Analysis of embassy areas of disaster and disaster mitigation efforts in pesawaran lampung district

Analysis of embassy areas of disaster and disaster mitigation efforts in pesawaran lampung district

I L Nugraheni[1*], Suhendro[2] and A Suyatna[3]

[13]Universitas Lampung
[2]Departement Geography of Education, Universitas Pendidikan Indonesia
[*]irmalusi42@gmail.com

Abstract. A landslide disaster was a hydro meteorological disaster that occurred in Pesawaran District, Lampung Province. The purpose of this study was to analyze the level of vulnerability of landslides in Pesawaran District. The method used is descriptive method using the variable (parameter) Grade slope, rainfall, geology and land use. The analysis was done by overlaying using ARCGIS from 4 variables which then obtained land units and land units then weighed to get the level of landslide vulnerability with three class. The results showed that areas with low vulnerability were 13,963 ha (4.89%), moderate vulnerability was 175,297 ha (61.39%) and high vulnerability areas were 96,286 ha (33.72%). The dominant variable causing landslides is rainfall, slope and land use. Landslide mitigation that can be done is by providing information to the people living in Pesawaran District about which areas are high, medium, and low in the danger of landslides. Increasing public awareness about the dangers of landslides in their area, preparedness faces landslides with regard to conditions when high intensity rain falls, for people who live in steep slopes and are very steep, be careful and always alert to the danger of landslides. Increased public awareness to use dryland agricultural land to be used in accordance with its designation, do not plant crops that can actually cause a greater risk.

1. Introduction

Landslide are natural geomorphic processes occuring at locations caracterized by spesific environmental conditions[1]. A landslide is a geological event that occurs due to the movement of rock mass or soil whose movement falls down. In general, landslides are caused by 2 factors: driving factors and trigger factors. The driving factor is a factor that affects material conditions while the trigger factors are the factors that cause the material to move[2]. Landslides, often hit Lampung Pesawaran District. Pesawaran Regency is located in the southern part of Lampung Province which borders the Sunda Strait. Pesawaran District is based on 2013 data, included in the multi threat disaster risk index per district in the territory of Indonesia in the category of high risk class with a score of 201. This shows that the Pesawaran District area is at risk of being exposed to the threat of natural disasters, both floods, tsunami, landslides, extreme weather, land and forest fires, volcanoes and others. Landslides that occur are caused by high rainfall (3000-3500 mm / th) with a slope of more than 45% which is steep to steep and there is an active Sumatra fault zone. Since 2018, there has been a landslide in Pesawaran District. As a result, the material that hides the road body makes the vehicle unable to pass within a few hours. The incident had cut off the interrupted roads. Landslides that occurred were also caused by the planting of plants that were not in accordance with the conditions of the land. The occurrence of landslides is certainly very detrimental to both the economic, social and environmental aspects. Therefore, identification of landslide-prone areas in full in Pesawaran District is very necessary in the effort to manage sustainable development and landslide mitigation efforts on target. Landslides are a form of erosion which transports or transfers the land at a time in large volumes. So it can

be said that landslides are one of soil erosion, soil erosion refers to the removal of topsoil by the natural physical forces of water and wind at a greater rate than it is formed or through forces associated with farming activities such as tillage. Without soil and plants the land becomes desert like and unable to support life. Landslides occur as a result of the sliding of a volume of soil above a rather impermeable layer of water saturated water[3]. Disaster mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness and capacity building to face the threat of disaster. Demarcating landslide prone areas and accordingly plan the future development activities like Reduce the slope angle. Reduce the load on the slope (rock, soil or artificial structures). Stabilize near-surface soil by preferably fast growing plants with sturdy root system .Build thick retaining walls at the toe of the slope (high thin walls have been less successful[4].The hypothesis that can be designed in this study is that the occurrence of landslides in the area of Pesawaran Regency is caused by high rainfall and steep slope up to steep so that there is a need for disaster mitigation.

