Analysis of potential landslides and local wisdom approaches in dealing with them in the Naga Traditional Village Area, Tasikmalaya Regency

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Abstract. Indonesia has a lot of natural resource wealth, but on the other hand, Indonesia has various threats or risks of natural disasters as a logical consequence of Indonesia's geographical conditions. One of the disasters that often occurs in Indonesia is landslides. The West Java Province region, in this case Tasikmalaya Regency, which contains the Naga Traditional Village, has the potential for landslides because it has a hilly morphology. So, this research not only aims to analyze the potential for landslides in Kampung Naga, but also aims to analyze how to deal with landslides through the local wisdom of the Kampung Naga community. The method used is a scoring and weighting method using a Geographic Information System (GIS), which involves several thematic data, namely data on land use, rainfall, soil type, geology and slope in the research area, which is adjusted to the estimation model from Puslittanak. Then use the Qualitative Descriptive method to analyze the traditional wisdom or local wisdom of the community in dealing with landslide disasters. The research results show that based on the analysis, landslide potential falls into three categories, namely very low, low and medium. Then the traditional wisdom or local wisdom of the community in dealing with landslides is by making terraces which is called *entep stone* or *umpak stone* , with stones obtained from the Ciwulan River next to the village. Apart from that, the community also continues to protect the land cover on the hill by making it a prohibited forest (*Leuweung Larangan)* and a forest entrustment (*Leuweung Titipan)* , so that its use can be well controlled, and maintain the strength of the soil.

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1 Introduction

Indonesia's location in the Subduction Zone makes Indonesia vulnerable to various disasters such as earthquakes, volcanic eruptions and landslides [1]. Disasters can occur at any time, both disasters caused by natural factors, non-natural factors and social factors. Indonesia has a lot of natural resource wealth, however, on the other hand, Indonesia has various threats or risks of natural disasters, one of which is landslides.

Several natural factors cause Indonesia to be very vulnerable to landslides, including because Indonesia has a topography that is mountainous and hilly, which is located on the equator, so that Indonesia has a tropical climate with two seasons, namely the dry season and the rainy season, characterized by quite a change in weather. extreme. The tropical climate with high rainfall causes weathering to occur so that much of the soil is unstable. Increasing water content in layers of soil or rock, especially on hill slopes, will facilitate sliding movements or landslides.

According to the National Disaster Management Agency (BNPB) in 2017 [2] in Indonesia there were 2,862 natural disasters recorded, with details of 979 floods, 886 tornadoes, 848 landslides, 96 fires. forests and land, 20 earthquakes, 19 droughts, 11 heat waves and 3 volcanic eruptions and claimed many lives.

Kampung Naga is located in Neglasari Village, Salawu District, Tasikmalaya Regency. Geographically, Kampung Naga is located in a valley The distance is ± 1 km from the main road with a height of 488 meters above sea level. Naga Traditional Village is famous for its people who uphold their ancestral culture. Traditional wisdom is capable of Traditional wisdom is traditional knowledge that is unique to a particular society or culture that has developed for a long time, and is the result of a process of reciprocal relations between society and its environment, becomes a reference for behavior, is practiced and passed down from generation to generation [1][3][4]. Traditional wisdom as a guide, controller and guideline for behavior in social life has a very important function in maintaining the sustainability of natural resources and the environment [1]. Wisdom Traditional practices include teaching human behavior in interacting with nature, through taboos, myths and traditional rituals [1].

Tasikmalaya Regency BPBD data shows that Tasikmalaya Regency is one of the areas in West Java that is prone to earthquakes and landslides. Besides land Landslides and flood disasters also often occur in Tasikmalaya Regency, especially during the rainy season. According to BPBD Tasikmalaya Regency, there are 17 sub-districts in Tasikmalaya Regency which are areas prone to natural disasters, one of the sub-districts which is prone to disasters is Salawu Sub-district [2]. Naga Village, which is located in Neglasari Village, Salawu District, is a village that is prone to natural disasters. Kampung Naga is located in the Ciwulan River Valley, flanked by highland hills stretching from west to east.

Even though the Naga Traditional Village is an area that has the potential for various kinds of disasters, up to now it remains safe from the threat of disasters, so this research aims to analyze the potential for landslides and how to deal with disasters through the local wisdom of the Naga Traditional Village community [5].

Local wisdom is used by the community as a form of effort to overcome problems encountered in life. The form of local wisdom itself varies from knowledge, belief, understanding, or insight and customs in life [6].

