The Level of Threats and Community Capacity Concerning to Landslide Emergency in Banjarnegara Indonesia

by Erni Suharini

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Abstract—Banjarnegara is one of the regions in Central Java which is very vulnerable to landslide disaster. This condition is motivated by the geological conditions and the metoerological conditions of Banjarnegara Regency that contributed to the high potential for landslides. One area in Banjarnegara Regency which is prone to landslides is Karangkobar Sub-District. From 2018, there have been 23 landslides in Karangkobar Sub-District, out of a total of 152 landslides that occurred in Banjarnegara. This study intended to determine the level of landslide threats in Karangkobar Sub-District and the level of community capacity in dealing with landslide threats in Karangkobar Sub-District. The method used in the study is scoring, geographic information systems, descriptive, Gutman scale, and comparative descriptive. Parameters used to determine the threat of landslides are rainfall, slope, soil type, land use, soil texture, soil drainage, and soil depth. While the parameters for the level of capacity are the rules and institutions for disaster management, early warning and disaster risk assessment, disaster education, reduction of basic risk factors, and preparedness development for all lines. Based on to the result, we know that the level of landslides in Karangkobar Sub-District consists of low landslide threat level that covers only 1% of the Karangkobar area, moderate landslide threat that covers 74% of the Karangkobar area, and High level of landslide threat that covers 25% of the entire Karangkobar area. Based on the research result shows that most of the Karangkobar Sub-District area still has a low capacity in dealing with disasters. The low capacity of the community in Karangkobar Sub-District will be a serious problem because of the large threat of landslides in the area. For this reason, disaster mitigation efforts are needed in the Karangkobar Sub-District community.

Index Terms—Capacity, Karangkobar, landslide, threat.

I. INTRODUCTION

Behind its natural wealth and beauty, Indonesia holds a huge potential and threat of disaster that can endanger the population [1]. This is a consequence of its geographical condition, where Indonesia is a tropical country resting on three major plates of the world, namely the Eurasian, Pacific, and Indo-Australian plates. Almost all of its regions are active earthquake zones with very diverse morphological forms [2], [3]. One of the disasters that is strongly influenced by geological and meteorological conditions that often occur in Indonesia is a landslide disaster [4]-[6]. Landslides are one

type of soil movement, which is the rapid movement of land masses by gravity following the slant of the slope [7].

Banjarnegara is one of the regions in Central Java which is very vulnerable to landslide disaster [8]-[10]. This is because 70% of the Banjarnegara Regency is included in the landslide prone category. This condition is motivated by the geological conditions of Banjarnegara Regency which is part of the North Serayu Mountain mandala with a slope between 15-40%, so it is prone to landslides. The types of constituent rocks are very influential on the occurrence of soil movement in this region [11].

In addition, the metoerological conditions of Banjarnegara Regency also contributed to the high potential for landslides [12], with high rainfall intensity between 3000-3500 mm/year [13]. The high rainfall causes water to enter the loose topsoil, so that the soil becomes saturated with water and has a heavy mass. If water penetrates into the impermeable soil layer at the bottom which acts as a slip plane, it will become very slippery so that the soil above will move along the slope [9], [14].

One area in Banjarnegara Regency which is prone to landslides is Karangkobar Sub-District [12], [15]. From 2018, there have been 23 landslides in Karangkobar Sub-District, out of a total of 152 landslides that occurred in Banjarnegara. It is the highest number compared to other regions in Banjarnegara Regency. The landslide that occurred in Karangkobar Sub-District during 2018 has caused various losses in the form of 6 people injured, 4 heads of households threatened, 2 houses severely damaged, 1 house slightly damaged, and 8 houses moderately damaged [16]. Karangkobar Sub-District is part of a fairly steep mountain range, where the majority of the populations work as farmers. For economic reasons, they use the mountainous land quite steep into agricultural land such as gardens and fields.

