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The Improvement of Community Capacity in Facing of the Landslide in Sukajaya Subdistrict of Bogor Regency

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Abstract. The improvement of community capacity in facing the landslide is one of the best ways to avoid community from bad impact of this disaster. Even though, in the field, program of the improvement of community capacity must be accordance with the kind and level of impact. The purpose of this research was analyzing the improvement of community capacity in facing of the landslide. Research method used qualitative and phenomenology design, and data analyze used Miles & Huberman & Saldana. The results of this research were a) assessment of risk disaster showed Sukajaya Subdistrict has middle to high level of landslide-prone; b) the knowledge, innovation and cultures showed enough to help the disaster management on the next time; c) the application of disaster risk reduction involved spatial management, land use for community agriculture, making new national park, and making disaster resilience village; d) the application disaster mitigation pre disaster with building permanent shelters, and post disaster by rehabilitation and reconstruction, reforestation and conservation; e) the strengthen of preparedness could take advantage of knowledge and awareness of community that have been high level. Suggestions were involved disaster program in local rules of Bogor Regency, continuing conservation program, conducting preparedness training program, and continuing mitigation program post disaster.

Keywords. Community Capacity, Landslide

1. Introduction

According to Law of the Republic of Indonesia No. 24/2007, the definition of a landslide is one type of movement of the mass of soil or rock, or a mixture of the two, down or out of the slope due to disruption of the stability of the soil or rock making up the slopes. These all types of ground motion are some of the geological processes that occur due to the interaction of several conditions, some of which are geomorphology, geological structure, hydrogeology, and land use (Karnawati, 2007). More than that, natural phenomena and human activities can be the causes of landslides. Natural phenomena typically appear as high-intensity rainfall and steep slopes. Meanwhile, human activities trigger the landslide in many ways as massive and illegal logging, building housing in cliff areas, and clearing agricultural land on mountain slopes.

Referring to data from BNPB (2020) on the incidence of landslide disasters during 2019 to January 2020, Indonesia was in the third position with a total of 356 times of incidence, the number of injured victims in the fourth position as many as 81 people, and the number of heavily damaged houses as many as 124 houses. Meanwhile, as reported by the Center for Volcanology

and Geological Disaster Mitigation (PVMBG, 2012), Bogor Regency is an area that has a high risk of landslides prone. To be more specific, the research location, namely Sukajaya subdistrict, is an area prone to landslides at medium and high levels. As believed by the Ministry of Energy and Mineral Resources, the landslide disaster that occurred on January 1, 2019, was probably caused by the intensity of rain reaching 301.6 millimeters in a day. Besides, in terms of soil structure, there was weathering of volcanic breccia and tuft (piles) in that location, and land use that was not suitable for its designation (Liputan6.com, 2020). Based on the Data of floods and landslides spread across 5 subdistricts on January 1, 2020, from the Main Command Post for Disaster Management in Bogor Regency, 517 residents reported suffered minor injuries, 12 people seriously injured, 2,139 houses severely damaged, 81 units moderately damaged, 2,140 units slightly damaged, and 104 housing units threatened. As for the Sukajaya subdistrict, there were 9 isolated villages with 7 victims reported dead and 4 missing people who have not been found because of being buried by landslides (BIG, 2019).

Furthermore, several capacity-building agendas that have been carried out by the Bogor Regency Regional Disaster Management Agency (BPBD) in handling landslides in Sukajaya Subdistrict were carrying out disaster risk identification activities from National Disaster Management Agencies (BNPB) in 2012, implementing the limited scope of mitigation activities in particular building alternative roads and making few permanent housings, providing knowledge and awareness of the hazards of impact on the people who live in the houses near the hills. It is reported that preparedness training and marked areas prone to landslides are already planned. Unfortunately, they were preceded by landslides before they had time to carry out preparedness training. Meanwhile, the installation of landslide detection tools has not been prioritized in the Sukajaya subdistrict considering budget constraints. For this purpose, the researcher employed survey data collected from the results of conducting observations and interviews with part of the communities and village officials that show high enthusiasm of local communities to participate in the disaster management program that will be held by BPBD Bogor Regency.

From the description above, researchers are concerned with observing and evaluating the conditions and efforts of the Bogor Regency government to increase community capacity in landslide disaster management both in the pre-disaster, emergency response, and post-disaster stages. The objective of this study is to empower the people in Sukajaya Subdistrict are having the capability of avoiding and reducing the negative impact of future landslides.

2. Objectives

The Objectives details of the research are as the following:

- 1) To analyze the implementation of knowledge and innovation as well as the culture of the communities to cope with landslides in Sukajaya subdistrict?
- 2) To Analyze the implementation of a landslide risk assessment in Sukajaya subdistrict?
- 3) To analyze the implementation of activities in reducing the risk factors for landslides in Sukajaya subdistrict?
- 4) To analyze the implementation of landslide disaster mitigation in Sukajaya subdistrict?
- 5) To Analyze the implementation of strengthening landslide disaster preparedness in Sukajaya subdistrict?