2 Research Methods

In this research, the method used is the scoring and weighting method, which involves several thematic data, namely data on land use, rainfall, soil type, geology and slope in the research area. The thematic data was then input into *ArcGIS 10.4 software* and then data processing was carried out to determine the potential for landslides in the Kampung Naga area.

The potential for landslides can be determined by giving a score and weight to each parameter. In the processing process, each parameter has a classification score which is multiplied by its respective weight according to the [7] estimation model, then the results of the multiplication of scores and weights are added up based on their geographical suitability.

The stages of this research are as follows:

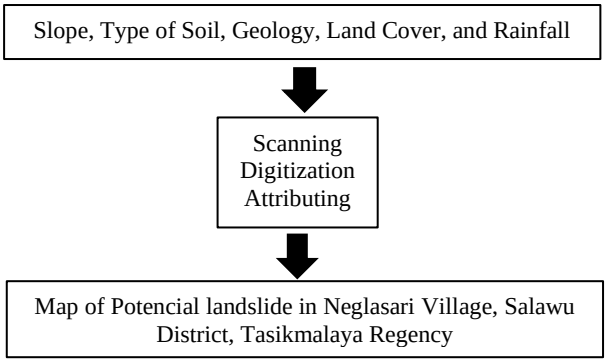

Fig. 1 . Stages of Longor Potential Zone Analysis.

The model used to analyze the potential for landslides is an estimation model that refers to research [7] with the following formula:

$$\text{TOTAL SCORE} = 0.3\ \text{FCH} + 0.2\text{FBD} + 0.2\text{FKL} + 0.2\text{FPL} + 0.1\text{FJT} \quad (1)$$

Information:

FCH = Rainfall Factor

FBD = Rock Type Factor (Geology)

FKL = Slope Slope Factor

FPL = Land Cover Factor

FJT = Soil Type Factor

0.3;0.2;0.1 = Value Weight

The parameter classification along with scores and weights can be seen in the following table:

Table 1. Rainfall Classification (mm/year).

Parameter	Weight	Score
Very Wet (>3000)	30%	5
Wet (2501-2300)		4
Medium (2001-2500)		3
Dry (1501-2000)		2
Very Dry (<1500)		1

Table 2. Classification of Rock Types (Geology).

Parameter	Weight	Score
Volcanic Rock	20%	3
Sedimentary Rocks		2
Alluvial Rock		1

Table 3. Classification of Slope Slope.

Parameters (%)	Weight	Score
>45	20%	5
30-45		4
15-30		3
8-15		2
<8		1

Table 4. Land Cover Classification.

Parameter	Weight	Score
Moorland, rice fields	20%	5
Shrubs		4
Forests and plantations		3
City/settlement		2
Ponds, reservoirs, waters		1

Table 5. Soil Type Classification.

Parameter	Weight	Score
Regosol	10%	5
Andosol		4
Chocolate latosol		3
Yellowish brown latosol association		2
Alluvial		1

The method used to analyze the traditional wisdom of the Naga Traditional Village community in dealing with landslides uses a qualitative descriptive method. The use of qualitative descriptive methods is by carrying out direct field observations accompanied by comprehensive interview activities [8]. The qualitative approach aims to gain understanding and insight into a particular event or behavior that occurs in a society [9]. Qualitative methods are used to explore behavioral or cultural habits and community values in mitigating disasters in their environment [10]. The research process starts with a survey of the research location, assessing the geographical conditions, analyzing the shape of the house, land use around the house, and so on. Then conduct interviews with the community and community leaders of the Naga Traditional Village, carry out documentation studies and literature studies that are relevant to the research.

3 Results and Discussion

The Naga traditional village is administratively included in the N eglasari village area, Salawu sub-district, Tasikmalaya Regency. The location of Naga village is in a fertile valley with the southern border bordered by rice fields, to the north and east by the Ciwulan River which borders Nangtang village. The Ciwulan River has its water source from Mount Cikuray, Garut district. The distance from the city of Tasikmalaya to the Naga Traditional Village is approximately 30 kilometers.