Reflecting on these conditions, mitigation efforts are a necessity in order to reduce the risk of disasters [10]. Speaking of disaster mitigation, it will not be removed from threat (hazards/threats), vulnerability (vulnerability), capacity (capacity), and risk (risk) [17]. Threat is an event that can potentially cause danger [14], which can damage or threaten human life, loss of property, livelihood, and environmental damage [18], either due to unexpected events or due to natural events with intensity or extreme duration [19]. Vulnerability is a condition that is influenced by physical, social, economic, and environmental elements, or processes that increase people's vulnerability to hazards or threats [7]. Then, community capacity is a set of abilities that allows the community to have more resilience to face the

threat of disasters and deal with various hazard impacts from disasters, which can take the form of skills, knowledge, actions and attitudes [5], [14], [20].

The interaction between threats, vulnerabilities, and capacities will shape the value of disaster risk. It is the potential damage caused by disasters, whether in the form of casualties, life threats, loss of property, or economic disruption. Risks can be reduced by minimizing vulnerability and increasing community capacity. For this reason, an assessment of all elements of disaster mitigation is very much needed as a guide in carrying out disaster mitigation measures [21].

An assessment of the components of disaster mitigation in Banjarnegara Regency has been carried out previously. However, so far it has not provided a detailed picture of the specific scope of the area up to the sub-district and village levels in Karangkobar. Several studies have assessed the threat and capacity of the community, but it is still in the universal scope of the district, namely the study conducted by Bayuaji *et al*. [22] and Rahman [23] which only focus on community capacity. Then, a study by Susanti [6] only focused on density. The studies that focus on the scope of sub-districts are the studies of Cahyani [8] who conducted studies in Pagedongan Sub-District, studies from Priyono, Priyana and Priyono [9] in Banjarmangu Sub-District, and Khasyir, Aji, and Setyaningsih [24] in Bawang Sub-District. By seeing the high potential of disasters in Karangkobar Sub-District, which has been proven by various geographical conditions data and records of disaster events that occur, it is necessary to assess the threat and capacity of the people in Karangkobar. This assessment is needed as a benchmark in mitigating disasters in Karangkobar Sub-District.

II. METHODOLOGY

A. Research Goal

The research was carried out in Karangkobar Subdistrict of Banjarnegara, which astronomically it was located between 7°14'50 "SL-7°19'15" SL and 109°40'05 "EL-109°44'45" EL. The research was conduct to 1) Determining the level of landslides in Karangkobar District, 2) Finding out the level of community capacity in the areas that have high levels of landslide threats.

B. Sampel and Data Collection

The population in this study consisted of area populations and community populations. The population of the area is in the form of all areas in Karangkobar Sub-District with an area of 3,209,252 hectares, while the population of the population is all households living in the study area. The samples are taken by overlaying or combining four different types of maps using geographic information systems. The four maps consist of slope maps, soil type's maps, rainfall maps, and land use maps. From the overlay process, 100 units of land were obtained in the study area.

Then, the 100 land units are grouped using the area sampling technique based on land units that have the same slope and soil type. The slope is chosen as a barrier in sampling because the slope factor is considered the most influential factor in the occurrence of landslide phenomena. The type of soil is chosen because the soil factor is the most frequently occurring landslide factor and the characteristics of each type of soil have different levels of different landslide vulnerability. By grouping 100 land units in the study area, 18 samples of land units were scattered in 13 villages in Karangkobar Sub-District.

In the population, sampling is done through a purposive sampling technique based on the level of high landslide threats, which are found in 11 villages. Samples in each village were carried out based on the Slovin formula with an error rate of 10% and a confidence level of 90% [25]. It can be known as many as 99 samples that are spread evenly in 11 villages that have high levels of landslide threats.

In this study, the primary data were obtained through questionnaires, measurements, field observations, and interviews. The secondary data in this study came from relevant agencies, such as BPS, BPBD, and BMKG. The data collection methods in the study include documentation, measurements, observations, field surveys, geographic information systems analysis, questionnaires, and interviews.

C. Data Analyze

The analytical methods used in the research were scoring analysis, geographic information system analysis, descriptive analysis, Gutman scale, and comparative descriptive analysis. The parameters which used to determine the threat of landslides include:

1) Rainfall

Rainfall has a major influence on the occurrence of landslides because it can increase saturation of the soil, increase groundwater levels, and affect the surface erosion which causes the slopes to become steeper. The higher the rainfall, the higher the potential for landslides will be. Rainfall is assessed based on annual rainfall intensity in the study area which is derived from rainfall data from several measurement stations in the study area. The classification of rainfall used is the classification according to the Soil Research Center – *Pusat Penelitian Tanah* [26], which can see in Table I.

