Study of Landslide Disaster in Aceh Tamiang Area of Nanggroe Aceh Darussalam Province Indonesia

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ABSTRACT

The Flash floods and landslides apparently continues. After the landslide in Bohorok, Pacet, and Aceh Tamiang, One accusation is an underlying cause catastrophic environmental damage, especially depletion of forests. This also reinforces the notion that the catastrophic flash floods and landslides is no longer as common natural disaster events (natural disaster), but as a natural disaster due to human actions (man made disaster).

Studies conducted by using primary and secondary data about the condition of the surface (land use, Soil Types and morphology) and subsurface (rock types and geological structure) and rainfall, with the purpose of estimating the area of landslides and floods, The tool that used are: Devices such as a compass geological field surveys, geological hammer, Rool, meter and GPS (Global Position System) as well as computer equipment and software Arc-Info / GIS. Based on the analysis of the factors triggering landslides on the Map Slopes, Geological map, Map Lithology and map vegetation of the area of Aceh Tamiang especially the District Bandar Pusaka, District Tamiang Hulu and the District Tenggulun divided into 5 zones range of areas prone to earth movement / landslides, Zona Prone 1 (high), with slope slope <50% elevation of 50-100%, lithology clay stone, ground motion that is very complex movements of the joint land slides, avalanches and gelinciran, Prone Zone 2 (high), with an area of 20% , 30-50% slope, lithology clay stone, ground motion glide usually areas with low sedimentation, Prone Zone 3 (moderate), with an area of 10% and 15-30% slope, sandstone lithology, soil movement in the form of gelinciran, Prone Zone 4 (low), with an area of 20% and 15-5% slope sandstone lithology, Prone Zone 5 (very low), with an area of 10%, 0-5% slope. lithology sandstones, and can be divided into three zones range of flood-prone areas, Zone Puddles 1 (high), situated at a height of contour of 25m, with the water level ± 8m located close to rivers and settlements, Zona Puddles 2 (moderate), situated at an altitude 50m contour, with the water level ± 2m is located close to the river and population, Puddles Zone 3 (low), condition at a height of 50m contour, with the water level is ± 2m away by rivers and settlements.

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1. INTRODUCTION

Flood and landslide disaster seems to be continuing. After landslide disaster in Bohorok, Pacet, and Jember. One of the accusations as the cause of the disaster is the environment, especially the depletion of forests. This at the same time strengthen the allegations of banjir bandang and landslide disaster is no longer as a natural disaster, but as a natural disaster due to human (man made disaster).

Along with the help of environmental damage as a result of illegal logging, mining, and land conversion, it will increase the risk of disaster. Unfortunately, disaster risk is not exactly the same as the community. Allowing the population to live with such risks can be seen as inhumane (inhuman). Because, it is tantamount to the victims of death and loss for the population, which actually can still be avoided. For that purpose, we need to assemble the Map of Disaster Prone Areas. The map is based on the possibility of disaster, including through the calculation of potential natural disasters.

1.1.Natural Disaster Classification.

Actually mapping of natural disasters can be obtained from geomorlogi maps and other sources such as image data and seismicity, this map is prepared in detail for survey purposes. Which includes natural disasters are:

1. Earthquake (earthquake damage)
2. Ground or landslide.
3. Flooding (flooding)
4. Volcanic disaster
5. Soil subsidence (sub-sidence of the subsoil)
6. Volcano and Drought (dronght).

2. EARTHQUAKE

Earthquake is the earth's shaking caused by collisions between the earth's plates, active volcanic activity or rock fall. Oceanic plates that are larger in mass when collided with continental plates in the collision zone (subduction) will infiltrate downward. The plate movement will experience a slowdown due to friction from the earth's sheath. The slowing of the motion causes the accumulation of energy in subduction zones and fault zones. Consequently in the zones there is pressure, pull, and shear (Figure 1). By the time the plate's elasticity limit is exceeded, a rock fault occurs followed by sudden loss of energy. This process encourages vibration of particles in all directions called earthwaves.