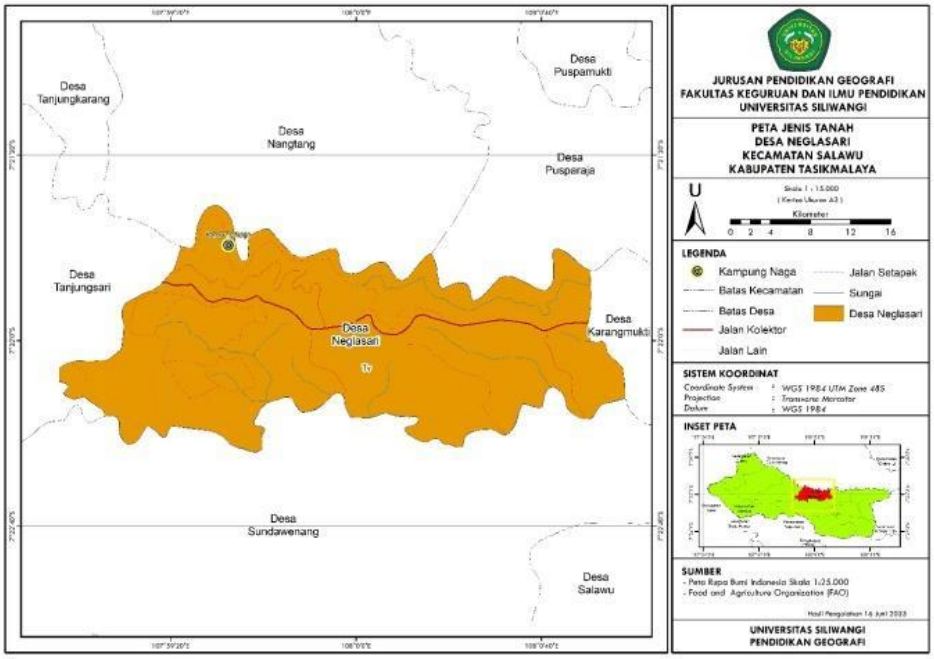

Fig. 2 . Administrative Map Neglasari Village.

The location of Kampung Naga is not far from the main road that connects the city of Garut with the city of Tasikmalaya. This village is located in a fertile valley morphology and is bordered by sacred forests. With the morphological condition of the Naga Traditional Village in the valley area, it has the potential for disaster. One of the potential disasters in this area is the potential for landslides .

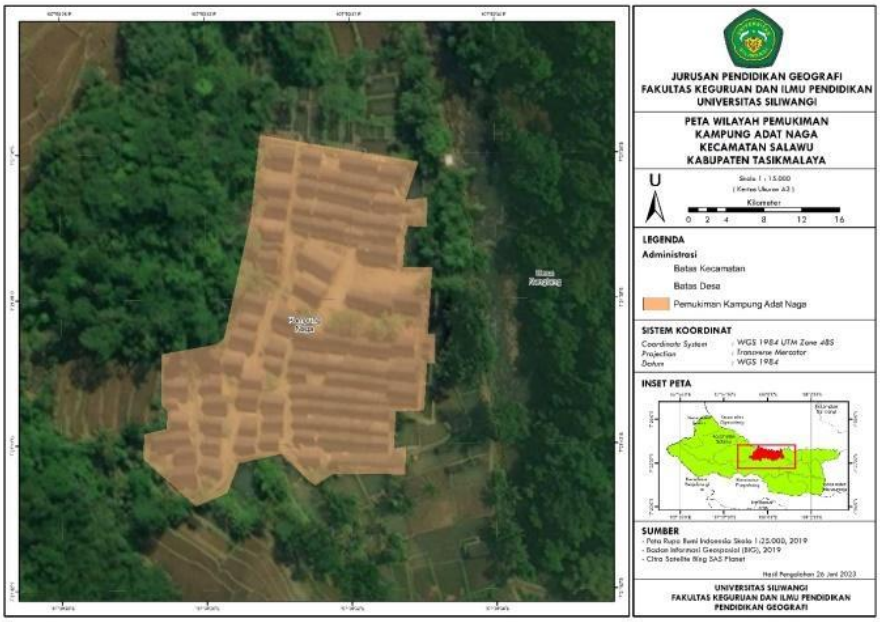

Fig. 3 . Administrative Map of Naga Traditional Village.

