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Application of Landslide Sisaster Risk Reduction in Subang Regency

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Abstract – Landslides are one of the dominant disaster potentials spread across the southern region which geographically consists of mountains. Based on social aspect, the disaster mitigation is concentrated on the dynamics of society when responding to the possibility of cyclical risks. The study aims to identify the understanding and readiness of the community in dealing with landslides. The study uses the Community Readiness Model measurement concept which assesses understanding to reduce the risk of natural disaster impacts. The study was conducted in Cupunagara Subdistrict, Cisalak District, Subang Regency, as one of the areas that has a high potential for vulnerability to landslide threats with relatively difficult accessibility. Primary data was obtained from key respondents from various elements of society. Secondary data was obtained through publications from the government or academic references. The results of the study showed that community readiness in dealing with the possibility of landslides reached a score of 4.161 with the confirmation/expansion category. With this score, it is concluded that: (a) The majority of the community already understands the knowledge regarding the efforts that must be taken including the level of program effectiveness, (b) Leadership plays a key role in expanding concrete efforts, (c) The majority of residents fully support the efforts or needs that must be met, (d) The community fully understands the main problems related to local values, (e) Most of the resource allocation is used to support the efforts taken.

Keywords: *Mitigation, Community Readiness Model, Disaster Risk Reduction*

1. INTRODUCTION

Disaster mitigation in Indonesia has now become an agenda that is inherent in almost all development sectors and is applied to all regions. This is because most of Indonesia's territory is in a high-risk area for natural disasters. The potential for natural disasters is spread almost evenly, so that the Indonesian Disaster Risk Index in 2022 was recorded at 134.16 with a Very high risky category. Related to this disaster issue, so that the paradigm taken is no longer disaster management, but disaster mitigation. One of the most common forms of natural disasters is landslides. Landslides occur because the driving force on the slope material is greater than the resisting force. The resisting force is generally influenced by the strength of the rock and the density of the soil. The driving force is influenced by the size of the slope angle, water, load and type of rock soil [1].

The potential for landslides becomes high when tectonic conditions in Indonesia form high morphology, faults, easily brittle volcanic rocks, then meet with a wet tropical climate. The potential for landslides has increased recently, especially those related to changes in land use that are not in accordance with their designation [2]. The potential for landslide disasters is found in Subang Regency. In 2022, the landslide risk index was included in the high category with an index of 17.86 with areas concentrated in mountainous areas.

This research will be conducted in Cupunagara Subdistrict Cisalak District, Subang Regency. The determination of the research setting was planned with the following considerations: First, Cupunagara Subdistrict is a village included in an area categorized as a landslide/landslide-prone area as stipulated in Subang Regency Regional Regulation Number 3 of 2014 concerning the Subang Regency Spatial Planning Plan for 2011-2031.

Second, during 2022, in Cupunagara Subdistrict for 3 consecutive years there were landslide disaster cases. Third, the impact of the landslide disaster in Cupunagara Subdistrict was not only felt by local residents, but also had an impact on agricultural areas and freshwater fisheries in the downstream area due to the blocking of the Cupunagara River flow due to landslides. The losses felt by residents due to this landslide disaster were more due to the lack of information regarding the possibility of disasters arising and the risks that accompany them. In general, this high risk is related to the use of space for settlements and socio-economic activities [3].

The substance of this study aims to identify the level of community preparedness in facing the possibility of landslides. So far, the emergence of natural disasters is often difficult to predict so that the level of losses suffered by the community is high. In the context of the social sciences, research on landslide disaster mitigation is a cross-disciplinary study, covering Policy Science, Public Administration, Risk Management, and so on, intersecting with other exact sciences [4].

Research on disasters, especially landslides, is mostly carried out in the fields of science and engineering. Research by Hidayat and Munir (2019), for example, examines hydrological aspects [5]. Furthermore, research by Sudarto and Utami (2021) examines the application of landslide disaster mitigation for residential areas [6]. Meanwhile, research by Apriliana and Herdiman (2021) focuses on identifying aspects of the spatial distribution of landslide-prone areas [7].

In the social sciences, research on landslide disaster mitigation tends to focus on public management functions [8]. In addition, research on landslides in the social sciences also discusses more aspects of local wisdom [9]. As a basic research product, research on community preparedness in facing the possibility of landslide disasters is expected to be the initial step for applied research and development research.