3. Research Methodology

In this study, the method used is qualitative. According to Creswell (2014), qualitative research is a study that is interested in analyzing and describing the experience of a phenomenon in the everyday world. Furthermore, the design of this study is phenomenology to explain the

fundamental concepts and meanings of a phenomenon experienced by a person (Polit & Beck, 2012). As for the analysis of the data used in this study using the theory of Miles, Hubermans, and Saldana (2014), which includes data collection, condensation, data presentation, and conclusion.

4. Theoretical & Conceptual Framework

4.1 National Security

According to Article 1 of Law of the Republic of Indonesia No. 03/2002 on State Defense stating as follows: State defense shall be all endeavors to defend national sovereignty, territorial integrity of the Unitary State of the Republic of Indonesia, and the safety of the entire Indonesian nation against threats and disturbances threatening the integrity of the nation. Based on the interpretation of this article, it can be implied that defense is not only about using and strengthening the force of the state; rather than that, it also includes all efforts considered as acts to defend the sovereignty, territorial integrity of the State. Disaster management activities are also an effort to maintain the safety of the nation and state of Indonesia, which is realized by the dedication of citizens for the interests of national defense in overcoming and minimizing the consequences of war, natural disasters, or other disasters. Thus, an understanding of national security can be interpreted as an outcome of the right and responsibility of citizens to take part in national defense and security.

4.2 Disaster Management

As specified by the Law of the Republic of Indonesia No. 24/2007 concerning Disaster Management, there are several changes in the perspective of disaster management, namely: (1) from responsiveness to risk reduction and preparedness; (2) disaster risk reduction and integration thereof into the local or national development program; (3) Government and the regional government shall sufficiently allocate a disaster management budget in APBN and APBD; (4) a strong legal ground for disaster management institutions; (5) guarantee of fulfillment of disaster-affected communities members' and refugees' rights in a fair manner and in accordance with minimum service standard.

The concept of disaster management in the Law of the Republic of Indonesia No. 24/2007 which is a joint responsibility between the central government and local government includes the stages of disaster management implementation, objectives, and stages of activities consisting of planning and funding as well as the role of disaster institutions that are given the authority to carry out coordination functions, command, and implementation.

4.3 Disaster Risk Reduction

The stages of disaster management according to Law of the Republic of Indonesia No. 24/2007 shall comprise: a) pre-disaster period, which includes (1) a situation where no disaster occurs by means of disaster management planning, disaster risk reduction and prevention; and (2) Situation of potential disaster, namely disaster preparedness, early warning, and mitigation; b) emergency response, with rapid assessment, determination of disaster emergency status, rescue and evacuation of affected communities, the fulfillment of basic needs for the protection of vulnerable groups, immediate restoration of vital facilities and infrastructure; c) post-disaster period, which includes rehabilitation and reconstruction.

4.4 Capacity development

Capacity-building is a series of efforts and actions to support or improve the quality of life in dealing with external disturbances. This can be increased either by reducing the risk of

disaster threat or by increasing their capacity to cope with it (Ulum, 2013). Meanwhile, according to GLG (2008), capacity is the control of the resources, methods, and strengths of the community which enables them to defend and prepares themselves to prevent, cope with, reduce and quickly recover from the consequences of disasters. Furthermore, it is explained in the Head of BNPB Regulation (Perka) No. 03/2012 concerning Guidelines for Assessment of Regional Capacity in Disaster Management which contains disaster mitigation, disaster risk assessment, the realization of the use of innovation knowledge and education as one of the implementations to build disaster-safe capacity and culture, reduce risks, and strengthening community preparedness.

4.4 Landslide

Referring to Law of the Republic of Indonesia No. 24/2007, a landslide is a type of mass movement of soil or rock, or a mixture of the two, down or out of the slope due to disruption of the stability of the soil or rock making up the slopes. As for geological processes, both from within the earth (endogenous) and from outside the earth (exogenous) can harm living things around it (Paimin, et al., 2009). The process of landslides occurs when an area with a steep slope of more than 45%, the subsurface is watertight which can act as a sliding area.

There are opinions of several experts who divide the types of landslides according to Harjadi, et al (2007), classifying landslides into 6 types, namely fall, topple, slides, lateral spread, flow, and combined. Meanwhile, Paimin, et al. (2009) states that the factors that cause landslides are: a. natural factors, such as (1) rainfall, (2) geological conditions, (3) presence of faults, and (4) soil depth (regolith); b. management factors, such as (1) land use, (2) road infrastructure, and (3) settlement density.

5. Results & Discussions

Sukajaya subdistrict is located in the development area of West Bogor, with an area of 12,644.32 hectares and elevation ranging from 600 to 1,000 meters above sea level. The rainfall rate is between 2650 - 3000 mm/year, with high humidity and an average temperature of 16 - 31°C. Most of the shapes and types of the Sukajaya subdistrict area are hilly plains with a slope of 30-45 degrees.