TABLE I: RAINFALL INTENSITY CLASSIFICATIONS

No	Rainfall (mm/year)	Score
1	<200	1
2	82000-2500	2
3	2500-3000	3
4	3000-3500	4
5	>3500	5

Source: Soil Research Center (2004) with modification

2) Slope

The greater the slope is, the greater the potential for landslides will be. The steep slope or cliff will increase the driving force and increase gravity. The slope data used is obtained through processing SRTM (Shuttle Radar Topography Mission) using geographic information systems. The classification used is the classification according to the Decree of the Minister of Agriculture No. 837 / KPTS / UM / 1980 [27], and can be seen in Table II.

TABLE II: SLOPE CLASSIFICATIONS

No	Slope %	Score
1	0 - 8%	1
2	8 – 15%	2
3	15 - 25%	3
4	25 - 45%	4
5	>45%	5

Source: Decree of the Minister of Agriculture No. 837 / KPTS / UM / 1980 with modification

3) Soil Type

Soil types in the study area are assessed based on the level of soil density. Solid soil will be more consistent so it is not easy to experience soil movement. The type of soil that is less dense is clay. The type of clay soil is also very sensitive in absorbing water so that it will increase landslides. The type of soil classification used in this study came from the Minister of Agriculture Decree No. 837 / KPTS / UM / 1980 [27] that can be seen in Table III, that are:

TABLE III: SOIL TYPE CLASSIFICATIONS

No	Soil Type	Score
1	Alluvial, Glei	1
2	Latosol	2
3	Brown Forest, Mediteran	3
4	Andosol, Grumosol, Podsol	4
5	Regosol, Litosol, Organosol	5

Source: Decree of the Minister of Agriculture No. 837 / KPTS / UM / 1980 with modification

4) Land Use

Land use is assessed based on the level of erosion sensitivity determined by the level of land treatment. Land that has received a lot of human intervention (awakened) will be more vulnerable to landslides. Landslides will be more common in the use of paddy fields, fields and puddles on steep slopes. This relates to the availability and ability of vegetation roots that can withstand soil from erosion and landslides. Land use data is produced from the interpretation of SPOT image 6. The classification of land use used in the study was obtained from Karnawati [28] that can be seen in Table IV below.

TABLE IV: CLASSIFICATION OF LAND USE

No	Land Use Class	Score
1	Heterogeneous Forest	1
2	Homogeneous Forest	2
3	Plantation	3
4	Residence, Farm, Pool	4
5	Garden, Open Land	5

Source: Karnawati, (2003:41) with modification

5) The soil texture

Soil texture in the study was assessed based on the degree of roughness and fineness of the soil grains. Soil texture is very influential on the ability of soil to store and pass water. Fine-textured soil will be easier to absorb and store water so that it has more potential for landslides compared to coarse-textured soil that is easy to pass water. Soil texture classification used in this study came from Sartohadi [29] which can be seen in Table V below.

6) Land drainage

TABLE V: SOIL TEXTURE CLASSIFICATION

No	Soil Texture	Score
1	Sand, Loam Soil	1
2	Loam Soil, Soft Loam Soil	2
3	Loam soil, very soft loam soil, the dusty loam, loamy clay	3
4	Dusty loam, sandy loam	4
5	Clay	5

Source: Sartohadi (2012) with modification

Soil drainage in this study was assessed based on whether water was lost from the soil. The better the drainage of a soil, the smaller the potential for landslides that occur, while the worse the drainage of a soil, the higher the potential for landslides on the soil. The classification of soil drainage used in this study came from Sartohadi [29] which can be seen in Table VI that are:

TABLE VI: SOIL DRAINAGE CRITERIA

No	Soil Drainage Criteria	Score
1	Good	1
2	Rather Good	2
3	Rather Bad	3
4	Bad	4
5	Very Bad	5

Source: Sartohadi (2012) with modification

7) The depth of land

Soil depth is a layer from the surface up to a few centimeters below the surface which is the soil horizon. In the soil horizon there will be infiltration and percolation processes which are strongly influenced by soil texture. The deeper the soil solum, the more water is stored and the heavier the aggregate mass of the soil so that the more potential for landslides. The soil depth classification used in this study came from Sartohadi [29] which can be seen in Table VII below.