2. Methods

A spatial database considering landsliderelated factors based on extensive field work and previous inventory maps, such as topography, geology, and land cover, was used[5]. The method that will be used in conducting this research is descriptive method by looking at the influence of each variable to analyze landslide prone areas where these variables are obtained through secondary data in the form of maps, namely land use maps, rainfall maps, geological maps, slope maps and administrative map of Pesawaran Regency. The maps are then overlaid by using ARCGIS to obtain a map of land units, which are then scanned for a land level hazard classification in Pesawaran District of Lampung. The value of the landslide susceptibility classification scoring using Puslitanak and BPPT, 2004, can be seen in Table 1. The classification of landslide vulnerability is divided into 3, namely high vulnerability, moderate vulnerability and low vulnerability.

Table 1. Score Indicator For Landslide Hazard Maps

no	variable	criteria	value
1	slope	≥ 45	5
		30-40	4
		15-30	3
		8-15	2
		≤ 8	1
2	geology	vulkanic rock	3
		sedimen rock	2
		aluvial rock	1
3	rainfall (mm/year)	very wet	5
		wet	4
		midle	3
		dry	2
		very dry	1
4	land use	tegalan, rice fields	5
		shrubs	4
		forests, plantations	3
		city, settlement, airport	2
		ponds, reservoirs, waters	1

Table 2. Landslide Vulnerability Assessment Criteria

Criteria for landslide	vulnerability Total score
Very vulnerable	17-22
vulnerable	11-16
Not vulnerable	5-10

3. Results and Discussion

The physical condition of Tanggamus Regency based on the four variables used in this study can be shown in each map as follows:

3.1 Physical Slope Conditions

The physical condition of the slopes of Pesawaran Regency is classified into 4 slope slopes, namely flat, sloping, rather steep, very steep. The classification can be seen in the table below.

Table 3. Classification of Slope Based on Van Zuidam, 1985

No	Slope (%)	Slope Class	Morphological unit
1	0-8	Flat	plain
2	>8-15	Sloping	Smooth relief hills
3	15-25	A little steep	Medium relief hills
4	>45	Very steep	The relief hills are very rough

From the results of data processing using ARCGIS, the distribution of slope classifications in Pesawaran District is obtained as on the map.