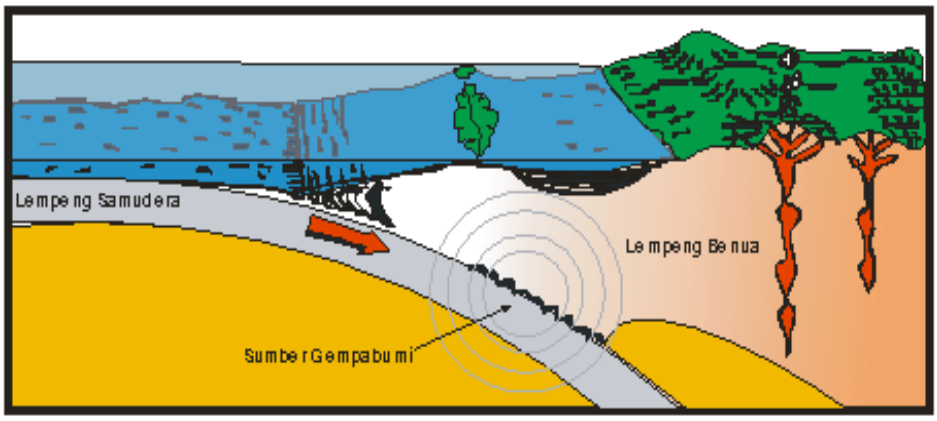

Figure 1.Proses Occurrence of earthquakes in subduction zones

The Indonesian archipelago lies at the meeting of three major plates of the world namely the Australian, Eurasian, and Pacific plates. The Eurasian and Australian Plates collide off the west coast of Sumatra Island, off the south coast of Java island, off the South coast of the Nusatenggara archipelago, and turn northwards to the southern waters of Maluku. Between the Australian and Pacific plates there are collisions around the island of Papua. While the meeting between the three plates occurred around Sulawesi. That is why in the islands around the meeting of 3 plates that often occur earthquake.

The 53 '18,81' '-°district of Aceh Tamiang is geographically located at 3 14'45,41 " East°43'41,51 " - 98°32' 56,76 " North Latitude and 97°4 Longitude . The rege The regency is located on the border between North Sumatra Province and Nanggroe Aceh Darussalam in the east, with administrative boundaries as follows:

• North side with Strait of Malacca and Langsa City

• South by Langkat Regency of North Sumatra Province

• East with Langkat Regency of North Sumatra Province

As the rainy season comes, it is predicted that natural disasters will occur. One of the related disasters at the time was landslide and flood disaster Landslides and floods are frequent in Indonesia and cost a lot of lives and property. Mapping of landslide and flood areas is needed to provide preliminary information and minimize the impact of are frequent in Indonesia and cost a lot of lives and property. Mapping Mapping of landslide and flood areas is needed to provide preliminary information and minimize the impact of are frequent in Indonesia and cost a lot of lives and property. Mapping of landslide and flood areas is needed to provide preliminary information and minimize the impact of landslides and floods Admintrasi Aceh Tamiang Including special into the research conducted only in three districts of Tamiang Hulu, Bandar Pusaka and Tenggulun

The district of Aceh Tamiang consists of 12 sub-districts, 1 sub-district, 208 villages, and 641 sub-villages with a total area of 1,939.72 km2 or 193,972 hectares. From the eight sub-districts, it is seen that Tamiang Hulu District is the most widespread of 44,700 Hectares or 23,04% of the total area of Aceh Tamiang Regency (Table 1).