The results of research related to increasing the capacity of the Sukajaya Subdistrict community that have been studied are about how the implementation before, during, and after a disaster occurs. Furthermore, increasing the capacity of the community in this study represents how the community tries to deal with landslides using the resources, methods, and strengths possessed by the Sukajaya subdistrict to prevent, reduce, and cope with and restore conditions to normal. The results of research in identifying, finding, and concluding the increase in community capacity in landslide disaster areas in Sukajaya subdistrict are as follows:

5.1 The use of knowledge, innovation, and community culture

Knowledge, innovation, and culture of the people of Sukajaya Subdistrict, the results are proven to be used to prevent, reduce, or control disasters with the resources they have (Ulum, 2013; GLG, 2008). From various statements obtained in the field, the definition of landslides from various levels of society is well understood as a form of large land displacement from mountains down slopes due to high rainfall. This definition means that it leads to the understanding of the BNPB from the instability of soil or rock that makes it up where Knowledge of the causes of landslides, almost all informants in the Village and District Officials agree that the cause is steep slopes triggered by high rainfall for 1 day. 1 night before. This statement is almost the same as that found by the Geological Agency and the Center for

Volcanology and Geological Disaster Mitigation, Ministry of Energy and Mineral Resources (2019), that the causes of landslides in Sukajaya Subdistrict are: a) there is high rainfall reaching 301.6 mm in one day, so that soil cannot hold water carrying rock and soil; b) the existence of soil geological conditions, namely a steep slope with a slope of 15-90 degrees, weathering of volcanic rocks and waterways that are not well ordered; c) improper use, land in the form of fields, mixed land, shrublands around the hill, above or below the road body, and empty land after the production of timber crops are cut (jenjeng trees).

The understanding of the benefits of the forest for the residents of Sukajaya Subdistrict is to hold water and be a good erosion barrier. However, because of the need for food and drink, the residents' plant Jenjeng plants on abandoned housing land, as soon as they grow up, they are sold. This shows that there is a lack of understanding of the functions and benefits of forests for natural conservation and disaster. The population is less touched with experience or information on landslide disaster management. This happens because so far there has been no counseling or training on the importance of implementation and early detection and evacuation of victims from landslide disaster areas. An extension is mostly directed to agriculture by encouraging people to plant on their plantations or company lands or empty National Parks to increase income. People reduce their habit of planting trees that can be harvested by the side of the road to prevent erosion, whereas according to researchers, the land on the roadside is still fertile.

Almost the entire Sukajaya area is dominated by wavy slopes. The waterway is formed from natural factors so that large or small water flows automatically go down slopes that are not well controlled. The strangest thing is that residential housing is still under the slope or even attached to the slope. This condition is destructive if it rains with high and long rainfall so that the losses do not have an impact on community losses, such as landslides alone. There are already efforts by the community and village officials to revive Karang Taruna to be involved in the development and social activities. This is evident in each village there is an organizational structure and its crews. However, the conditions are still not considered too much, so the focus of youth organizations is directed at social activities not towards disasters. However, when a landslide disaster occurs, many members of the youth organization are involved in helping to evacuate and provide logistical assistance to landslide victims, the Acting Head of Village will take advantage of members of the Karang Taruna to participate in Tangguh Village activities. The community and officials are already interested in holding training to form a Disaster Resilient Village from the Bogor Regency BPBD.



Fig. 1. Landslide in Harkatjaya Village
(source: researchers, 2020)

With the community's ability to know, understand, and be aware of the landslide disaster, the negative impacts of landslides can be identified, namely a) direct damage to public facilities, agricultural land, or human casualties; b) Indirect damage is the dysfunction of transportation so that there is no distribution of goods and services in and out, and communication is cut off, power outages, thus increasing difficulties for the community to meet their daily needs. In the end, everything will hamper regional development programs for the welfare of the community, which is in accordance with the prediction of Hardjowigeno (2007), that disasters will have a negative impact in paralyzing development activities and economic activities in the disaster area and its surroundings.

5.2 Implementation of Landslide Risk Studies

As stated in the Regulation of the head of BNPB (Perka) No. 02/ 2012, disaster-prone conditions are conditions or characteristics of the geological, biological, hydrological, climatological, geographical, social, cultural, political, economic, and technological aspects of an area for a certain period which reduces the ability to prevent, reduce, achieve readiness, and reduces the ability to respond to the adverse effects of certain hazards. Meanwhile, disaster risk is the potential loss caused by a disaster in an area within a certain period which can be in the form of death, injury, illness, threatened life, loss of security, displacement, damage or loss of property, and disturbance to community activities.

From the research findings on disaster-prone risk assessment, the following data were obtained:

a. Disaster risk assessment

Disaster risk assessment includes:

(1) The threat level of steep hills or slopes ranging from 30 - 500 degrees; there is a gliding area below the surface of the ground which is impermeable, and there is enough rainwater in the soil above the impermeable layer so that rainwater that falls from above the ground surface then saturates the soil. This certainly determines the stability of the slope because the decrease in soil shear resistance (T) is much greater than the drop in soil shear

pressure (S), so that the slope safety factor (F) decreases sharply, causing the slope to become prone to landslides or $F = T / S$ (Karnawati, 2005).