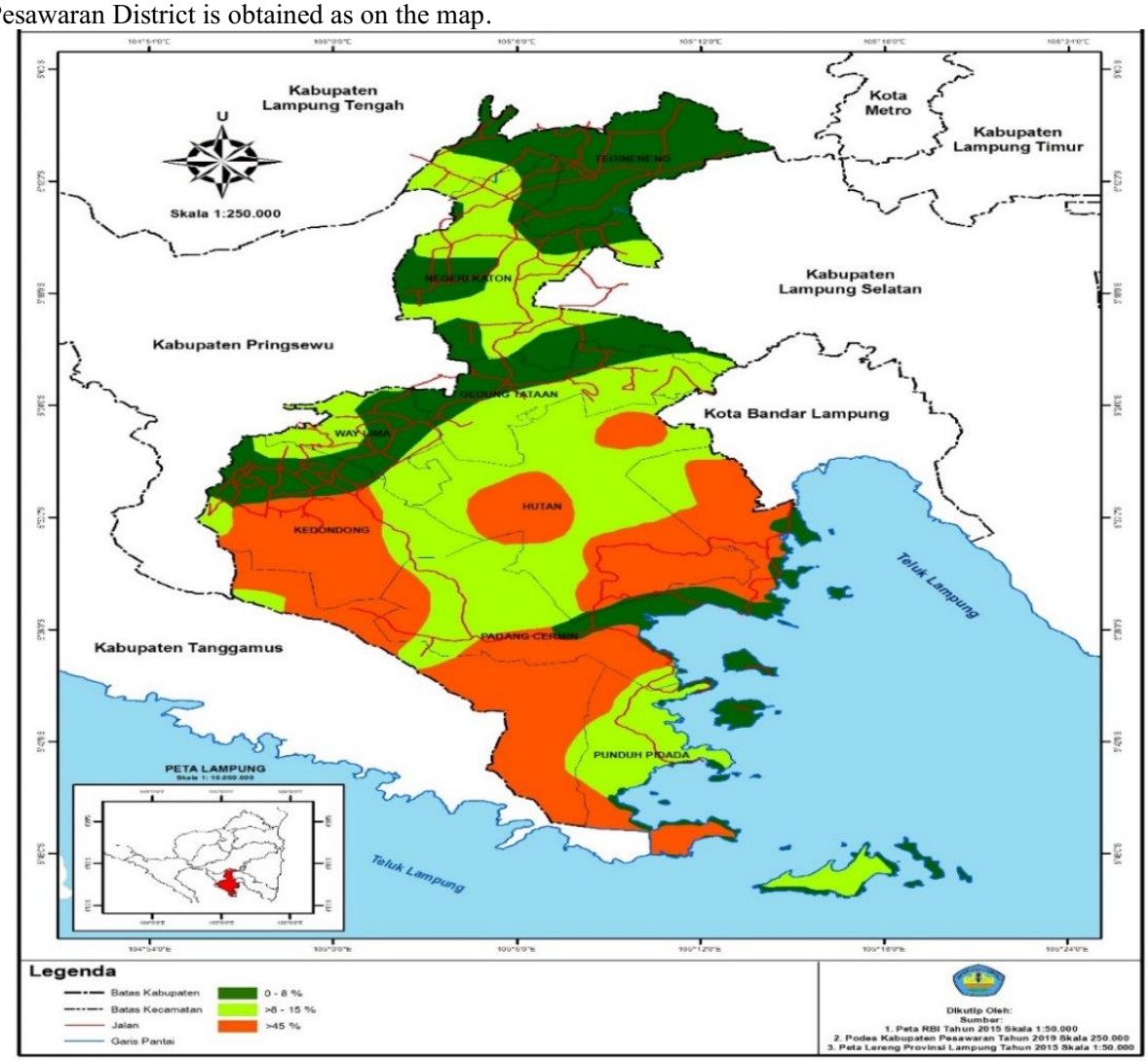

Figure 1. Map of the Slope Classification of Pesawaran District

Source:Data secunder 2019

The grade of the flat slope is marked by dark green, located in part of the Kecamatan Gedongtataan, Negeri Katon, Way Lima, padang Cermin. The grade of the sloping slope, marked by light green, is located in a part of Gedongtataan Subdistrict and Pidada Download Grade in the area of Padang Cermin District and Kedondong.

3.2. Rainfall

Rainfall in Pesawaran Regency ranges from 2000-3000 mm/year. This rainfall is included in the classification is very heavy, heavy, medium, light, very light, based on rainfall classification.

Table 4. Rainfall Classification

No	Description	Rainfall (mm / day)
1	Very heavy	>100
2	Heavy	51-100
3	Medium	21-50
4	Light	5-20
5	Very light	<5

Based on the classification of rainfall, the area of Pesawaran Regency is in moderate rainfall.