TABLE VII: SOIL DEPTH CRITERIA

No	Criteria	Depth	Score
1	Very Shallow	<50 cm	1
2	Shallow	50-60 cm	2
3	Medium	60-90 cm	3
4	Deep	90-120 cm	4
5	Very Deep	>120 cm	5

Source: Sartohadi (2012) with modification

Furthermore, the class of landslide threat is determined based on the highest score and the lowest score generated in the scoring process in each unit of land using the Sturgess formula. The resulting threat level classification can be seen in Table VIII below.

TABLE VIII: CLASSIFICATION OF LANDSLIDES THREAT LEVELS

No	Class Value	Susceptibility Level
1	<16,3	Low
2	16,3 – 25,6	Medium
3	>25,6	High

Source: Analysis result (2019)

The Community capacity levels are assessed using parameters and indicators of The Hyogo-HFA Action Framework in accordance with the regional capacity assessment guidelines for disaster management from the Regulation of the Head of National Board for Disaster

Management Number 03 of 2012 [30]. Consists of 5 parameters and 22 indicators, including:
1) Disaster management rules and institutions
2) Early warning and disaster risk assessment
3) Disaster education
4) Reduction of basic risk factors
5) Development preparedness on all fronts.

These parameters are then translated into 88 questions in the form of a closed questionnaire using the Gutman scale [31]. Next step is to determine the community capacity class based on the score of each respondent using the Sturgess formula. Community capacity classification can be seen in Table IX as follows.

TABLE IX: COMMUNITY CAPACITY CLASS

No	Score	Index	Grade
1	<29	0 - 0.33	Low
2	29– 58	0.33 – 0.66	Medium
3	>58	>0.66	High

Source: PERKA BNPB No. 2 the Year 2012

III. FINDINGS / RESULTS

A. The Condition of Banjarnegara Regency

Karangkobar Sub-District is located between 7^0 14'50" South Longitude to 7°19'15" South Longitude and is located between 109°40'05" to 109°44'45" East Longitude. Karangkobar Sub-District is located in the North Serayu Mountains region. The topography of the Karangkobar Sub-District is dominated by hills with various slopes, ranging from the plains to very steep. Karangkobar Sub-District is located in the northern part of Banjarnegara Regency which is a hill with an altitude ranging from 710 to 1,025 mdpl. Karangkobar Sub-District in 2018 consisted of 29,753 residents with a composition of 15,140 male residents and 14,613 female residents. The majority of the population of Karangkobar Sub-District works in the agricultural sector with a total of 14,873 residents.

B. The Level of Landslide Threats

The results of landslide threats are obtained through measurements of each parameter in each representative land unit. These parameters consist of slope, soil type, rainfall, land use, soil texture, soil drainage, and soil depth. After each parameter is known its value, then scoring is done in accordance with the classification of each parameter that is the basis or reference used in the study. After that, an overlay of all parameters using the Geographic Information System to produce landslide threat numbers in Karangkobar Sub-District was classified into 3 classes of landslide threats which can be seen in Table X and the distribution can be seen in Fig. 1, as follows:

TABLE X. THE LEVEL OF LANDSLIDE THREATS IN KARANGKOBAR DISTRICT IN 2019

No	Name of Village	Area		
		Low (%)	Medium (%)	High (%)
1	Slatri	0.00	78.28	21.72
2	Paweden	0.00	95.81	4.19
3	Gumelar	0.00	71.28	28.72

4	Purwodadi	0.00	100	0.00
5	Sampang	0.00	53.41	46.59
6	Ambal	0.71	29.11	70.18
7	Pagerpelah	0:00	77.66	22:34
8	Pasuruhan	0:00	84.06	15.94
9	Karanggondang	4:20	77.28	17.78
10	Jlegong	0:00	24.63	75.37
11	Binangun	2:15	80.18	17.66
12	Karangkobar	0:00	88.34	11.66
13	Leksana	5:48	94.52	0:00

