlet voluntarily relocated to the Karangkendal permanent settlement. The main reason is that their living place was damaged heavily and most of the house entirely collapsed. They decided to move in to the safer place [18].

The residents of Pelemsari even searched for their relocation land and bought it together. However, the planning and construction process was assisted by the government and Rekompak, the organization responsible for the reconstruction of the post-disaster. After six months of the construction, in mid-2012, 81 families of Dusun Pelemsari started living in the permanent settlement

In opposite to residents of Pelemsari Hamlet, Pangukrejo residents are not interested in relocating. The reason is that not all of the houses in Pangukrejo Hamlet were heavily damaged. Moreover, after the eruption, there is a new tourist attraction around Pangukrejo Hamlet. This Merapi lava tour invites many visitors, making the residents prefer to stay in their old dwellings because of the promising economic potential. Due to several factors above, only 35 out of 114 families of Dusun Pangukrejo participated in the relocation, which is now becoming Plosokerep's permanent settlement. However, the other left shortly relocated to the Plosokerep permanent settlement because they were

increasingly aware of the dangers of occupying Pangukrejo Hamlet.

3.2 The condition of Karangkendal and Plosokerep permanent settlements

Since occupied in 2012 and 2013, the residents have improved their housing conditions. These changes are based on the dissatisfaction or need of each household. Since 2012 at least the residences in both permanent settlements have made at least one renovation. Starting from cleaning the walls to adding floors depends on the needs of each occupant. According to residents, the current quality of the existing shelters is as follows:

Fig. 1. Housing conditions (Source: Interview, 2020).

The results show that there are differences in the residents' perspectives. Residents' perception is based on their experience living in their old dwellings. They can compare the permanent settlements reach their ideal expectations or not. Almost half of the Karangkendal residents assume that the existing building materials are inadequate. Meanwhile, the Plosokerep residents are not too concerned about this. The respondent in Plosokerep (one-third of the respondents) complained about the small size of the area. Although at the same time, they also accepted the current permanent settlement's conditions.

On the other hand, a small part of the community complains that the settlements and daily living infrastructure are inadequate in both permanent settlements. Although some respondents already felt that the shelters were good, some wanted to improve their houses. Several reasons are illustrated in the following graphs.

Fig. 2. Housing development (Source: Interview, 2020).

Based on the interviews, the housing development occurs due to the increasing number of family members. Additional family members included children or children who are married. In consequence, the need for space in the house increases as well.

3.3 The housing development strategies

The community's residential development strategy is divided into developing existing permanent settlements, development outside the houses, and community financial strategy.

3.3.1 The existing housing development strategy

The development of existing housing is the primary choice for the community in both the Karangkendal Huntap and Plosokerep permanent settlements. It could be a sign that the community accepted the shelter as their living place. The residents prefer developing the shelter rather than developing outside the shelter. In addition, the economic factor is one of the main reasons because most of them work in the tourism and agricultural sectors. Based on the interviews, the preferences for existing residential development are as follows:

Fig. 3. Housing development preference.
(Source: Interview, 2020)

Based on the interviews, most residents want to live in the existing permanent settlement. The community's main reason is limited funds and does not own land outside the temporary shelter, so they prefer to develop the permanent settlement they currently have.

All residents of Karangkandal permanent settlement have the ownership certificate of the initial land, but the land cannot be re-inhabited after the disaster. In addition, after more than five years of living, the community has gained a sense of belonging to the place. Adaptation to daily activities and livelihoods successfully carried out, and the kinship between communities in the permanent settlement growing more robust so that people prefer to develop their existing permanent settlement.

One community even has a strategy to buy a neighbor's land as an addition to their house. Meanwhile, several residents want to buy land outside the shelter and develop new housing because they want to be safe from the threat of the Merapi Volcano.

Since 2012, the community has made many modifications to its permanent settlement. Respondents have made at least one modification to their permanent occupancy. The pattern of community development in the early days of inhabiting is modifying the walls and the house's appearance. The permanent settlement wall was initially an unpainted brick wall so that the community renovates it by repainting or painting the house.

Table 1. The residents room renovation.