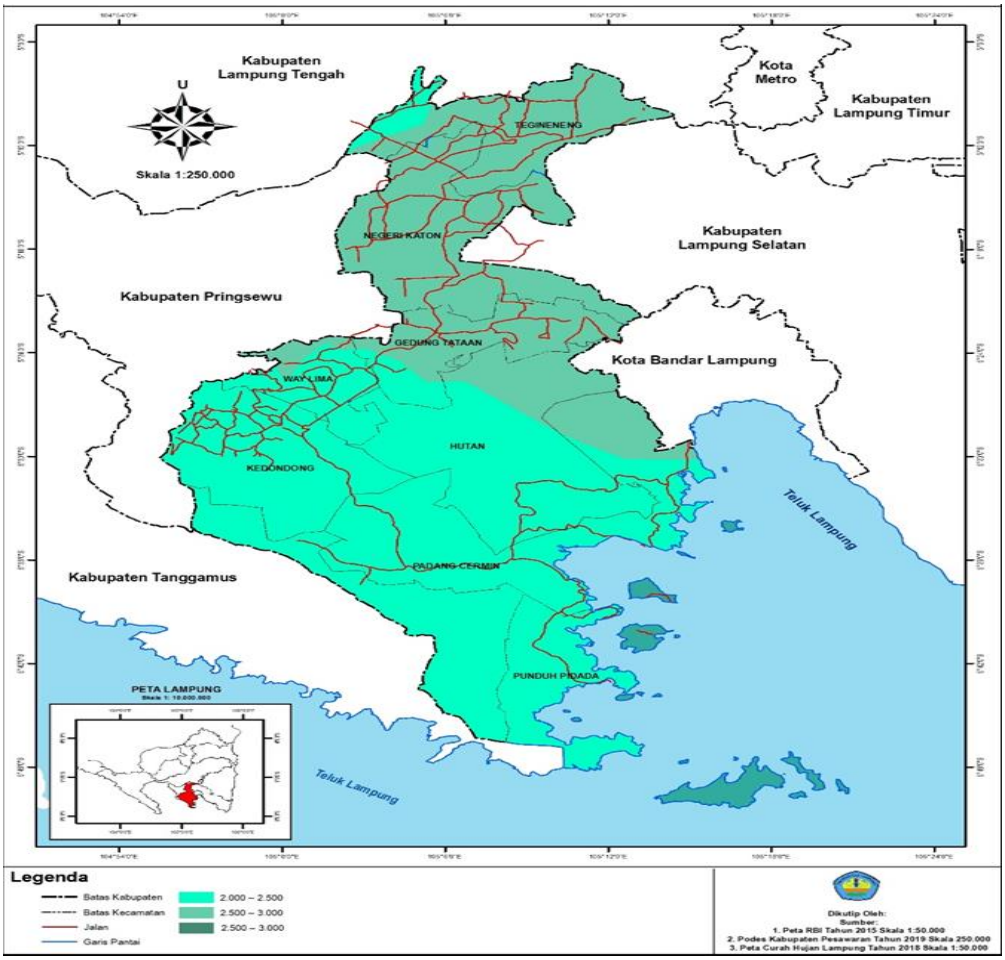

Figure 2. Rainfall Distribution Map Based on Differences in Rain Intensity
Source:Data secunder 2019

3.3. Land Use

Basic classification land use can be seen in the Table 5.

Table 5. Classification of Land Use

No	Type of Land Use	Skor
1	Forest	1
2	Bushes, Tegalan	2
3	Fields, Gardens & Rice Fields	3
4	Settlement	4
5	Bodies (River, Rawa, Tambak)	5

For land use, most of the land is used for farming of degraded land and settlements. For more details, see the map in Figure 3 below.