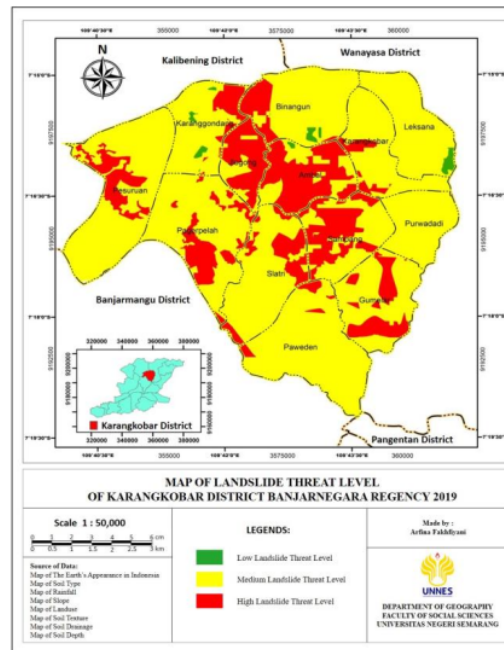Source: Analysis Result, 2019

Fig. 1. Landslide threat level map of Karangkobar district in 2019.

C. The Level of Community Capacity

The community capacity is assessed using the Hyogo-HFA Framework and Action Framework indicators in accordance with the hood assessment guidelines regional characteristics in disaster management from the Regulation of the Head of the National Board for Disaster Management Number 03 of 2012 [31]. Each sample is then assessed and subsequently classified into community capacity classes of low, medium and high. The calculation of the community capacity score of each respondent is done by adding up the score of 88 questions on the questionnaire from the 5 parameters used in the study. Based on the results of the analysis, the level of community capacity in the study area that has a high level of landslide threat is divided into 3 classes which can be seen in detail in Table XI.

IV. DISCUSSION

A. The Level of Landslide Threat

1) Level of low landslide threat

The study area which has a low landslide threat level is 1%

of the entire Karangkobar Subdistrict, which consists of 1 unit land unit namely Aluvial_I_H Mixed Forest spread in 3 villages namely Leksana Village, Karanggondang Village, and Ambal Village. The level of low landslide threats is found in areas that have a flat slope of 0-8%, with high to very high rainfall intensity or 3000-3500 mm / year. In addition, the low threat level is found in alluvial soils with a loamy texture. It has a very thick soil depth of> 120 cm with good and rather good soil drainage. While for land use areas that have low levels of landslide threats have land uses in the form of fields, settlements, mixed forests, and gardens.

2) Level of moderate landslide threat

Areas that have a moderate level of landslide threats are 2,419.96 hectares or with a percentage of 74% of the entire study area. The research area which has a moderate level of landslide threat is 74% of the entire Karangkobar Sub-District area. Land units that fall into the level of landslide threats are 10 land units namely Mediteran_I, Litosol_I, Litosol_II, Aluvial_II, Aluvial_III, Aluvial_IV, Andosol_I, Andosol_II, Andosol_III, andAndosol_IV

TABLE XI: CAPACITY LEVEL OF COMMUNITIES IN THE STUDY AREA IN 2019

No	Village	Presentation Level Capacity			Indexes
		Low	Medium	High	
1	Slatri	22%	78%	-	0.35
2	Paweden	100%	-	-	0.23
3	Gumelar	100%	-	-	0.16
4	Sampang	20%	80%	-	0.31
5	Ambal	22%	78%	-	0.33
6	Beeper	11%	22%	67%	0.57
7	Labor	100%	-	-	0.24
8	Karanggondang	100%	-	-	0.15
9	Jlegong	100%	-	-	0.16
10	Construction	100%	-	-	0.19
11	Karangkobar	94%	6%	-	0.17

Source: Analysis Result, 2019

The areas with a threat of landslides are being spread in Slatri Village, Paweden Village, Gumelar Village, Sampang Village, Ambal Village, Pagerpelah Village, Pasuruhan Village, Karanggondang Village, Jlegong Village, Binangun Village, Purwodadi Village, Karangkobar Village, and Leksana Village. The level of moderate landslide threat is found in areas with slope of 0-45%, and rainfall intensity > 3000 mm/year. In addition, there is a moderate level of threat in the types of soil that is Mediterranean, lithosol, alluvial, and andosol with a texture of light clay, loamy clay, loamy, and sand. It has a very thick soil depth of > 120 cm with good and rather good soil drainage. And on the use of land in the form of fields, settlements, mixed forests, and gardens.