2. LITERATURE REVIEW

Disasters mean something that causes trouble and loss or sufferers. Disaster is the impact of an event that cannot be overcome with local resources. The process starts with the existence of a hazard which becomes an event. Events whose impacts can be reduced by local resources are considered as accidents. Conversely, if it cannot overcome, then it is called disaster. Natural hazards are defined as events that are caused by nature and can threaten safety.

Natural hazards can be classified into three categories: hydrometeorology (floods, typhoons, etc.), geophysics (earthquake, tsunami, etc.), and biological (exposure to pathogens of microorganisms, poisons, etc.). Natural hazards can occur suddenly or through a slow process. They are usually inevitable, always giving a shock effect and causing a lot of losses, both soul and material. This shock effect is caused by a lack of vigilance and preparedness in facing the threat of danger. Although by definition disasters cannot be predicted, the cycle can be anticipated through planning that focuses on risk reduction efforts. The better prepared and planning is carried out, the better risk-reduction steps can be taken.

Disaster preparedness is steps taken previously to ensure an effective response to the impact of hazards through a timely and effective early warning system, as well as the temporary evacuation of property and assets from threatened locations. Preparedness also refers to actions taken to reduce the impact of disasters such as predicting (if possible), preventing, and mitigating vulnerable groups.

Disaster preparedness can be done by anyone, either by the government, communities, households or individuals. The stakeholders of preparedness are grouped into three main groups: individuals & households, government, and school community. In this case, the household plays an important role as one of the spearheads in preparedness. This research will focus on measuring disaster preparedness at the household level. We need to measure this to examine what factors affect preparedness in natural hazards

Some researchers try to develop a natural disaster preparedness framework used 5 parameters to measure the level preparedness of households in dealing with disasters: Knowledge and attitudes, policies and guidelines, emergency response plans, early warning systems, and resource mobilization. In their research also compiled three critical factors to measure disaster preparedness. The three critical factors are knowledge, disaster emergency plans, and information-communication. Previous studies found a significant relationship between household characteristics and preparedness.

Factors such as demography and socioeconomic, have an affecting on household / individual preparedness for disasters. These factors are influential because the socioeconomic status of the community can be affecting their decision making, and the same logic can be applied to decision making about evacuation in emergencies caused by natural hazards.[10]

3. METHODS

The research will be conducted in Cupunagara Subdistrict Cisalak District, Subang Regency. The location setting for this research was determined because the village is located in a landslide-prone area as stipulated in Subang Regency Regional Regulation Number 3 of 2014 concerning the Subang Regency Spatial Planning Plan for 2011-2031 and the high number of landslide cases.

The object of the research used is the assessment of the level of community readiness or Community Readiness Model (CRM) in facing the possibility of landslides using primary and secondary data. Primary data was obtained through interviews with informants consisting of village heads, local figures and residents. Meanwhile, secondary data was obtained from various literature and other relevant materials.

The concept of the Community Readiness Model used in this study consists of the following constructs: (1) Community knowledge; (2) Community knowledge related to issues; (3) Resources related to issues; (4) Leadership; and (5) Community climate. The scaling used is the Likert Scale with a scale range of 1 - 5. The results of the calculation with this scale are used to determine the level of community readiness which can be seen in the following table: [11]

Table 1: Determining the Level of Community Readiness

No.	Stage	Range
1.	No awareness	0 - 0.55
2.	Denial/ resistance	0.56 - 1.10
3.	Vague awareness	1.11 - 1.65
4.	Preplanning	1.66 - 2.20
5.	Preparation	2.21 - 2.75
6.	Initiation	2.76 - 3.30
7.	Stabilization	3.31 - 3.85
8.	Confirmation/ expansion	3.86 - 4.40
9.	Community ownership	4.41 - 5.00

Source: Plested, at.al, 2006

4. RESULTS AND DISCUSSIONS

Cupunagara Subdistrict is one of the areas in Cisalak District, Subang Regency, located in the south, directly bordering West Bandung Regency. As the farthest area, the distance from Cupunagara Subdistrict to the Cisalak District government center is around 21 km and to the Subang Regency government center is 35.5 km. The geographical conditions of Cupunagara Subdistrict consist entirely of mountains with an altitude of 500 - 1,800 above sea level, with an area of 45.70 km2. As a mountainous Subdistrict almost most of the area has an average land contour of 25 degrees and rainfall above 1,000 mm per year. With an average growth rate of 0.83% per year, by 2023, the population of Cupunagara Subdistrict will reach 5,129 people, almost all of whom live around the Cupunagara Subdistrict government center and around the PTPN VIII Bukanagara Tea Factory.