3.1 Factors that influence the occurrence of landslides

3.1.1 Rainfall

Based on rainfall data from Balai PSDA Mt. Satria, rainfall in the research area is considered high rainfall, namely 2,233 mm/year. Rainfall will determine how big the chance of landslides is. More details can be seen on the rainfall map as follows:

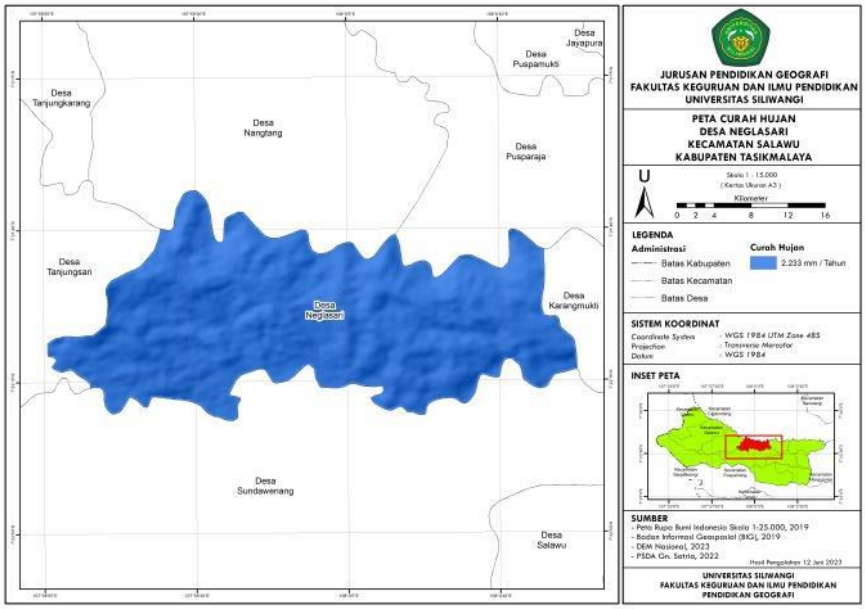

Fig. 4. Neglasari Village Rainfall Map.

Table 6. Classification of Rainfall in Neglasari Village.

Parameter	Weight	Score	Final Score
Medium (2001-2500)	30%	3	0.9

Based on this data, it is known that the rainfall in Neglasari Village is 2,233 mm/year with a score of 3 and multiplied by a weight of 0.3 which has a result of 0.9 and falls into Medium rainfall.

3.1.2 Rock Types (Geology)

The geology of the research area is an area with a rock structure that is very strongly influenced by volcanic conditions, one of which is Mount Cikuray with the rock code QTvc which experienced formation in the Quaternary and Pleistocene epochs. The rock code QTvc is rock resulting from old volcanoes such as volcanic breccia, lava and tuff with layers of andesite to basalt. Apart from that, there are also young volcanic rocks: eflata and flows composed of basaltic andesite with the rock code Qy which experienced the formation of the Quaternary period with the Holocene period. The rocks found at the research location belong to the Quaternary era, where geological events occurred around the last two million years.

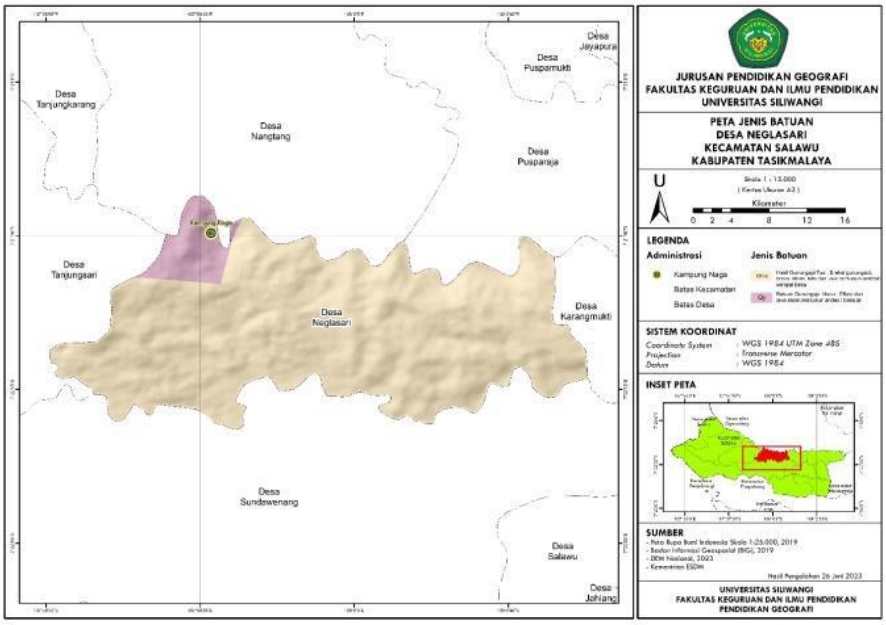

Fig. 5. Neglasari Village Geological Map.