3) Level of high landslide threats

The level of high landslide threats has an area of 789.29 hectares or with a percentage of 25% of the entire study area. There are 7 units of land that fall into the level of high landslide threats namely Mediteran_II, Mediteran_III, Mediteran_IV, Mediteran_V, Litosol_III, Litosol_IV, and Andosol_V. Villages that have a high level of landslide threat are Slatri Village, Paweden Village, Gumelar Village, Sampang Village, Ambal Village, Pagerpelah Village, Pasuruhan Village, Karanggondang Village, Jlegong Village, Binangun Village, and Karangkobar Village.

The level of high landslide threats is found in areas with slope rather steep to very steep namely> 15%, rainfall intensity> 3000 mm / year, found in the types of soil Mediterranean, lithosol, and andosol with a texture of mild clay, loam, loam and sand splattered. It has a very thick soil depth of> 120 cm with good and rather good soil drainage, and the use of land in the form of fields, settlements, and gardens. The distribution of the level of landslide threat in Karangkobar Sub-District can be seen in the Fig. 1.

Karangkobar Sub-District is one of the districts that is vulnerable to landslides Banjarnegara Regency. Based on research conducted by Susanti, Miardini, and Harjadi [6], Karangkobar District is included in the category of districts with high levels of landslide vulnerability. Susanti, Miardini, and Harjadi [6] conducted a study to determine the landslide prone areas in Banjarnegara Regency by combining landslide threat parameters and vulnerability parameters. It consists of natural parameters which include: rainfall, slope, geology (rock), fault (escarpment), soil depth, and management parameters which include: land use, infrastructure, and settlement density. Thus, the true research from Susanti, Miardini, and Harjadi [6] focuses more on measuring the value of landslide threats rather than landslide vulnerabilities. This is because of the parameters used, 80% are parameters of landslide threats and 20% are parameters of landslide vulnerability.

Then, Susanti, Miardini, and Harjadi [6] classify the vulnerability numbers into five classes consisting of not vulnerable, slightly vulnerable, somewhat vulnerable, vulnerable, and very vulnerable. In Susanti, Miardini, and Harjadi's research [6], landslide susceptibility in Karangkobar Sub-District consists of 17,969 Ha which is a slightly vulnerable category, 3134, 411 Ha a somewhat vulnerable category, 804,713 a vulnerable category, and 3,588 Ha is a very vulnerable category. Different from the results of Susanti, Miardini, and Harjadi [6] research, this study classifies landslide threats in Karangkobar Sub-District into three categories, namely a low threat level of 1%, a moderate threat level of 74%, and a high threat level of 25%.

The threat of landslides in Karangkobar Sub-District is strongly influenced by the slope conditions in Karangkobar. Most of the Karangkobar Sub-District area has steep slope (15% - 25%) and steep slopes (25% - 45%). The higher the level of the slope, the greater the potential for landslides. In Susanti, Miardini, and Harjadi's research [6], it was stated that rainfall is a major factor influencing the threat of landslides in Karangkobar Sub-District. This is relevant to the results of this study because the majority of the Karangkobar Sub-District has high and very high rainfall. About 75% of the Karangkobar Sub-District area has rainfall of 3641 mm / year and around 25% has rainfall of 5878 mm / year. High rainfall that occurs in areas with steep and unstable slopes can cause landslides [7].

In addition, the threat of landslides in Karangkobar Sub-District is also closely related to the influence of soil conditions in the area. Soil conditions that are very influential are soil types, which will affect soil texture and soil drainage. In Karangkobar Sub-District, areas with a moderate level of

threat are dominated by Alluvial and Andosol soils with light clay texture and sweaty sand. The high level of landslide threat is dominated by Mediterranean land and Litosol with loamy and muddy texture. This is consistent with the results of research from Susanti, Miardini, and Harjadi [6] that soils with high clay mineral content especially kaolinite and vermiculite minerals will be unstable when saturated with water so that they have higher levels of landslide vulnerability.

In addition, land use factors also affect the level of landslide threats in Karangkobar Sub-District. Areas with land use in the form of good and strong vegetation such as mixed forests and gardens have a low level of threat compared to areas with poor vegetation that receive a lot of human intervention such as fields and settlements. This is in line with research from Khasyir, Aji, and Setyaningsih [24], who suggest that areas with rare vegetation will have higher levels of landslides. As for the soil depth indicator, it is not very influential because all land unit samples taken have very deep soil depths of more than 120 cm.