Although measurements have not been carried out regarding disaster vulnerability, Cupunagara Subdistrict can be categorized as an area prone to landslides. This is due to the unstable land structure and the slope of the land and high rainfall. However, in the Subang Regency Strategic Environmental Assessment document 2025-2045, Cupunagara Subdistrict is included as one of the areas with a category prone to landslides along with 27 village/sub-district areas in Subang Regency. A visual depiction of the position of Cupunagara Subdistrict as an area located in a landslide-prone area can be seen in the following image:

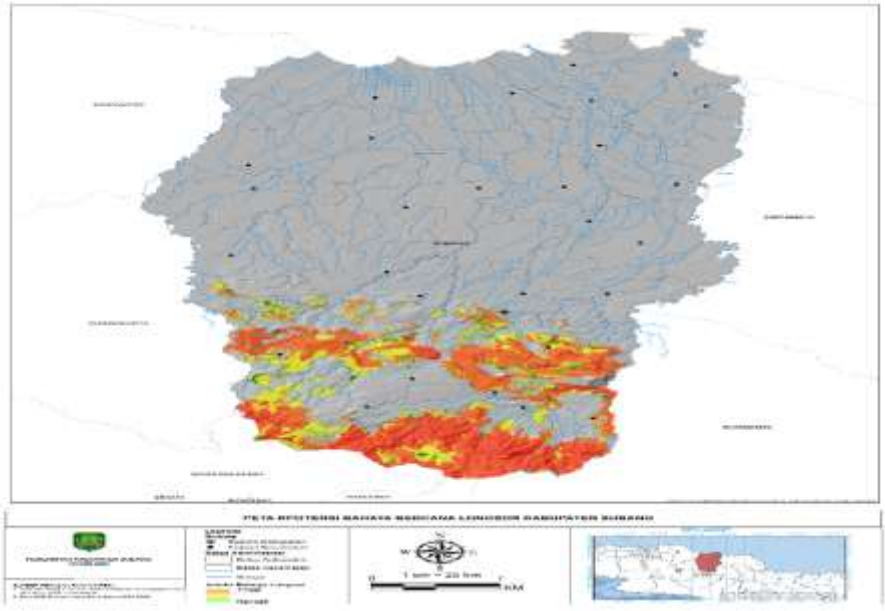


Figure 1. Landslide Disaster Hazard Potential Map
Source: West Java Province Disaster Risk Assessment 2022-2026 reprocessed, 2024

Calculation of Community readiness in facing the possibility of landslide disaster in Cupunagara Subdistrict was done by conducting quantitative assessment and interview with key respondents on 5 dimensions.

1) Community Knowledge Dimension

For the Community Knowledge dimension, the calculation of Community readiness for the possibility of landslide disaster can be seen in the following:

Table 2: Community Knowledge for the Possibility of Landslide Disaster Dimension

No.	Key Respondents	Average Score	
		Subdistrict Apparatus	Public
1	Village Secretary	3.33	
2	Village Consultative Agency	5.00	
3	Community Empowerment Institution	4.67	
4	Village Head	3.67	
5	Farmer 1		5.00
6	Farmer 2		4.33
7	Trader 1		4.33
8	Trader 2		3.67
9	Religious leaders		5.00
10	Village Youth Organization		4.00
11	Businessman		3.67
12	Indonesian National Armed Forces/Indonesian National Police		5.00
	Average Score	4.17	4.38
	Average Total Score	4.31	

Source: Analysis Results, 2024

In the Community Knowledge Dimension regarding the possibility of landslides, the total CRM calculation results produce a confirmation/expansion category. This category is also indicated in the Subdistrict apparatus group and the community already generally understand various aspects related to reducing the risk of landslides. This is possible because Cupunagara Subdistrict has been a place of residence and a place to earn a living for generations for a long time. This means that

community knowledge has a very strong influence on resilience in facing the possibility of landslides. [12]

2) Community Knowledge Dimension Related to Landslide Disaster Mitigation Issues

The calculation of community readiness in the Community Knowledge Dimension related to landslide disaster mitigation issues can be seen in the following:

Table 3: Community Knowledge Related to Landslide Disaster Mitigation Issues Dimension

No.	Key Respondents	Average Score	
		Subdistrict Apparatus	Public
1	Village Secretary	4.33	
2	Village Consultative Agency	3.33	
3	Community Empowerment Institution	4.67	
4	Village Head	4.67	
5	Farmer 1		4.33
6	Farmer 2		3.00
7	Trader 1		3.67
8	Trader 2		3.67
9	Religious leaders		4.67
10	Village Youth Organization		5.00
11	Businessman		3.67
12	Indonesian National Armed Forces/Indonesian National Police		4.00
Average Score		4.25	4.00
Average Total Score		4.08	

Source: Analysis Results, 2024

The dimension of community knowledge related to landslide disaster mitigation issues is more specific to the technical side based on perceptions related to what should be done to reduce risk. In general, this dimension is included in the confirmation/expansion category. This means that both village officials and local residents have mastered information about landslide disaster mitigation quite adequately, although information devices or facilities such as maps of disaster-prone points or printed information about practical steps in the event of a landslide have not been presented in public places. This means that all residents, including village officials, already understand that knowledge about the causes and effects of landslides can reduce the losses that can be felt. This is the main capital to reduce the physical and socio-economic vulnerability of residents. This specific knowledge score was higher for the Subdistrict apparatus group. This is possible because they have more open access to information through formal institutional relations from the sub-district or district government compared to residents. [13]

3) Dimension of Resources Related to Landslide Disaster Mitigation Issues

The calculation of the Dimension of Resources Related to Landslide Disaster Mitigation Issues can be seen in the following:

Table 4 : Resources Related to Landslide Disaster Mitigation Issues Dimension

No.	Key Respondents	Average Score	
		Subdistrict Apparatus	Public
1	Village Secretary	5.00	
2	Village Consultative Agency	3.00	
3	Community Empowerment Institution	4.00	
4	Village Head	4.50	
5	Farmer 1		4.50
6	Farmer 2		4.50
7	Trader 1		4.00
8	Trader 2		4.00
9	Religious leaders		4.00
10	Village Youth Organization		4.00
11	Businessman		4.00

12	Indonesian National Armed Forces/Indonesian National Police		5.00
	Average Score	4.13	4.25
	Average Total Score	4.21	

Source: Analysis Results, 2024

This dimension basically measures the perception of the extent to which local resources are available, in the form of humans, time, funds, space, and others related to landslide disaster mitigation. In this dimension, the perception of residents regarding the possibility of landslide disasters is included in the confirmation/expansion category. From this assessment, both residents and village officials already understand how to use existing resources to anticipate the possibility of landslide disasters. In this context, residents of Cupunagara Subdistrict are considered to have started implementing local resource mobilization as one element in preparedness for the possibility of landslide disasters. In this context, it is also seen that control of resources is more dominated by community self-reliance than by the village government. [14]

4) Leadership Dimension

To calculate community readiness in facing the possibility of landslide disasters in the Leadership Dimension, it can be seen in the following:

Table 5: Leadership Dimension

No.	Key Respondents	Average Score	
		Subdistrict Apparatus	Public
1	Village Secretary	4.00	
2	Village Consultative Agency	4.00	
3	Community Empowerment Institution	4.50	
4	Village Head	4.50	4.5
5	Farmer 1		3.50
6	Farmer 2		5.00
7	Trader 1		4.00
8	Trader 2		2.50
9	Religious leaders		4.50
10	Village Youth Organization		4.00
11	Businessman		4.00
12	Indonesian National Armed Forces/Indonesian National Police		4.00
	Average Score	4.25	3.94
	Average Total Score	4.08	

Source: Analysis Results, 2024

For the Leadership dimension, the results of the calculation of community readiness in facing the possibility of landslides are included in the confirmation/expansion category. This category is at a high level, where village officials and residents have assessed that the leadership in Cupunagara Subdistrict has played a concrete role in motivating and mobilizing residents to participate in socialization activities to landslide disaster management. In this context, the high level of community participation in the collaboration of various actors shows that the role of the village head and his staff has carried out facilitative leadership.[15]

5) Community Climate

Assessment of the Community Climate Dimension on community readiness in mitigating landslide disasters as can be seen as follows:

Table 6: Community Climate Dimension

No.	Key Respondents	Average Score	
		Subdistrict Apparatus	Public
1	Village Secretary	5.00	
2	Village Consultative Agency	5.00	