Table 7. Geological Classification in Neglasari Village.

Parameter	Weight	Score	Final Score
Volcanic Rock	20%	3	0.6

Based on the classification from the Research Center, the rocks in Neglasari Village are volcanic rocks which have a score of 3 and a weight of 0.2 with a total of 0,6.

3.1.3 Type of Soil

Soils that develop from volcanic products have distinctive and unique characteristics compared to other soils that develop from non-volcanic materials. In the classification of [11] it is known as Andosol soil or in the soil taxonomy system [12] it is known as the Andisol order and in the [13] it is known as Andosol. The majority of Andosol land is located on volcanic slopes, with predominantly hilly to mountainous topography. This is because Indonesia is a country that has many volcanoes. In essence, all types of land in Indonesia are prone to landslides triggered by several other variables. Including Andosol land, it is land that is prone to landslides. If you look at the taxonomic system, there are 10 types of soil that are relatively easy to landslide, namely fluvisol, regosol, cambisol, vertisol, renzina, litosol, ferrasol, nitosol, acrisol and andosol. So it can be understood that Neglasari Village, the Naga Traditional Village itself has an Andosol type of soil which has soil that is relatively easy to landslide . More details can be seen on the rainfall map as follows:

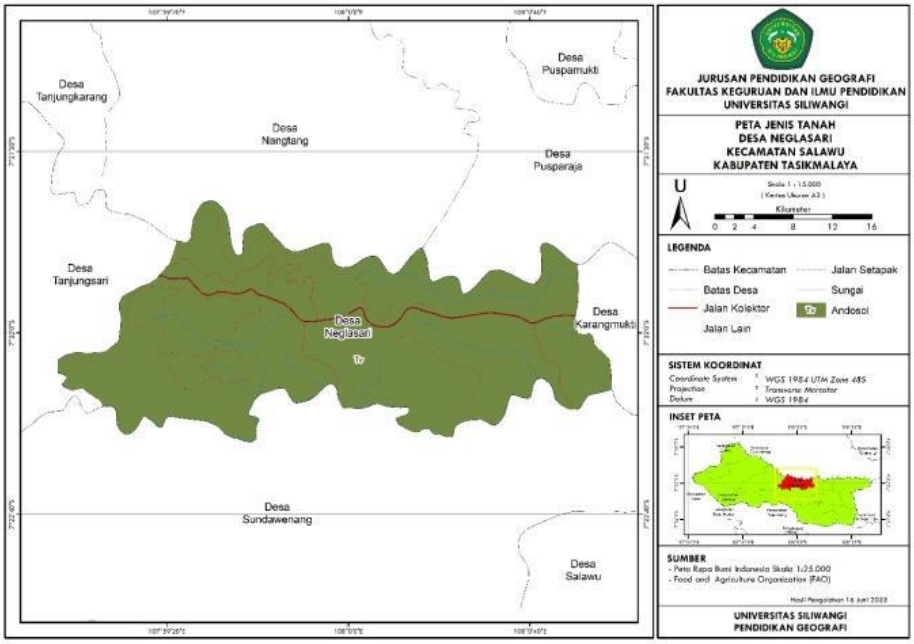

Fig. 6. Neglasari Village Soil Type Map.

Table 8. Classification of Soil Types in Neglasari Village.

Parameter	Weight	Score	Final Score
Andosol, Podsolik	10%	4	0.4

Based on the classification from Puslittanak, the type of soil in Neglasari Village is Anosol soil which has a score of 4 and a weight of 0.1 with a final score of 0.4.

3.1.4 Slope

The influence of slope on the occurrence of landslides is that the steeper the slope, the stronger the frictional force and attraction (gravity) of the earth, the faster the slip plane that forms, with disturbances from both above and below the slope, the earth's gravitational force will increase. very strong. The steeper the slope, the more friction there is what appears will be weaker, meaning that the magnitude of the force or power to push against the earth's gravitational force is getting weaker, any disturbance to a gentle slope causes weak pulling

and pushing forces when compared to a steep slope, there is little disturbance to the slope of the load on it. The top of the slope is susceptible to gravitational attraction and the resulting friction force becomes greater.