NO	KECAMATAN	LUAS		JUMLAH				
		(Km2)	(Ha)	MUKIM	DESA	LURAH	DUSUN	LINGK.
1.	Tamiang Hulu	447,00	44.700	2	9	-	60	-
2	Bandar Pusaka				15			
3	Kejuruan Muda	420,03	42.003	2	15	-	82	-
4	Tenggulun				5	-		-
5.	Rantau	51,71	51.71	2	16	-	66	-
6	KotaKuala Simpang	4,48	448	-	4	1	16	5
7	Seruway	188,49	18.849	4	24	-	83	-
8	Bendahara	180,50	18.005	8	33	-	113	-
9	Banda Mulia				9	1	-	-
10	Karang Baru	380,40	38.040	4	45	-	119	-
11	Sekera							
12	Manyak Payed	267,11	26.711	1	32	-	102	-
Jumlah		1.939.72	193.972	25	208	1	641	5

Catatan : Belum ada Data yang jelas mengenai Kecamatan yang baru mengalami pemekaran.

Table 1. Area and name of sub-district in Aceh Tamiang district

2.1. Physiographically

Physiographically, Bemmelen (1949) divides Aceh (Northern Sumatra) into 5 Physiographic Zones (Figure 2.2), namely:

1. Dataran Teluk Meulaboh dan Sigli.
2. Komplek Gunung Api Muda.
3. Zona Dataran Rendah dan Kaki Perbukitan.
4. Zona Depresi / Graben.
5. Zona Pegunungan Blok.

3. MAPPING METHODOLOGY

Materials Research

Includes data collection in the form of maps and data of related agencies or agencies such as Bakosurtanal, Directorate of Geology, Bappeda.

The map data in question includes:

A. Topographic maps scale 1: 250,000
B. Map of Landsystem Reprot in 1997.
C. Geographical sheet of Langsa, Sumatra 1: 250,000 scale
D. Land use map based on Satellite imagery interpretation in 2000
E. Earthquake Resistance Map scale 1: 5000.000 in 2001
F. Map of Rupa Bumi Indonesia in 1991
G. Seismotectonic map of Indonesia scale 1: 5000.000 in 1998

3.1. Regional Geology.

3.1.1 Lithology

Regionally, the lithology of NAD region is composed of metamorphic rocks or sedimentary rocks, sedimentary rocks, volcanic rocks extracted by volcanoes, and intrusive rocks.

Metamorphic rocks (Fig. 2.) spread extends along the northwestern-southeast hills and extends in the southeastern (southern) regions. This rock consists of gneiss, hornfels, marble, phyllite, slate, meta sedimen and meta volcanik.

The sedimentary rocks in northern Aceh are spread over the wings of the ridge mountains, to the east and west coasts. Southern tear is more scattered in the east coast and west coast of south aceh, while the middle slightly separated because it is more dominated metamorphic.

Volcanic rocks are spread far apart from: the northern area (large enough area to the east coast even on the whole Weh Island), slightly on the west coast, appears in the middle area within a large area surrounded by sedimentary rocks.

Frozen rocks appear in the largest area in the northern western coastal region, emerging slightly in the middle of the hills to the south. In some locations the middle of the ridge appears a little melange rock and tectonic results ofiolit, even to the island of Simeule

3.2 Local Geology

3.2.1. Stratigraphy

Stratigraphy starts from Uneun Unknown Unit which is not known exactly its age but it was confirmed before the End of Yura. This unit contains a slate inserted with meta sedimen or marble and terregular volcanics.
• Group Woyla precipitated Late Jurassic to Early Cretaceous consists of formations that contain meta limestone, marble, calcareous slate, limestone conglomerate, siltstone, kalkarenit, rijangan shale limestone and phyllite.

• Meureudu groups deposited in early Oligocene. This group consists of Meujeumpo Formation, Meucampli and Agam which is dominated by limestones and sandstones.
• The Hulu Masen group deposited in the early Oligocene to the Middle Miocene consists of Tangla and Peunasu Formations containing argilic limestones and reef limestones.
• The Tiro group deposited in the late miocene period until the Pleistocene consists of the Kotabakti, Ready and Seulimum Formations containing sandstones and clay, gravel, the limestone of a limestone conglomerate.