According to Hardiyatmo (2012), the community must be introduced to general signs that usually arise before a landslide disaster such as the appearance of cracks on the slopes parallel to the direction of the cliffs after rainfalls, the emergence of new springs suddenly, brittle cliffs and soil. translational landslides begin to emerge little by little before it rains, especially when there is rain. In principle, landslides occur when the driving force on the slope is greater than the holding force.

(2) The level of vulnerability of the threatened area.

Based on the geological type and geohydrology type, the villages in Sukajaya District in the West Bogor region are mostly located in alluvial fan areas and have very steep slopes. This is following the statement of Paimin, et al. (2009) that the subsurface part of the soil is usually impermeable, which can act as a sliding area. It is evident that the type of translational landslide in Sukajaya Subdistrict occurs due to ground cracks that allow water to enter the gaps in the soil, thereby accelerating the process of flooding and landslides in the hills.

Meanwhile, the level of regional and community vulnerability according to ADPC (2006) consists of the following aspects: (a) Social vulnerability score, namely the majority of Sundanese and Muslim ethnic groups so that from the point of view of the level of interaction there is no significant problem; (b) Economic vulnerability score, most of them are middle to lower-income; (c) Physical vulnerability scores, namely road buildings that have not been asphalted, mountains and hills that are not covered with vegetation and are of loose type so that they are prone to cracks when exposed to heat and easily slide when exposed to rainwater; (d) Environmental vulnerability scores, namely mountains and hills dominating the contours of the land, having high rainfall, humid temperature, the absence of a barrier wall for large and small river flows in the hills that can trigger landslides; (e) Institutional vulnerability; namely related to the formation of volunteer groups, but until now the volunteer group in Sukajaya Village disaster management has not been formed, so the disaster management system has not been well documented.

3) Capacity level of the area at risk

In reference to the income level of the people in Sukajaya Subdistrict, most of whom are classified as middle to lower income. This illustrates the possibility of floods and landslides being greater due to the high rainfall in Sukajaya Subdistrict, and most of the land in the form of mountains and hills is not planted with trees that are strong enough to hold water. Besides, all villages are equally potentially affected by floods and landslides, especially Sukamulih, Harkatjaya, Pasir Madang, and Cieulaksa Villages which are indicated to be more severely affected than the other villages. This can be seen from the number of houses under the hill.

Together, the present findings in the field confirm that the level of vulnerability of the community in Sukajaya Subdistrict has a middle to lower level as obtained from the results of the disaster risk assessment. This shows that the possibility of the condition of the Sukajaya Subdistrict in the next 5 years is still very high at risk of landslide disaster.

b. Mapping

From the results of mapping with drones conducted by the Head of the Disaster and Climate Change Mapping Division, the Geospatial Information Agency in 2020 shows that the morphology around the location is generally a wavy hill with slopes from a bit steep to very steep, even in some places it is found almost perpendicular to the average slope is more than 30 degrees. Meanwhile, based on the Land Movement Vulnerability Zone Map of Bogor Regency, the location of land movements in this area is included in the Medium to High ground movement vulnerability zone. This means that the potential for landslides to occur is very easy.

Based on the documentation, the Pasir Madang Village area and its surroundings are the areas with the most frequent landslides. Landslide points can be found on the hills in this area and around residential areas as well as on the main road so that it has the potential to block road access connecting Sukajaya and Cileuksa villages. Meanwhile, the contour and image data obtained also show that the area to the west of the village of Pasir Madang and its surroundings has several hills that are quite steep, based on the contour pattern and the number of areas of material clearing, it can be identified that the western area of Pasir Madang is a denudational hill that has experienced erosion.

Meanwhile, in the eastern area, the contour pattern is not as close as in the west, even though the eastern location is still dominated by steep hills where the slope level is not as steep as in the western region. The hills are steep with dendritic flow patterns where this flow pattern is influenced by rock resistance. The resistance of rocks to erosion will greatly affect the process of forming river channels. Rivers that flow on rocks that are less resistant to erosion will form a dense river texture, while those that are resistant to erosion will form a tenuous river texture.

As can be seen from the mapping results that the mountain and hilly areas have undergone a denudational process, namely a form of land that occurs due to weathering processes, erosion, rock mass movement so that it is easy to experience erosion when heavy water travels on it and causes the eroded soil to move towards the direction below it due to the earth's gravitational process.