The potential landslide zone is the zone of vulnerability to ground movements located in areas with a slope of >15% [14]. In the BNPB landslide disaster risk assessment module, it is assumed that landslides have the potential to occur on slopes >15% or on slopes of more than 8.51º (degrees).

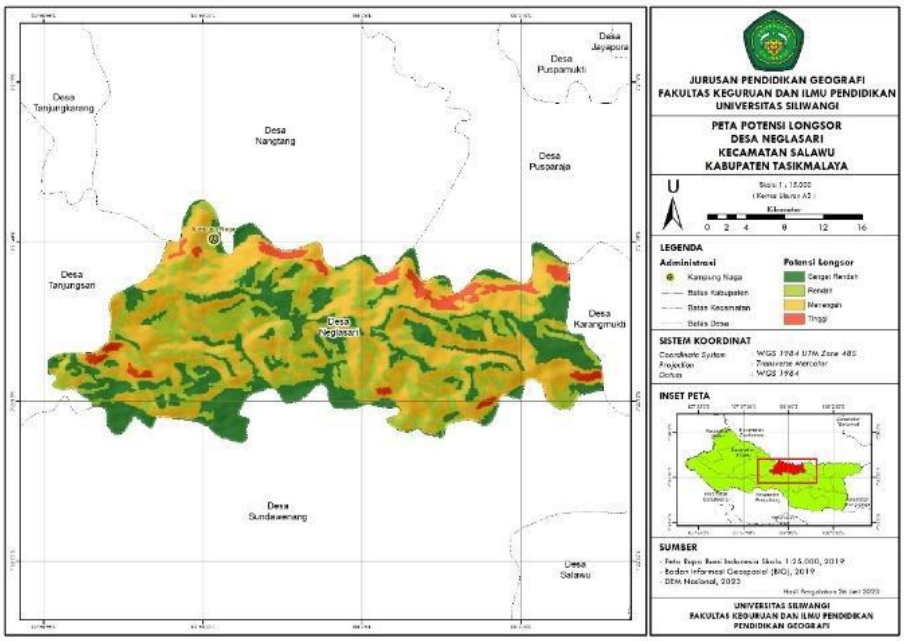

Fig. 7. Neglasari Village Slope Map.

Table 9. Classification of Slope Slopes in Neglasari Village.

Parameters (%)	Weight	Score	Final Score
>45	20%	5	1
30-45		4	0.8
15-30		3	0.6
8-15		2	0.4
<8		1	0.2
Amount			3

Based on the classification from the Research Center, the slope of the slopes in Neglasari Village is quite varied, starting from <8% with a score of 1 times a weight of 0.2 being in the flat class, 8-15% with a score of 2 times a weight of 0.2 being in the flat class. into the sloping class, 15-30% with a score of 3 times a weight of 0.2 into the rather steep class, 30-45% with a score of 4 times a weight of 0.2 into the steep class and >45% with a score of 5 times the weight 0.2 falls into the very steep class. The overall or final score of the 5 classes in Neglasari village is 3.

3.1.4 Land Cover

Land cover in an area is closely related to economic conditions and the type of community in that area. Land cover has different contributions in influencing the occurrence of landslides in an area, the following is a map of land cover in Neglasari village.