4. DISCUSSION

Based on the results of field surveys that have been implemented can be seen the physical condition of the area can be made geological mapping of disaster prone areas that are located in the watershed (DAS) that exists mainly for the river Simpang Kanan and Simpang Kiri River crossing the district of Aceh Tamiang in particular located in 3 (three) subdistricts of Tamiang Hulu, Tenggulun and Bandar Pusaka.

Land Prone Areas (Landslide)
Based on data from field survey and analysis of factors that trigger landslides on map Slopes, Geological map, Map Lithology and map vegetation of the area of Aceh Tamiang especially Subdistrict Bandar Pusaka, District Tamiang Hulu and the District Tenggulun divided into three zones range of areas prone to earth movement / landslide (Table 2. Prone land movement zone):

1. Zone Vulnerable 1 (very high)
Zone of vulnerability 1 with slope of slope <50% elevation 50-100%, clay lithology, soil thickness> 2m and dryland vegetation type of secondary forest (Photo 1) Mountainous mountainous landscape. (Figure 3.) area of 45%, the area is safe and g.hulurangas, lithology consists of limestone, sandstone, calcareous sandstone and soil movement mikaan very complex movement that combined land slides, avalanches and gelinciran, are difficult to access for transportation.

1. Prone zone 2 (high)
Zone of vulnerability 1 with area of 20%, 30-50% slope, claystone lithology, soil thickness> 2m and secondary forest vegetation type of vegetation. Areas that get into the vulnerable zone 1 is the village of Batu bedulang, villages and regions titi Tenggulun roots. (Figure 3.) landscape of undulating hills (Photo 2), faults are many and growing lithology consists of reef limestone, dolomite, calcareous sandstones, conglomerate and black mud rock Movement of glide usually in low sedimentation area.

2. Prone zone 2 (medium)
Prone zone 2 with 10% width and slope 15-30% slope, sandstone lithology, soil thickness> 2m and vegetation type of plantation and shrubland. Enters the area 2 is prone zones and areas titi Tenggulun village roots. (Figure 3.) landscape with hills, avalanches could be falling for a very hard rock that is meta Metakonglomerat limestone, quartzite and meta little limestone, sandstone and claystone, ground motion in the form of slippage, recharge and recharge area.

3. Random Zone 3 (low)
Zone of vulnerability 3 with area of 20% and slope of 15-5% sandstone lithology, soil thickness> 2m and vegetation type of open land and rice field. Areas that enter the 3 prone zone are the area of BT.Manirang (Figure 3.) terrain landscape, a good obstacle Sandstones, mudstone and gullingan gampingan Watersheds, the presence of pebbles.
4. Prone to Zone 4 (very low)
Prone zone 4 plains with area of 10%, slope 0-5%. sandstone lithology, soil thickness> 2m and vegetation type of open land and rice field. The areas that fall into this fragile zone 4 are the areas (Figure 3.) with the landscape of the plains typically occupying very low areas of gull, sandstone and glokonitan. The bad water flow is very difficult to dig.

5. CONCLUSION

Natural disasters can occur anytime and anywhere that can result in loss of life or material. Natural disasters consist of volcanic disasters, earthquakes, landslides, floods, erosion or drought.To anticipate the consequences of this natural disaster we can use the natural disaster map as the first information about locations vulnerable to any disaster that will occur. With the map we can reduce or even eliminate the worse effects of the disaster.In making natural disaster maps we need, among others, geomorphological maps, drainage patterns, and earthquake-prone maps, image data and other supporting data.The landslide map for Aceh Tamiang is divided into 4 zones based on its high level of vulnerability: very high vulnerability zone, high vulnerability zone, low vulnerability zone and very low vulnerability zone