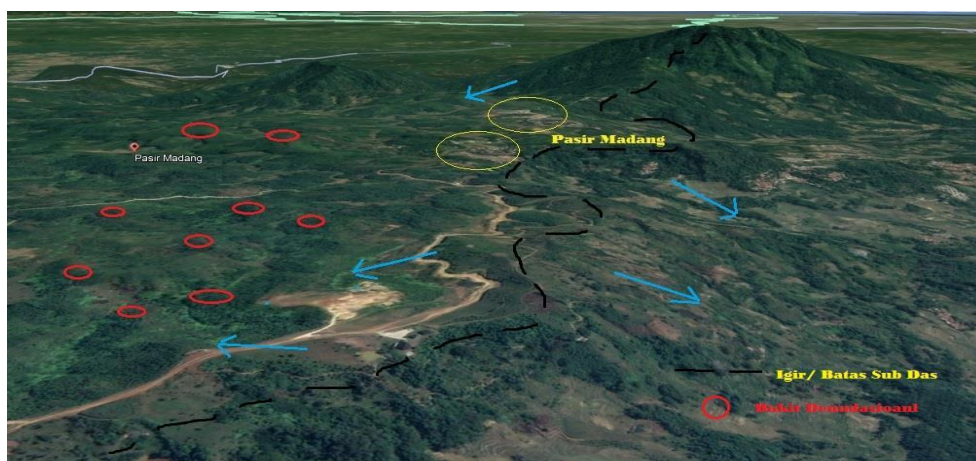


Fig. 2. Landslide's Pattern in Pasir Madang Village and its surrounding
(source: researchers, 2020)

The results of the disaster-prone risk assessment and mapping show that several villages in Sukajaya District are at risk of landslides, including Harkatjaya Village, Kiarapandak Village, Urug Village, Kiarasari Village, Sukajaya Village, Sipayung Village, Sukamulih Village, Jayaraharja Village, Pasirmadang Village, Cileuksa Village, and Cisarua Village. Responding to this, the recommendation made by BNPT to the Regent, Subdistrict, and Village Head is to immediately move all houses for residents under hills or on slopes to a safer place.

5.3 Implementation of disaster risk factor reduction activities.

From the explanation of the disaster risk assessment, it shows that Sukajaya Subdistrict, Bogor Regency is still a flood and landslide-prone area. Several activities can be carried out to reduce risk factors for landslides, namely:

1. Land use management, namely the land use of Sukajaya Subdistrict during the New Order era, which was used for clove and tea planting projects. Clove and tea plants fully cover the large area that seem no gaps in an empty land. In line with that condition, there is no chance for water to soak in excess, no potential erosion, and flood that will occur. By cause of that projects, eventually an abundant harvest and the type of that clove becoming the best clove in Indonesia, and it also absorbs the labor of the local people. Currently, local government regulations on disaster do not yet exist explicitly. However, there is an organizational structure for carrying out disaster activities, especially during emergency response. With the existence of an organizational structure, it will involve other institutions and services so that cooperation is established that helps each other. This condition is somewhat different from the findings of Kurniadi (2019) that in Pandeglang Regency disaster activities have been included in the Regional Planning Regional Regulation so that it will make it easier for BPBD Pandeglang to carry out disaster risk assessment programs to mitigation ranging from pre-disaster, emergency response to post-disaster including the provision of budgets.

2. Utilization of forestry land for the community, namely land in Sukajaya Subdistrict that can be used for agriculture as a livelihood for the community, into productive forest plants, and into a National Park. Most of the Sukajaya people own land for agriculture of no more than 500 meters. They can only plant crops to meet basic needs such as rice and cassava. Soil type Most of the subdistrict in Sukajaya is a natural formation on the surface of the earth, which is filled with hills, mountains, plains, and basins. Soil type is at the high-risk level of landslides and is not suitable for planting or needs to be made of terracing farming methods.

3. The government's plan to create a National Park.

This plan is in accordance with the Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number 46 of 2016, as mentioned in Article 1 paragraph 1, which reads:

"A national park is a nature conservation area that has native ecosystems, managed by a zoning system which is used for research, science, education, cultivation support, tourism and recreation purposes."

The main function of the National Park is for the conservation or preservation of nature. However, its implementation depends on regional or national interests. In various countries, it has different functions. One of the national parks in Indonesia is regulated in the Republic of Indonesia Law No. 05/1990 concerning Conservation of Living Natural Resources. From the reality on the ground, the local government and the central government would be right to use the Sukajaya subdistrict as a National Park which aims to:

(a) protection to support the life of the Sukajaya people who are very dependent on the income of the forests and mountains around them;

(b) utilizing biological sources in the form of production trees that can be felled and sold to increase family income.

4. Other productive activities that do not interfere with biological sustainability are to raise cows and goats as it can not only to fulfill their needs for Qurbani animals but also increase their monthly income. Even during the festival of Qurbani, people besides being able to celebrate the festival of Qurbani without giving qurbani animals from outside, many people in Sukajaya subdistrict take advantage by selling their pets to other areas that are usually bought by middlemen. In addition, it can utilize bare forest land to be planted with productive trees which are currently lacking and limited to certain communities. Most of the land cultivators

will have permission to go to the village head or the subdistrict so that they can get permission to work from the local government or PT housing. This actually intends to shape people's perspectives to do not change the function of forest land into productive land that can destroy its natural habitat. As claimed by researchers, this plant is used for reforestation as well as preventing erosion, flooding and landslides. It is hoped that the community can utilize bare forests land by planting productive plants under the Republic of Indonesia Law No. 41/1999 article 16 which discusses activities to determine the function and utilization of forest areas.