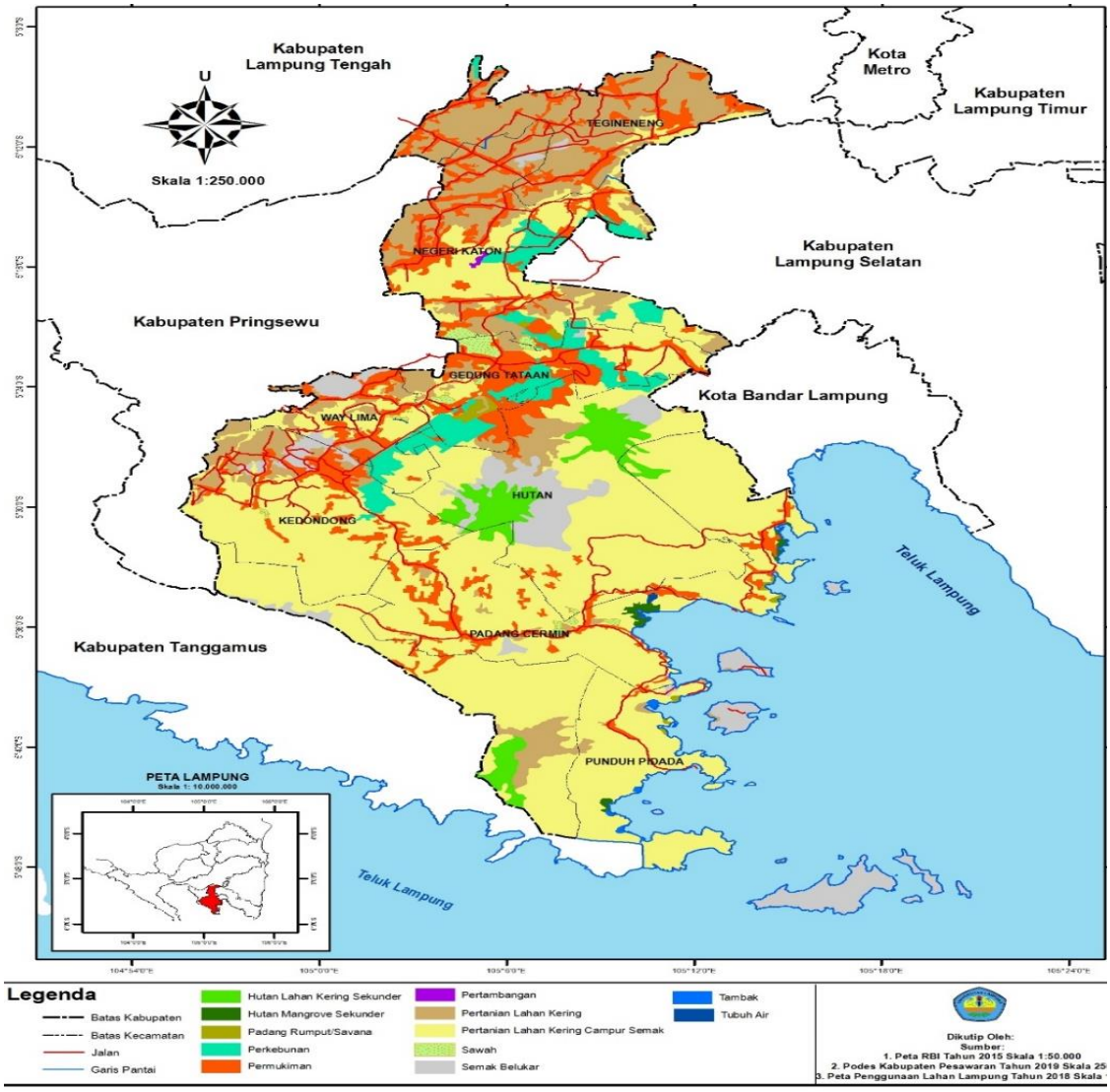

Figure 3. Map of Land Use in Pesawaran Regency

Source:Data secunder 2019

3.4. Geology

The geological conditions in Pesawaran District are mostly dominated by volcanic rocks. It can be seen on figure 4.