No	Renovated Rooms	Total Number
1	Bedroom	13
2	Kitchen	12
3	Terrace	12
4	Toilet	1
5	Garage	2
6	Storage	1
7	Adding floor	2

(Source: Interviews, 2020)

Furthermore, the community develops housing according to the needs of each household. Some respondents develop bedrooms, kitchens, terraces, toilets, garages, and warehouses. Moreover, some of them add more floors in the dwelling. The terrace was developed for a communal space that can be shared with

the surrounding neighbors. The increasing number of the family makes the residents develop adequate toilets and bedrooms. Kitchens are needed so that there is adequate and proper cooking space. The residents need to improve garages and warehouses to store household items and various private vehicles.

Fig. 4. Terrace renovation, adding rooms and adding floor
(Source: Field Survey, 2020).

The development process of the permanent settlements illustrates in three stages. In the early stage, almost all respondents modified the housing appearance by painting the walls and install ceilings. Over time, several modifications were made, such as adding terraces and rooms, modifying the kitchen, adding warehouses, and adding floors according to the abilities and needs of the community. So that the building modifications carried out by the community are not carried out at one time, but gradually, this is due to financial factors because people do not have much money at one time to develop their dwellings. Because of the financial factor, each household has a different time developing their house. Residents who have an excellent financial level can develop their house immediately, but those who have limited finances have to save their money first.

Fig. 5. Stages of permanent settlement development.
(Source: Analysis, 2020)

In the future, several residents want to enhance spaces in the settlement such as toilets, terraces, rooms and add second floors. Some other want to renovate the floor and roof. The next stage shows that the community will add the second floor after the first floor is fully used.

3.3.2 Housing development preferences outside the permanent settlement

Residential development outside the permanent settlement is not the community's primary choice. However, several families develop their house in the permanent settlement area, and several others are moving back to the land in their old residences located in disaster-prone areas.

Community strategy facing the development options outside the permanent settlement area is still developing itself. Culturally, the community is more accessible and familiar with developing its houses. Buying a house requires much money.

Some residents wanted to stay in the village because of their social attachment and livelihood. They choose to be in the scope of one subdistrict but different villages or outside the sub-district. In addition, the community also wants to be safer from the threat of disasters by staying outside the affected areas of the eruption of Mount Merapi.

Fig. 6. Housing development preferences outside the permanent settlement (Source: Interview, 2020).

Based on these preferences, people are not entirely tied to the old locations or the locations they currently inhabit. Financial limitations are the main factor of society who stayed in the permanent settlement. If the government develops more housing to extend the living place for residents, the government can find alternative locations around Cangkringan District or outside Cangkringan District. Some people who choose to live

outside the district are willing to feel safe from the threat of the eruption of Merapi Volcano.

3.3.3 Aspects of community financial strategy

In developing houses, it is essential to have resources, specifically funding. In low-income communities, self-help construction could become the most suitable solution. If the community has enough money, they could build and stop the construction whenever the money is available. In addition, the other family member could help by becoming the substitution of the primary worker.

The same goes for communities in both Karangkendal and Plosokerep permanent settlements. They have the same funding method, which is saving some of their income. In addition to having more funding, a small number of residents sell their assets, such as cattle bred. The other residents take additional loans to banks or financial institutions. This option is generally taken by residents who have more assets or residents who have fixed incomes.

Fig. 7. Housing development funding source.
(Source: Interview, 2020)

Looking at the strategy of most of the residents who save their money to develop housing, the government could provide special revolving funds for those who need to enhance their houses. Considering the next 5-10 years, the increasing number of families means more accommodation. The revolving fund could become an appreciation for residents living in the shelters and not returning to their initial village. Furthermore, the sustainability of the people who live in the shelters can be maintained.

4 Conclusion

Based on the analysis, most of the community in the Karangkendal and Plosokerep resettlement area prefer to develop their existing dwellings. Although several residents consider leaving the resettlement area, most of them remain to choose to develop the existing place.

The development of existing dwellings is also carried out gradually, starting from improving the appearance, adding space, and floor addition. The improvement has a different timeline for each family because of the financial capabilities and needs.

Some families who prefer to develop housing outside permanent settlement areas have various opinions. Some choose to be in the village or within one district because it is close to their old village. At the

same time, some choose outside the district for safety reasons. Development outside of permanent settlement requires a high cost, so that this community needs a better financial strategy.

The community's financial strategy in developing housing is limited to their saving. This condition needs to be considered because the community demands external support. For instance, the government provides revolving funds or building a coop that effectively supports housing improvement.

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