3	Community Empowerment Institution	4.00	
4	Village Head	4.50	
5	Farmer 1		5.00
6	Farmer 2		4.50
7	Trader 1		1.50
8	Trader 2		4.00
9	Religious leaders		3.50
10	Village Youth Organization		5.00
11	Businessman		2.50
12	Indonesian National Armed Forces/Indonesian National Police		5.00
	Average Score		
	Average Total Score	4.13	

Source: Analysis Results, 2024

This dimension basically aims to measure how the community's attitude is towards the implementation of disaster mitigation. Based on the calculation, the Community Climate Dimension is at confirmation/expansion, which means that the community and the Cupunagara Subdistrict apparatus have shown a positive attitude to fully support and are ready to jointly implement landslide disaster mitigation. This positive attitude basically begins with an awareness to minimize disaster risks which are expected to also have an impact on a disaster-aware community.[16]

6) Level of Community Readiness for Possible Landslide

Disasters Based on data analysis using the CRM concept, the level of community readiness in facing the possibility of a landslide disaster can be seen in the following:

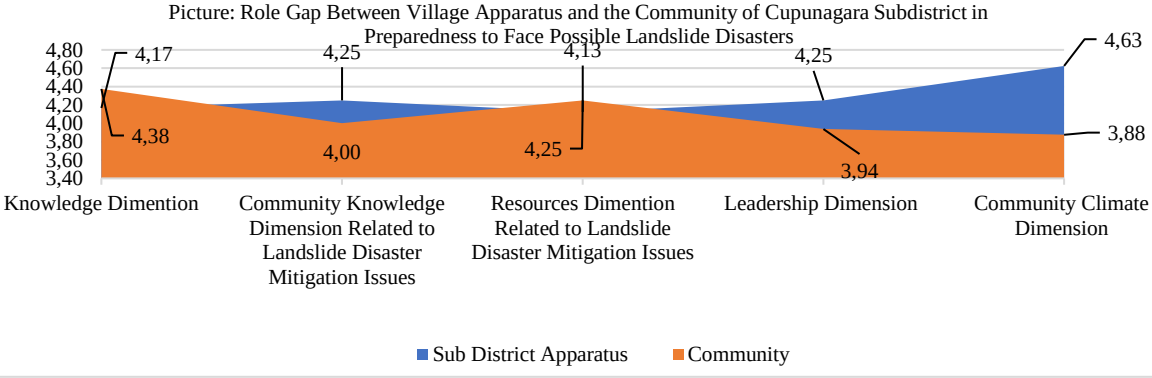
Table 7 : Score of the Level of Readiness of the Cupunagara Sub District Community in Facing the Possibility of Landslides

No.	Dimensions	Average
1.	Community knowledge	4.31
2.	Community knowledge related to landslide disaster mitigation issues	4.08
3.	Resources related to landslide disaster mitigation issues	4.21
4.	Leadership	4.08
5.	Community climate	4.13
	Total	20.81
	Average	4.16

Source: Analysis Results, 2024

With the average score achieved, the level of Community Readiness of Cupunagara Subdistrict in facing the possibility of landslides is included in the confirmation/expansion category. With this category, it can be interpreted that most residents of Cupunagara Subdistrict already have adequate understanding regarding the implementation of disaster mitigation for landslides, at least at the local level. The gap in the level of preparedness in facing the possibility of landslides between the community and the Cupunagara Subdistrict apparatus can be seen in the following:

Picture: Role Gap Between Village Apparatus and the Community of Cupunagara Subdistrict in Preparedness to Face Possible Landslide Disasters



Source: Analysis Results, 2024

Using the benchmark of 5 as the ideal number [17], it can be seen that there is no significant difference between community groups and village officials. Thus, it can be seen that local policy makers and policy users have almost the same perception. However, in the Community Climate Dimension, it can be seen that the composition of the role of village officials is relatively greater in forming social cohesion. This is possible with the leadership model applied to the structure and characteristics of a simple agrarian society with traditional institutions [18].