5. Forming a Disaster Resilient Village Group (Destana).

As stated in the Republic of Indonesia Law No. 24/2007 concerning Disaster Management, the government has the responsibility to protect the entire nation of Indonesia as well as the whole homeland with the aim of providing protection for the life and livelihood including protection against disasters. One of the strategies to achieve this is through developing resilient villages against disasters with community-based disaster risk reduction (PRBBK). In CBDRM, the disaster risk management process actively involves the community in assessing, analyzing, managing, monitoring, and evaluating disaster risk to reduce vulnerability and improve its capacity.

From the results of interviews with all Acting Heads of Village and their staff, it shows that the youth in Sukajaya subdistrict has been actively involved in helping the success of landslide victims and assisting in the evacuation of victims and distribution of logistics to the disaster sites. The enthusiasm of these youth will be utilized by adding to the Disaster Resilient Village (Destana) program. In terms of quantity, it is possible to increase the number of youth for each village, considering there is already an environmental youth program which is a program of the Minister of Forestry and Environment in collaboration with the subdistrict.

BPBD will also support the Destana program by planning for disaster resilient village training, along with preparedness training. The determination of youth to play an active role in disaster control must be maintained by BPBD and the subdistrict authorities. It is necessary to support BNPB's efforts so that every village has a Disaster Risk Reduction group regardless of its form. In accordance with the objectives of the Regulation of the head of BNPB (Perka) No. 01/2012 is to (a) provide guidance for the government and/or local governments in the development of Destana as part of CBDRM efforts; (b) provide guidelines for the implementation of Destana development for implementing officials and disaster risk reduction (DRR) stakeholders.

5.4 Analyzing the implementation of landslide disaster mitigation

According to the Government Regulation of the Republic of Indonesia No. 21/2008, disaster mitigation is a series of efforts to reduce disaster risk, both reducing disaster risk through physical development as well as awareness and increasing capacity to face disaster threats. Before the landslide occurred, the Bogor Regency Government in collaboration with the Ministry of Public Works and Housing made permanent housing for residents who inhabit hills that are prone to landslides. Given budget constraints and the difficulty of finding a location that is safe from landslides where almost 80% of the Sukajaya Subdistrict is hilly, the Bogor Regional Government has prioritized Sukamulih Village, by making 100 permanent housing units, although still less than the real needs in the field.

As for several activities that have been and will be carried out at the time of the landslide disaster, from the explanation above, the mitigation activities carried out by the Regional Government, and the Sukajaya subdistrict Communities are to approach the important principles of mitigation from Jokowinarno (2011), including:

1. Evacuation and Rescue, which is carried out by forming an emergency post in each village and forming a Task Force Team led by the Head of the Sukajaya subdistrict. With the post and task force team, all data on victims and affected areas can immediately be identified and accelerate the provision of assistance.

2. Opening Access to the Isolated Area, which is carried out in intensive coordination with the Ministry of Public Works and Housing for the provision of heavy equipment to open access. The village is connecting the road that connects Cieulaksa Village and Pasir Madang which can only be passed after 30 days after the landslide.

3. Services for refugees, which are carried out by providing medical personnel services, setting up refugee tents, building public kitchens and clean water facilities, and lighting for refugees.

4. Logistics dropping to isolated areas, which is carried out to distribute logistics, especially foodstuffs, clothing, and the like as well as medicines by land and air for isolated areas in collaboration with Atang Sanjaya Air Base.

5. Data Inventory and Compilation of Affected Locations, which is carried out by taking direct data from residential areas (types and number of victims), basic infrastructure (houses and buildings, roads, electricity, water facilities, public facilities), technical studies of the affected areas (number and types of damage and loss), and aerial mapping (taking photos of geological conditions after landslides).

6. Provision of Occupancy Guarantee Money, which is carried out by diverting Direct Cash Assistance (BLT) from the President, Governors, and Regents for victims of Covid-19 to victims of landslides and increasing the number, adding to the types of assistance including for people with special needs such as toddlers, seniors, and disabled, incapacitated students.

7. Inventory of prospective land, which is carried out by searching for land or locations that will be used as temporary residential buildings (Huntara). Therefore, each village head must record the status of the land to be used and ask for assistance from the Geological Agency and BPN to avoid floods and landslides.

8. Rehabilitation and Reconstruction of Basic Infrastructure, which is carried out in collaboration with the Ministry of PUPR to:

a. Bringing in heavy equipment to clean roads and bridges from landslide materials, for roads in Cieulaksa, Pasir Madang, Harkatjaya, Urug, Cisarua;

b. Repairing irrigation channels from large and small rivers in lerang, this has not all been realized;

c. Providing clean water and sanitation by connecting from the nearest spring, already in the shelters but not yet realized for shelters;

d. Rehabilitating several SD, MI, and SMP / MTs, and SMA / MAN schools in the villages of Harkatjaya, Cieulaksa, and Sukajaya;

e. Repairing the local health center (Puskesmas) in Pasir Madang;

f. Repairing religious facilities, such as mosques and prayer rooms, as well as Islamic boarding schools, for Cieulaksa and Harkatjaya Villages, removal of graves in Harkatjaya Village.