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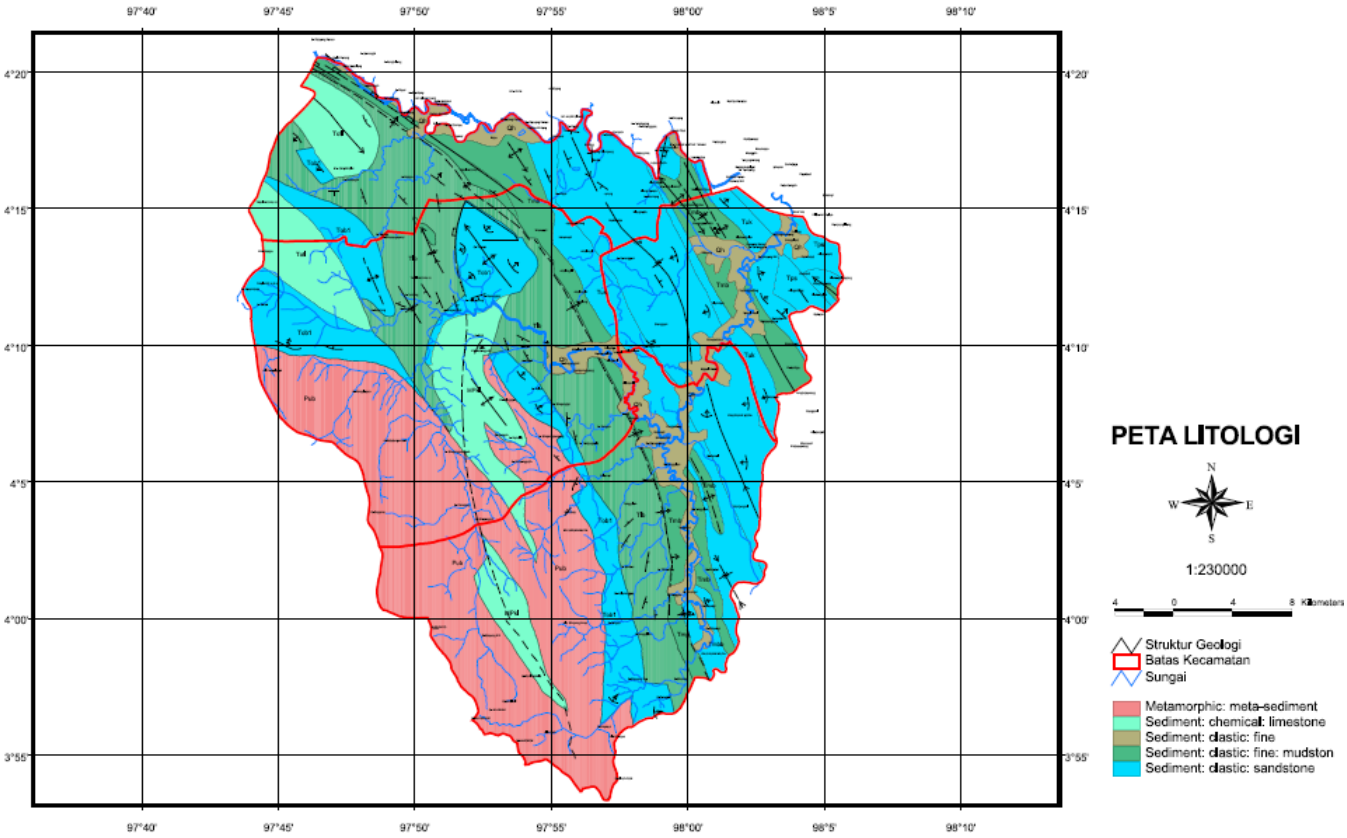
Table 1. Area and name of sub-district in Aceh Tamiang district