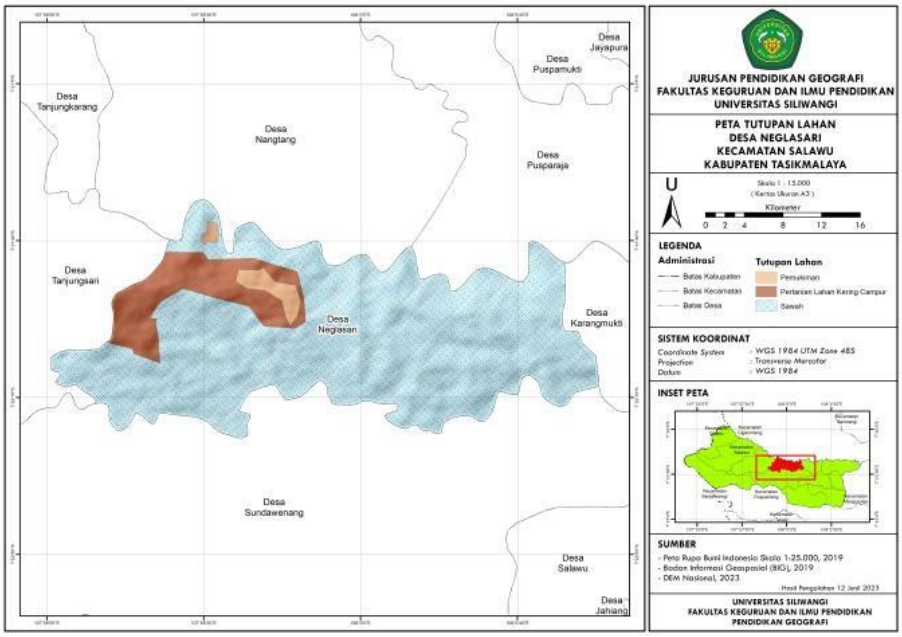

Fig. 8. Neglasari Village Land Coverage Map.

Table 10. Classification of Land Cover in Neglasari Village.

Parameter	Weight	Score	Final Score
Moorland, rice fields	20%	5	1
City/settlement		2	0.4
Amount			1.4

Based on the classification from the Research Center, land cover in Neglasari Village is rice fields and moorland with a score of 5 multiplied by a weight of 0.2 and cities/settlements with a score of 2 multiplied by a weight of 0.2, which has a total score of 1.4.

3.2 Potential Landslide Area in Neglasari Village, Salawu District, Tasikmalaya Regency

Estimation of disaster-prone areas or potential landslides is carried out using a model sourced from [7] where the parameters used are rainfall, geology, soil type, slope slope and also land cover. All parameters are then classified as Table 1 to Table 5 respectively. By using the landslide potential estimation model from Puslittanak, the criteria for landslide susceptibility are obtained, namely; Low, Medium, High and Very High. Where each parameter has a certain weight, such as rainfall has a weight of 30%, type of rock (geology), slope and land cover has a weight of 20% and type of soil has a weight of 10% [15].

The model used to analyze the potential for landslides in the research area is as follows:

$$\text{TOTAL SCORE} = 0.3\ FCH + 0.2FBD + 0.2FKL + 0.2FPL + 0.1FJT \quad (2)$$

Information:

FCH	= Rainfall Factor
FBD	= Rock Type Factor (Geology)
FKL	= Slope Slope Factor
FPL	= Land Cover Factor
FJT	= Soil Type Factor
0.3;0.2;0.1	= Value Weight

Based on the analysis of the total score results of all parameters at the location, a classification of vulnerability classes is obtained with the score intervals for each class listed in the following table:

Table 11. Class Score Interval for Landslide Disaster Vulnerability Level.

Score Interval (%)	Vulnerability Class
3.1 – 4.5	Low
4.6 – 6	Currently
6.1 – 7.5	High
7.5 – 8.9	Very High

Based on the explanation of the formula above, the final score for each parameter can be calculated which has been multiplied by the weight according to Puslittanak, 2004 as follows:

TOTAL SCORE = 0.9 +0.6 + 0.4 +3 +1.4 = 6.3

This result is 6.3, which indicates that Neglasari village has quite high potential for landslides, including the Naga Traditional Village which is right in Neglasari Village.

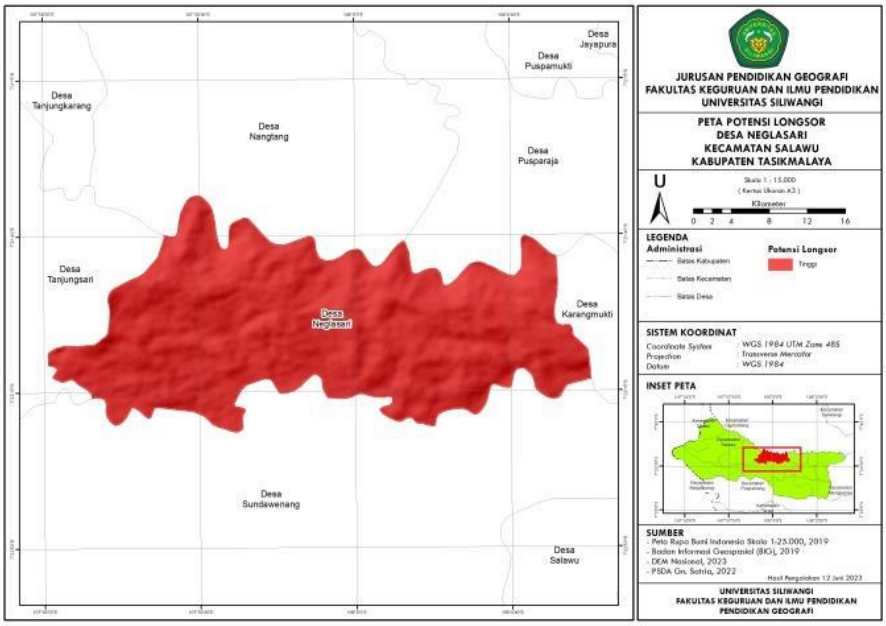

Fig. 9. Landslide Potential Map in Neglasari (Naga Traditional Village Location).