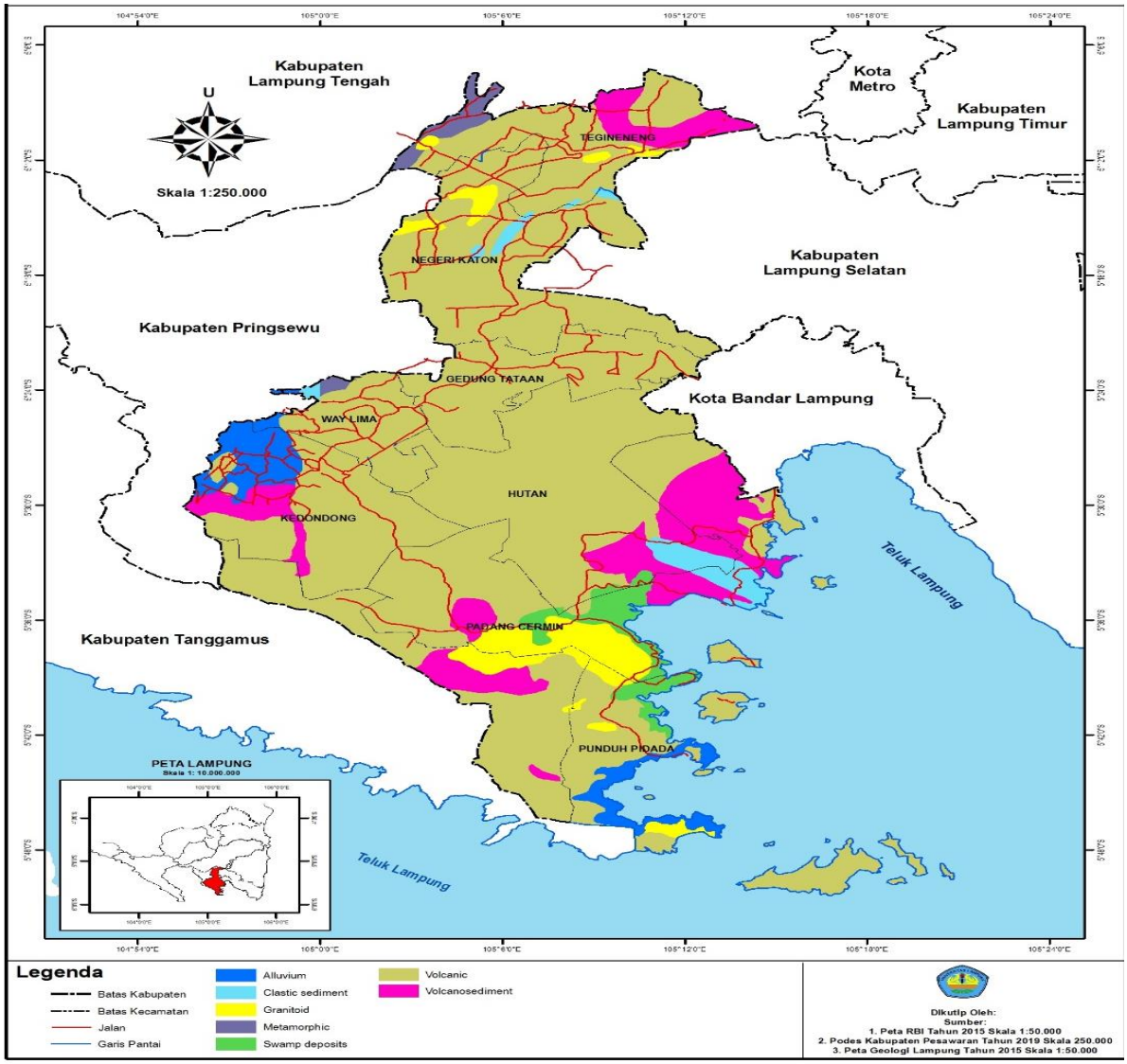

Figure 4. Geological Map of Pesawaran Regency

Source:Data secunder 2019

3.5. Landslide Vulnerable Areas

Landslide Vulnerable classes are categorized into three criteria, which are very vulnerable, quite vulnerable, and not vulnerable.Based on the landslide vulnerability map in Pesawaran District (figure 5), three classes of landslide vulnerability were obtained, namely dark green for insecure vulnerability, yellow for prone landslide vulnerability and red for landslide vulnerability levels were very prone.For areas with insecure vulnerability, in the district of Cermin Cermin, download pidada. For areas with a high level of vulnerability in most of the district of Katon District, download Pidada, while for areas with a very vulnerable level in the Sub-districts in around the lingdung forest.