B. The Level of Community Capacity

Based on the table XI, From the 11 villages that have high landslide threats, there are 7 villages that have low capacity levels, namely Paweden Village, Gumelar Village, Pasuruhan Village, Karanggondang Village, Jlegong Village , Binangun Village, and Karangkobar Village. On the other hand, the villages that have medium capacity levels are 3 villages, namely Slatri Village, Sampang Village, and Ambal Village. While the village with a high level of landslide threat that has a high level of capacity is Pagerpelah Village.

From the the five community capacity indicators, the majority of villages are still unable to meet these indicators. The first capacity indicator, which is related to the rules and institutions in disaster mitigation only exists in villages with medium and high capacity. Of the five community capacity indicators, early warning indicators and disaster risk assessment are still very minimal in each village. Then, disaster education indicators are also still minimal, both from the level of primary education and non-formal levels in the community. In addition, indicators for the development of preparedness in all lines have also not been fulfilled in the majority of villages in Karangkobar Sub-District.

The results showed that most of the Karangkobar Sub-District area still had low capacity in dealing with disasters. Of the 11 villages, 7 villages are still dominated by people with low capacity, 3 villages are dominated by people with medium capacity, and there is only 1 village that is dominated by people with high capacity. This result is relevant to research from Bayuaji, Nugraha, and Sukmono [22] which measures community capacity using the geometrical interval method which states that in all Banjarnegara Regency there are still 222 villages with low capacity levels, 42 villages with medium capacity levels, and 15 villages with high capacity level. However, these results are somewhat different from the results of research from Rahman [23] who conducted a study of the capacity of the Banjarnegara area in dealing with landslides. Rahman [23] did not take village measurements, but rather conducted a purposive sampling study and obtained results that the value

of the capacity of the Banjarnegara community was 70.45% or included in the good category.

The low capacity of the community in Karangkobar Sub-District is due to the still very minimal variety of disaster mitigation efforts. Of the five aspects of community capacity measurement, at this time there are still many unfulfilled. This condition is influenced by the lack of institutional, educational, preparedness and technical instruments in the field.

The low capacity of the community in Karangkobar District will be a serious problem because of the large threat of landslides in the area. This condition is further exacerbated by the vulnerability that exists in society. Based on the results of the study, many settlements are on land with steep slopes to very steep slopes. This was done because of limited land owned so that residents were forced to build settlements on the land. This certainly increases the public's exposure to landslides. Then, the majority of the population of the Karangkobar sub-district work as farmers. This is in accordance with the research of Khasyir, Aji, and Setyaningsih [24], that if landslides occur on agricultural land, it will greatly disrupt the livelihood activities of the population.

In addition, people only rely on meeting the needs of the agricultural sector so that they have an unstable income. In addition, the number of family members still covered makes it a condition where expenses are fixed but income is uncertain. The average number of family members at each head of the family is 4 people. This causes the community to only focus on meeting the needs and become less concerned with budgeting for special funds for disaster activities.

The magnitude of the threat of landslides in Karangkobar Sub-District which is compounded by vulnerability to the community, and not balanced with community capacity will pose a great disaster risk. This is in accordance with the function of disaster risk which states that risk will be directly proportional to the threat of disaster and community vulnerability and will be inversely proportional to community capacity. The higher the threat of disaster and the vulnerability of the disaster, the higher the risk of disaster will be. Conversely, the lower the capacity of the community, the higher the risk of disaster will be [23].

For this reason, disaster mitigation efforts are needed in the Karangkobar Sub-District community. Indeed disaster mitigation is an effort to reduce disaster risk, namely minimizing disaster threats and vulnerability and increasing community capacity [10]. And disaster risk measurement is one small pre-disaster step of disaster mitigation efforts that still needs to be followed up with a variety of more concrete mitigation efforts [21]. Disaster mitigation includes mitigation from the pre-disaster stage, during the disaster, and post-disaster. Disaster mitigation also consists of two dimensions, namely the structural dimension in the form of impact minimization and the use of a technological approach as well as the non-structural dimension in the form of spatial management and training in order to increase community capacity [32].