9. Reforestation, which is carried out by promoting efforts to greening vetiver plants combined with perennials that have ecological functions, such as durian, avocado, and cardamom. To be more effective, BNPT has built several plant seeding centers to support the implementation of reforestation in Pasir Madang Village. In all affected villages, the community is empowered to plant Vetiver and other trees with a salary of 3 months from the Regional Government and BNPT.

10. Structural Mitigation of the Affected Land, which is carried out by technical engineering making terraces on the slopes to reduce the amount of runoff that occurs during the rainy season.

11. Destana optimization, which is done by optimizing youth organizations that are already doing well. Youth organizations that have participated in assisting the implementation of the emergency response during landslides, will be used as the formation of a Disaster Resilient Village (Destana), to be more prepared to face all possible disasters that will come.

12. Control of illegal miners, illegal logging, and buildings in forest areas and slopes, which is carried out by installing warning boards for landslide-prone areas, temporarily closing illegal mining operations, providing assistance when occupying temporary shelters, prohibiting and arresting parties carrying out illegal logging, and prohibits building on mountain hills, evacuating residents in forest areas and on slopes that are prone to landslides by providing shelter and permanent housing.

13. Geosite arrangement, which is carried out by improving road infrastructure so that there is access to several Geosites in landslide-affected areas. The purpose of the geosite is to maintain and preserve beautiful mountains and hills that will bring benefits to increasing community income and the Bogor Regency APBD.

Other disaster mitigation efforts that have been and will be continued by the Bogor Regency Government are the implementation of conservation, including:

1) Technical civilian, namely carrying out large-scale technical civil developments, small technical civil developments such as making infiltration wells, rainfall infiltration (rorak), and the like, revitalizing lakes, lakes, reservoirs, especially large and small river channels in the hills. hills so as not to cause flooding and landslides, build industrial and domestic waste controllers, so as not to cause pollution that is detrimental to society and the ecology, create areas for the management of temporary garbage dumps (TPS), and landfills (TPA). Revitalizing public facilities damaged by landslides; and carry out Revegetation activities in Villages that are directly affected or that have the potential to be affected by floods and landslides, such as: (a) replanting with new plants on mountains and hills that have long been left empty; (b) promote an integrated agricultural program such as terracing technique by planting crops that vary according to the season; (c) promote forest area improvement and management programs by planting mountains and hills of productive trees in order to increase regional and community income.

All these technical activities according to Zakaria (2010), are referred to as stabilization measures. Stabilization measures are carried out in an effort to reduce the potential for factors that cause slopes to fall, such as replanting, as well as strengthen supporting factors so that slopes do not collapse easily, such as making terracing.

2) Non-civil engineering/vegetation, namely (a) creating and enforcing land/water conservation regulations or regulations which determine the areas that can be used as productive land and those that cannot be or are protected; (b) conducting campaigns and outreach so that the community understands what activities can and should not be carried out in utilizing mountain and hill land; (c) conduct socialization and capacity building for the carrying capacity of mountains and hills for the common interest and the danger that landslides can occur again if it is not in accordance with the principle of sustainability.

5.5 Implementation of strengthening disaster preparedness

Based on the results of interviews with officials implementing the Prevention and Preparedness of the Bogor Regency BPBD, it was found that so far there has been no full

attention dedicated to making landslide preparedness planning in Sukajaya subdistrict. Given that the area prone to flooding and landslides in Bogor Regency is very broad in scope, and the priority areas are Puncak and its surroundings. With the disaster management structure that has been endorsed by the Regent, the implementation of preparedness training activities can actually collaborate with several other parties such as the Social Service, the Health Office, and the BMKG for a preliminary study. As clear evidence, the Bogor Regency BPBD has included Postgraduate Students of the Disaster Management study program, the Faculty of National Security, the University of Defense in the form of a long time collaboration to realize the flood and landslide preparedness and mitigation program in Sukajaya subdistrict. As it is known, the Disaster management study program community service program has conducted several times preparedness training to form disaster resilient village leaders in Puncak and its surroundings.

The results of the meeting with the subdistrict head and the Heads of Pasir Madang, Cieulaksa, and Harkatjaya Villages, it was found that in the aspect of receiving training and education guidance programs as well as monitoring the preparedness of the Bogor Regency BPBD, they expressed their readiness. Each village already has a youth organization structure and youth guarding it against the youth and disaster preparedness youth groups. Based on observations, the reality on the ground shows that when a disaster occurs, the youth participation rate is very high, seen from the willingness to step in directly to overcome and assist in implementing the emergency response. With experience in assisting the implementation of emergency response assistance, the youth organizations will adjust themselves to add to their duties as a potential leader for the formation of the Disaster Resilient Village (Destana) which will be programmed by the Bogor Regency BPBD. In terms of personnel for disaster, it does need additional personnel.