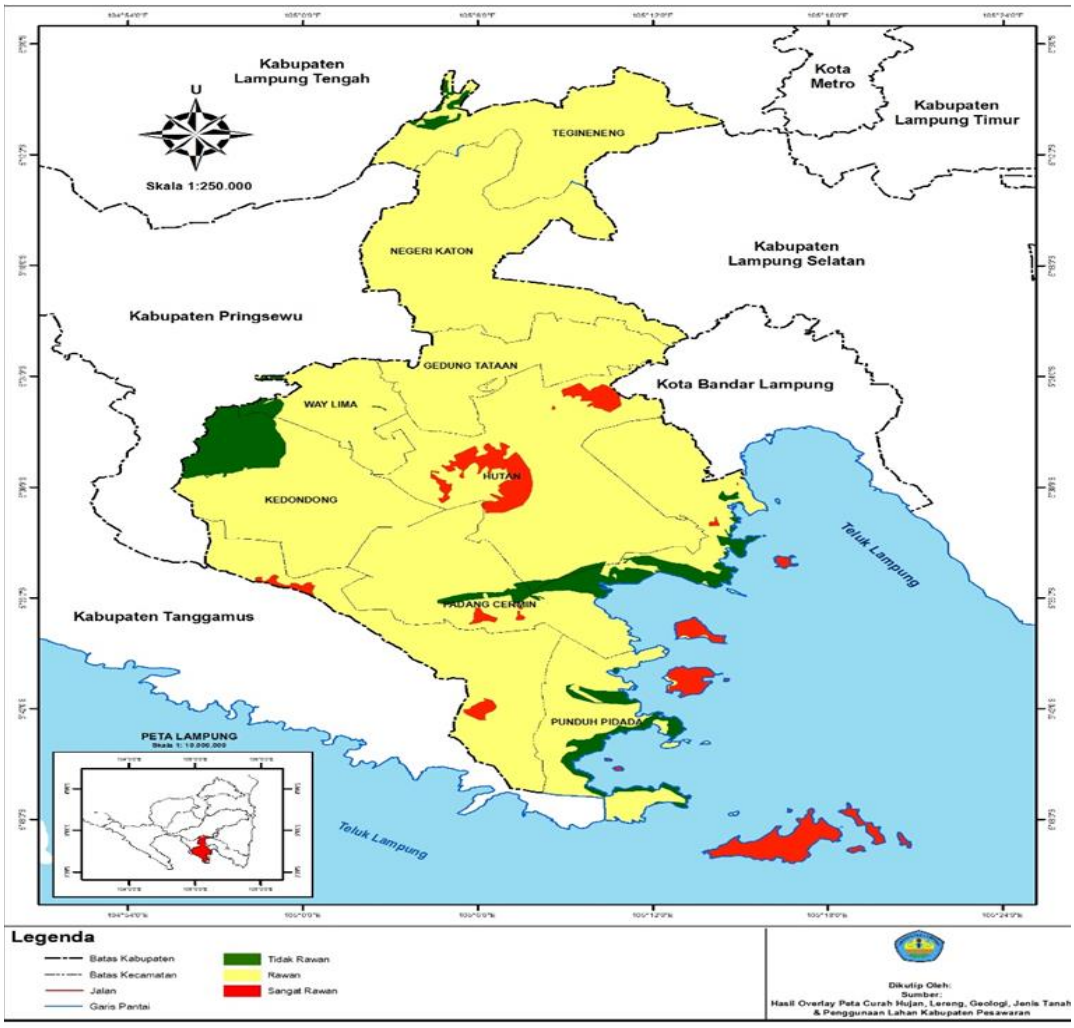

Figure 5. Map of Landslide Prone Areas in Pesawaran District, Lampung, 2019
Source: Secondary data processing

3.6. Landslide Disaster Mitigation

Landslides that occur in Pesawaran District must receive serious attention from the community, regional government, and the central government. Because if not, it will be detrimental both socially, economically and environmentally. The anticipatory steps that can be taken immediately are by mitigating landslides. The mitigation includes:

3.6.1 Mapping

These researches are basically either for planning or for repair and maintenance [6].This mapping was carried out to determine the level of vulnerability of landslides, and this was done so that people could find out which area was included in the category of landslides, whether low, medium or high.