Disaster mitigation that must be carried out can be started from a structural dimension to reduce disaster threats and increase preparedness. This step can be done by overcoming

the main problems that cause landslide threats, namely slopes and rainfall. This is in accordance with the research of Susanti, Miardini, and Harjadi [6] who recommend appropriate mitigation measures in Banjarnegara, namely through structuring and conservation in sloped areas. This effort can be done through changes in the slope geometry such as making bench terraces, controlling drainage and seepage especially surface and subsurface drainage, building buildings for stabilization, demolition and removal of material in landslide-prone areas, and protection of soil surfaces.

The second step is observation of rainfall because each region will have a threshold value of rainfall that has the potential for different landslides. Therefore it is necessary to provide continuous rainfall information as a basis for early warning for people living in landslides. This step must also be complemented by the provision of adequate early warning system tools in each landslide-prone area that can increase community preparedness because so far the early warning system facility is still lacking [10]. In addition, other disaster mitigation facilities must also be provided, including disaster prone maps, evacuation routes and evacuation route maps, and facilities in disaster emergency response conditions.

Non-structural mitigation is done as an effort to increase public awareness and knowledge about the potential for landslides in the area and preparedness for the potential for landslides [6]. Non-structural disaster mitigation includes developing and strengthening regulatory and institutional capacity in dealing with disasters, from the village to the national sphere. Disaster risk reduction must be mainstreamed into development policies, planning, implementation, and evaluation [8]. This aims to achieve a national development mission that starts from the smallest scope so that each village must have clear regulations and institutions in disaster mitigation. By doing so, the implementation of mitigation will become more official, more directed, and have legitimacy and strong financial support.

Information dissemination and information to the public is very important to be carried out to increase public awareness and knowledge about landslides. This activity was carried out to provide knowledge to the community about landslides, landslide mitigation efforts, and what was done by the community before a landslide, during a landslide, and after a landslide. Besides that, training and disaster simulation are also very necessary so that the community understands what must be done when a disaster occurs. Landslide simulation is carried out so that the community prepares for real conditions in the event of a real landslide. In this activity, the community must be given an understanding of evacuation routes and direct practice in the field. In addition, there needs to be training on alternative livelihoods for the community as an effort to improve the economic resilience of the community in the post-disaster Losngor phase.

V. CONCLUSION

The level of landslides in Karangkobar Sub-District consists of low, medium and high levels of landslides. Low landslide threat level covers only 1% of the Karangkobar area.

The level of moderate landslide threat covers 74% of the Karangkobar area. High level of landslide threat covers 25% of the entire Karangkobar area. The threat of landslides in Karangkobar Sub-District is strongly influenced by the slope conditions in Karangkobar. Most of the Karangkobar Sub-District area has rather steep slope (15% - 25%) and steep slopes (25% - 45%). In addition, a factor that greatly influences landslides in Karangkobar is rainfall. About 75% of the Karangkobar District area has rainfall of 3641 mm / year and around 25% has rainfall of 5878 mm/year.

Of the 11 villages with a high level of landslide threat, there are 7 villages that have a low level of community capacity, 3 villages have a medium level of capacity, and 1 village has a high level of capacity. This condition shows that most of the Karangkobar Sub-District area still has a low capacity in dealing with disasters. The low capacity of the community in Karangkobar Sub-District will be a serious problem because of the large threat of landslides in the area. This condition is further exacerbated by the vulnerability that exists in society. This problem will pose a great disaster risk. For this reason, disaster mitigation efforts are needed in the Karangkobar Sub-District community. Disaster mitigation that must be carried out can be started from a structural dimension to reduce disaster threats and increase preparedness. This step can be done by overcoming the main problems that cause landslide threats, namely slopes and rainfall, and increasing the early warning system. While non-structural mitigation is done as an effort to increase public awareness and knowledge that can be done through strengthening institutional rules and capacity, providing information activities, socializing, training and simulation of landslides, and alternative livelihood training.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Erni Suharini conducted the research; Fakhfiyani Arfina analyzed the data; and Edi Kurniawan author wrote the paper. And all authors had approved the final version.

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FINAL GRADE

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GENERAL COMMENTS

Instructor