Evacuation routes for landslides have not been officially established. However, according to the Acting Head of Village, signs or boards for disaster-prone areas on each steep hill have been socialized. Upon agreement with several village staff, it was hoped that the location of the evacuation route would be far from people's homes and easy to reach and must be far from the reach of landslides from falling. Even though they are looking for a location that is really suitable for an evacuation route, the community already understands and is aware of the importance of installing an evacuation direction fund path if at any time there is a flood and another landslide.



Fig. 3. The Signs of Landslide's Prone

(source: researchers, 2020)

Although BPBD can identify flood and landslide areas, BPBD has not installed an early warning system (EWS) for each area prone to landslides. This is because the coverage of landslide-prone areas in the Bogor Regency is very wide, and the funds needed to provide equipment have not yet been allocated. Until now, the areas that received priority for installing

EWS for landslide areas were Hambalang Village, Babakan Madang subdistrict, and Cibadak Village, Sukamakmur subdistrict. The Bogor Regency Government can use the new EWS technology from LIPI to detect sponsors named Wiseland (LIPI, 2018). Wiseland itself stands for Wireless Sensor Network for Landslide Monitoring. As the name implies, this tool functions as a monitor or monitor ground motion based on a wireless sensor network. The wireless sensor system that was created is also able to provide early warning to the public of the threat of various types of ground movement in a large area. Wiseland uses four main sensors, and the rainfall sensor can monitor even deep and shallow ground movements.

There is a contingency plan for landslides by the Bogor Regency Regional Disaster Management Agency (BPBD) including various training in terms of capacity building in disaster management. However, the training is still in the planning stage while the landslide emergency response activities in Sukajaya subdistrict have been well organized, consisting of:

a. Establish the evacuation sites together with emergency response command posts in the assembly point such as School Buildings and other privately owned public spaces.

b. Opening access to isolated areas, by conducting intensive coordination with the Ministry of Public Works and Housing for the provision of heavy equipment to open road access in all affected and isolated villages.

c. Providing assistance to disaster victims by facilitating health services carried out by health workers from the Sukajaya subdistrict Health Center together with volunteers, setting up tents and public kitchens, along with lighting installations and clean water facilities.

d. Distributing logistics to isolated areas by coordinating directly with Atang Sanjaya Air Base for the deployment of 1 helicopter to all isolated villages, such as Cieulaksa and Cisarua on the air route. While the opening of areas on land, in collaboration with the Ministry of PUPR for areas whose roads are difficult to pass using heavy equipment.

e. Data collection on the number of dead and injured, bridges, buildings, electricity networks, and houses that were completely destroyed, severely damaged, and slightly damaged as well as aerial mapping obtained from various stakeholders, including local government associations, non-governmental organizations, professional organizations and the private sector, the media, and the wider community.

Regarding the issue of training budgets, all the executors of the village head agreed that the regional government would issue new regulations on the use of special direct cash assistance (BLT) funds to be allocated for preparedness training and others. It should also be noted that currently, the subdistrict head is only asking to set aside a budget for disasters, for example, 10-20% of village funds.

6.1 Conclusions

As specified by community capacity indicators, the conclusions include:

1) Based on the disaster risk analysis and assessment as well as the vulnerability mapping of landmass movement, the results show an important finding that Sukajaya subdistrict has medium and high risk of the landslide-prone zone.

2) The knowledge, innovation, and culture of the people of Sukajaya subdistrict are sufficient to help with disaster management in the future. It is clear that empowerment approach for disaster management related activities, from prevention, mitigation, preparedness, emergency response to recovery from the local authority and local disaster management agency of Bogor Regency (BPBD) could help create a more proactive stance and attitude among the people.

3) A further novel finding is that the implementation of disaster risk reduction has been carried out in the form of spatial planning, utilization of forestry land for the community, creation of National Parks, and the formation of disaster response village groups (Destana).

4) This analysis also found that the implementation status of mitigation in pre-disaster situations is ready for residents whose locations are potentially disaster-prone by building permanent shelters even though the numbers are a relatively small number, while in post-disaster programs such as rehabilitation, reconstruction, reforestation, and conservation for geosite locations that have high altitudes need to be continued.

5) This is an important finding that in understanding the strengthening of disaster preparedness, the role of local communities that have a high level of knowledge and awareness can be taken an advantage of to succeed in the training objectives effectively and efficiently.

6.2 Recommendations

As a result, this report recommends further work to:

1) Propose a formulation of Local Government Regulations of Bogor Regency on the disaster management program to make the disaster management related activities will run smoothly in the long run.

2) Implement conservation of soil and water program in the catchment area of Sukajaya subdistrict as a priority due to almost 80% of the land surface is not covered by vegetation.

3) Carry out the immediate efforts to cope with landslides that occur every year such as starting the preparedness training programs and continuing the existing mitigation programs.

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