3.6.2 Information Dissemination

The dissemination of this information is conveyed or given to the community, as well as the district government to the sub-districts and villages of each region. Submission of this information can be done by counseling residents about landslide hazards through representatives of RT/ RW, Distribution of brochures installed in each house. Generation of real time early warning requires continuous monitoring of landslide

parameters. It is very essential for the early warning system to be multihazard perspective since one factor can cause more than one hazards e.g., heavy rainfall can trigger landslide and flood.

3.6.3 Disaster Simulation

Landslide simulation activities are carried out nearing the rainy season involving government and community officials and NGOs.

3.6.4 Determination of evacuation routes

The right evacuation route affects the process of rescuing residents quickly. Community forestry is used here broadly to include all aspects, initiatives, sciences, policies, institutions, and processes that are intended to increase the role of local people in governing and managing forest resources[7]

3.6.5 Monitoring

Monitoring is carried out in disaster-prone areas, in strategic areas economically and services, so that the level of danger is recognized early in the community. Landslide early warning systems (LEWSs) are nonstructural risk mitigation measures usable at different scales of analysis. Basically, they are used to monitor one or more variables responsible for triggering landslides and to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations [8]

3.6.6 Establishment of Disaster Response Community Groups (PKMTB)

As a basis for landslide mitigation, the implementation of preventive measures usually focuses on avoiding slope failure, diverting the moving mass away from vulnerable elements, or building reinforcement to protect the threatened elements.It is a community organization that aims to monitor and implement activities related to landslide disasters at the village level. Several studies have noted that a community is an important element in the reduction of disaster risk[9][10].

4. Conclusion

Pesawaran Regency is based on four landslide parameters, namely rainfall, slope, land use and geology which have a classification of landslide vulnerability levels ranging from low, medium and high where the dominant factor is influenced by rainfall and slope. For this reason, it is necessary to mitigate landslides by mapping, disseminating information, simulating disasters, establishing evacuation routes, monitoring and establishing disaster response community groups.

Acknowledgments

Thank you to the Prof. Dr. Agus Suyatna M. Si as Promoter and have provided guidance for this research.

Reference

[1] Glade T 2016 Vulnerability assessment in landslide risk analysis [Vulnerabilitätsbewertung in der Naturrisikoanalyse gravitativer *J. Geogr. Soc. Berlin* vol 134 (2) no February pp 123–146
[2] Skilodimou H D, Bathrellos G D, Koskeridou E, Soukis K and Rozos D 2018 Physical and anthropogenic factors related to landslide activity in the northern Peloponnese, Greece *Land* vol 7 no 3
[3] Bashir S 2017 Soil and water conservation *Eos, Trans. Am. Geophys. Union* vol 57 no 10 pp 708–711
[4] Prasad N B N 2017 *Landslides-Causes & Mitigation* no June 2017
[5] El Bchari F, Theilen-Willige B, and Ait Malek H 2019 Landslide hazard zonation assessment using GIS analysis at the coastal area of Safi (Morocco) *Proc. ICA* vol 2 no July pp 1–7
[6] Dahal B K and Dahal R K 2017 Landslide hazard map: tool for optimization of low-cost mitigation *Geoenvironmental Disasters* vol 4 no 1 2017
[7] Suzuki R 2012 Linking Adaptation and Mitigation through Community Forestry Case Studies from Asia RECOFTC Thailand
[8] Segoni S, Piciullo L, and Gariano S L 2018 Preface: Landslide early warning systems: Monitoring

systems, rainfall thresholds, warning models, performance evaluation and risk perception *Nat. Hazards Earth Syst. Sci.* vol 18 no 12 pp 3179–3186

[9] Kusumastuti R D, Viverita, Husodo Z A, Suardi L and Danarsari D N 2014 Developing a resilience index towards natural disasters in Indonesia *Int. J. Disaster Risk Reduct.* vol 10 no PA pp 327–340

[10] Handayani W, Hapsari S P I, Mega A and Sih S J 2019 Community-based disaster management: Assessing local preparedness groups (LPGs) to build a resilient community in Semarang City, Indonesia *Disaster Adv.* vol 12 no 5 pp 23–36