Zona	Kondisi Fisik	Potensi	Kendala	Penilaian		Bobot (NxB)
				Nilai (N)	Bobot (B)	
Sangat Tinggi	Bentang alam perbukitan-pegunungan, luas 45%, lereng <50% elevasi 50-100%, daerah selamat dan g.hulurangas	Terdiri dari batugamping, batupasir, batupasir gampingan dan mikaan	Gerakan tanah yang sangat komplek adanya gerakan tanah gabungan yakni luncuran, longsoran dan gelinciran, sukar diakses untuk transportasi	5	2	10
Tinggi	Bentang alam perbukitan bergelombang, luas 20%, lereng 30-50% sesar yang banyak dan berkembang	Batu gamping terumbu, dolomit,batupasir gampingan, konglomerat dan batu lumpur hitam	Gerakan tanah luncuran biasanya didaerah dengan sedimentasi rendah,	4	2	8
Sedang	Bentang alam pebukitan, luas 10%, lereng 15-30%, longsoran bisa berupa jatuhan karena batuan yang sangat keras yaitu meta batugamping	Metakonglomerat, sedikit kuarsit dan metabatugamping, batupasir dan batulempung	Gerakan tanah berupa gelinciran, daerah recharge dan resapan,	3	2	6
Rendah	Bentang alam dataran, 20%, lereng 15-5% suatu kendal yang baik	Batupasir,batulumpur dan batulumpur gampingan	Daerah aliran sungai, adanya kerikil-kerakal	2	2	4
Sangat rendah	Bentang alam Dataran, luas 10%, lereng 0-5% biasanya menempati daerah yang sangat rendah	Batulumpur gampingan, batupasir dan glokonitan	Aliran air buruk, sangat sukar di gali	1	2	2