Understanding of the threat of natural disasters for residents of Cupunagara Subdistrict has so far been limited to landslides. So far, there have been no recorded cases of natural disasters in the area and landslides are considered the only potential disaster. In fact, the area also has the potential for other natural disasters, namely earthquakes. Subang Regency area is crossed by the Cipeles Fault and the Baribis Fault which are included in the thrust fault category.[19]

The terminology of disaster mitigation itself, including that related to landslides, is still very limited. Local residents and a number of village officials generally understand the meaning of mitigation from a practical aspect based on experience. The case of the landslide disaster on the Darmaga Subdistrict - Cupunagara Subdistrict-road on October 10, 2022 is still strongly embedded in the memories of local residents, because the road is crossed by residents every day to go to local growth centers in Cisalak District and Subang Regency. The limited knowledge of the community, including village officials from formal local government channels, can be understood due to the limited resources owned by the Regional Disaster Management Agency and related task forces at the sub-district level. Moreover, until now the Subang Regency Government has not made a Disaster Hazard Map for the district level or a Detailed Spatial Plan (RDTR) for Cisalak District.

In addition, so far, understanding of this mitigation has been obtained more from informal sources individually, especially news updates about disaster events in other places. Communication tools in the form of smartphones are the main means of gathering information that not only covers events in other places, but also relates to practical technical aspects such as the peak of the rainy season in January-February which is one of the moments of high potential for landslides as a trigger factor [20-21]. Knowledge about the importance of disaster mitigation has proven to be the basic capital for realizing community participation in implementing landslide disaster mitigation [22]. In addition, leadership at the village level to the hamlet level has carried out an effective function in motivating and mobilizing residents to participate, starting from socialization activities to preparedness preparations.

The social cohesion of local residents greatly assists the role of the village head and his staff in realizing a shared understanding of the threat of this natural disaster. The characteristics of local residents who are agrarian are a determining factor in the high level of social cohesion and the emergence of a gemeinschaft or community-type society [23]. In addition, aspects of resources in the form of finance, technical equipment, local officers and volunteers, and other resources have technically supported mitigation efforts. Another interesting aspect is the influence of local culture that accustoms residents to always living "side by side" with the potential for landslides. This is possible because most of the local residents have long lived in Cupunagara Subdistrict so that awareness of the possibility of landslides is inherent in everyday life.

So far, population mobility to Cupunagara Subdistrict has been relatively low. Generally, the migrants are only assigned State Civil Apparatus such as Elementary School teachers or members of the Police who serve as Bintara Pembina Desa (Babinsa) or Bhayangkara Pembina Keamanan dan Ketertiban Masyarakat (Bhabinkamtibmas). Access to road infrastructure is the cause of low internal migration. The condition of the district road connecting Cupunagara Subdistrict to the provincial road in Darmaga Subdistrict which is 14.2 km away, which was originally badly damaged, was mostly repaired in 2022 and is planned to be fully completed in 2025.

The low population growth rate and internal migration can also be seen from the pattern of population settlements which are relatively centralized around the Cupunagara Subdistrict Head Office and the PTPN VIII Bukanagara Tea Factory. Residential areas accompanied by elementary schools and centers of socio-economic activity are mostly located in flat areas. High-contoured areas are mostly located on residents' agricultural lands, which are in fact the place of residents' economic activities. However, the road infrastructure that connects Cupunagara Subdistrict with other villages

in Cisalak District and to Cikole Subdistrict West Bandung Regency, completely crosses the landslide-prone area.

The level of community readiness for the possibility of landslides in Cupunagara Subdistrict with the confirmation/expansion category, can then be followed up at least by formulating a work network with other institutions, collecting disaster funds and measuring the level of vulnerability to disasters, and initiating formal and informal institutions at the local level for disaster mitigation. These steps are certainly expected to accelerate the increase in the readiness of the Cupunagara Subdistrict community to the community ownership category, where the application of the disaster mitigation concept has become part of people's lives.

5. CONCLUSION

The level of preparedness of the people of Cupunagara Subdistrict, Cisalak District, Subang Regency in facing the possibility of landslides is at level 8, namely confirmation/expansion. With this category, most residents of Cupunagara Subdistrict already have an adequate understanding of the implementation of disaster mitigation for landslides, at least at the local level. With this level of preparedness, the government at the village level is considered to have relatively started efforts to implement mitigation by initiating local institutions, so that it can be followed up with various development efforts that lead to the community ownership category. However, the measurement of the level of preparedness at the village level is still not specific. In the future, measurement efforts with this model can be carried out in other institutions/communities such as educational institutions, tourist destinations, and other community activity centre.

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