The map is a visualization of the total final score which has been multiplied by weights according to [7]. If you look at the map of potential landslides in the Naga Traditional Village, there are community residential areas there. There are 113 houses stretching from west to east with doors facing north and south. Specifically in this residential area, by digitizing it can be seen that the potential level for landslides is from very low to medium. If you look at the slope percentage it is at 25% -45% which can also cause losses. So this indicates that there is potential harm to the local community.

The community's knowledge of potential landslide conditions makes the community adaptive and provide solutions, one of which is the local wisdom possessed by the Naga traditional village community to deal with disasters that can occur there at any time. The people of the Naga Traditional Village are very concerned about land use in their area, which seems to be set in such a way as to be adaptive to landslides, because the position of the Naga Traditional Village is on a fairly steep slope.

The morphology of the Kampung Naga area is on a sloping hillside, this condition has the potential to be affected by landslides. A wealth of experience, influence from outside, and a variety of technologies can cause dynamics in carrying out forms of local wisdom that exist in society [16]. Reflecting on experience and the morphological conditions of the area around Kampung Naga, the community has adapted to these conditions.

The position of the houses close to each other because there are regulations that cannot expand the area of traditional villages also exacerbates the risk of landslides. The people of Kampung Naga are trying to find a solution regarding the threat of landslides, according to the community, because there are many natural stones available around the river, how can they be used as a medium to reduce the risk of landslides. Finally, the stones are arranged around the steep slope with the aim of protecting the soil on the slope so that landslides do not occur. One way to anticipate landslides is to make terraces and protect the slopes with rock cover or what is called "entep *rock*" [17]. Stones obtained from the Ciwulan River next to the village were brought to the village as material to cover the slopes, this aims to resist soil movement and reduce splash erosion resulting from rainwater.

Fig. 10. Arrangement of Erosion Resisting Stone (*Entep Stone*).

Apart from using stones to support the slopes, the people of the Naga Traditional Village also apply the term "*pamali*" or pantrang in entering or making excessive use of the prohibited forest (*leuweung ban*) and forest entrusted (*leuweung titipan*) located around the Naga Traditional Village. Of course, this Patrangan is sacred, apart from being related to aspects of public trust, if it is further studied, it is also related to aspects of environmental conservation.

Fig. 11. Ban Forest (*Leuweung Larangan*).

Fig. 12. Titipan Forest (*Leuweung Titipan*).

The sacredness of these two forests is related to the community's spring reserves, which can be maintained during the dry season. Then it is also related to land cover on the slopes which can strengthen the soil, so that the bond between the soil and the slopes and plants is maintained and can minimize the risk of landslides.

Almost the entire area of the Naga Traditional Village which has a high slope, especially around houses, is covered with rocks to protect the soil from erosion or landslides. Then, by guarding prohibited forests (*leuweung ban*) and entrusted forests (*leuweung titipan*), this is to maintain groundwater reserves and reduce the risk of landslides. Of course, this is a form of community adaptation in terms of traditional wisdom or local wisdom that has been used from generation to generation to deal with potential landslide disasters around their environment.

4 Conclusion

Naga Traditional Village located in Neglasari Village, Salawu District, Tasikmalaya Regency. Based on the analysis, the potential for landslides is in the high category. Judging from this category, the Naga Traditional Village area is an area that is included in the potential location for landslides. The Naga Traditional Village community certainly does not remain silent in facing the potential for landslides in their area, society has its ways with a traditional wisdom approach or local wisdom in dealing with it. The way for the people of Naga Traditional Village to anticipate or minimize losses that will arise from landslides is by making terraces. Which is called *entep stone* or *umpak stone*, with stones obtained from the Ciwulan River next to the village. Apart from that, the community also continues to protect the land cover on the hill by making it a prohibited forest (*Leuweung Larangan)* and a forest entrustment (*Leuweung Titipan)*, so that its use can be well controlled, and maintain the strength of the soil.

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