Picture. 2. Geological Map of Aceh Tamiang Region Nanggroe Aceh Darussalam

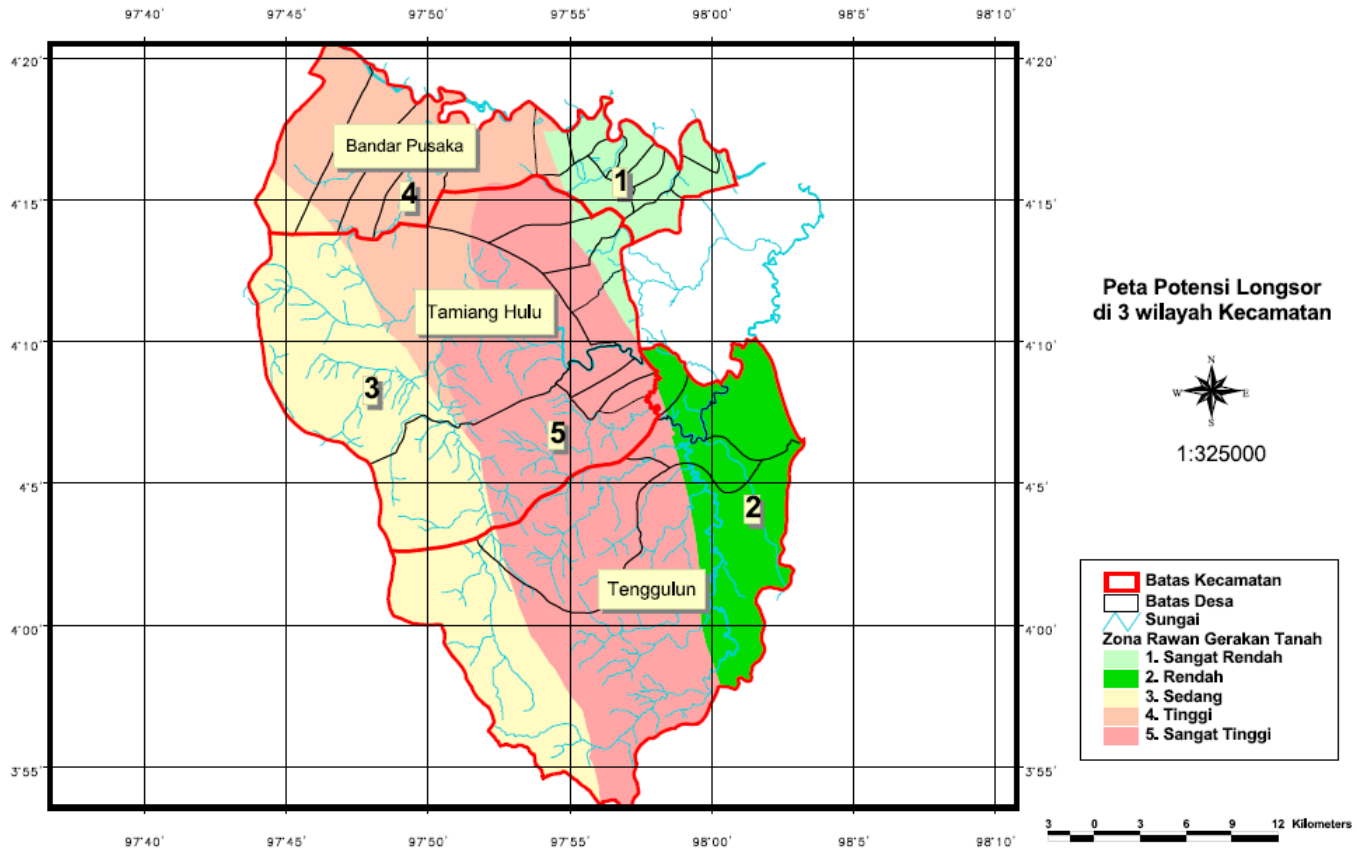


Figure 3. Map of Potential landslides Aceh Tamiang

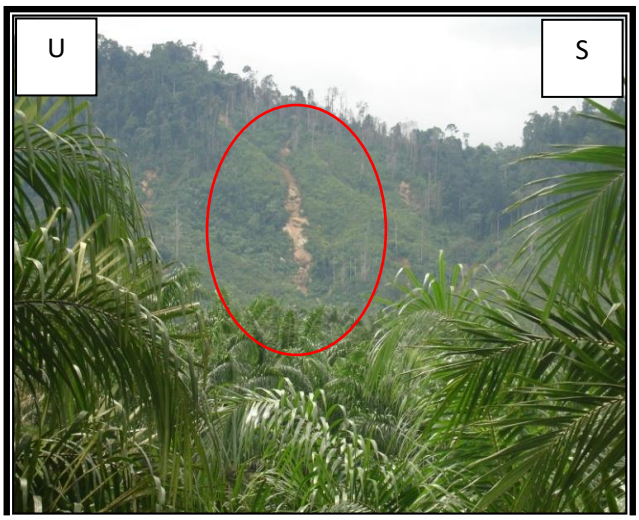


Foto.1 Potential of ground motion that happened in elephant groove kec. Tamiang Hulu

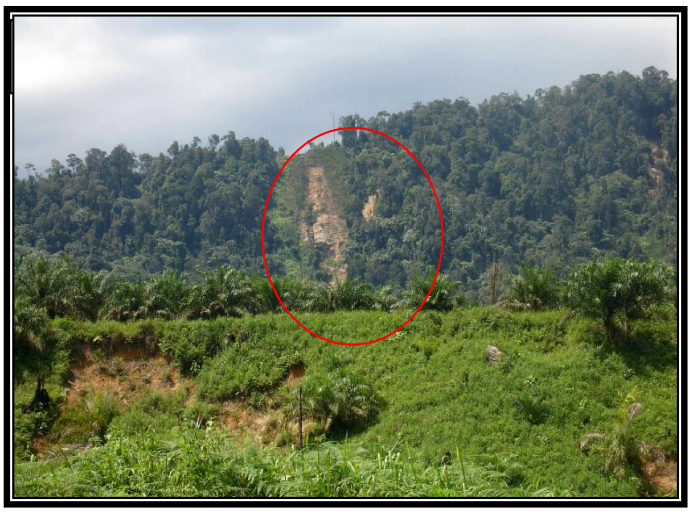


Foto.2 Movement of land that occurred in Tenggulun kec. Tenggulun, litologi is dominated by sandstone