Deasy Arisanty

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Editor : Ersis Warmansyah Abbas

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Pengantar Editor

Ersis Warmansyah Abbas
Program Studi Pendidikan IPS FKIP ULM

Salam menulis.

Belasan tahun lalu, sekembali dari pendidikan doktoral di UPI Bandung, saya ditugaskan Dekan FKIP ULM, Prof. Dr. Wahyu, MS., melaksanakan seminar internasional dan bertemu dengan Prof. Deasy Arisanty, S.SI., M.Sc., berbicara dan instink saya menuntun "membelajarkan" Deasy. Seminar internasional tersebut beberapa seri dan Deasy menjadi Wakil Ketua Pelaksana. Sebagai ketua saya tidak terbeban.

Bagi orang lain mungkin aneh, sebab Prof. Deasy dari Program Studi Pendidikan Geografi, saya dari Program Studi Pendidikan Sejarah dan Pendidikan IPS. Sebelum program studi "kuat", dulu kami lebih berbicara sebagai warga FKIP ULM. Ya, kami membangun kolaborasi dengan beberapa orang sebagai Insan ULM.

Ketiga ditugaskan merekrut dosen-dosen muda ULM untuk menulis artikel jurnal internasional bereputasi dan mempublikasikan untuk persiapan meraih jabatan profesor oleh Rektor ULM, Prof. Dr. Sutarto Hadi, M.Sc., M.Si., Deasy orang pertama saya pilih. Alhamdulillah. ULM memprofesorkan dosen-dosen muda sebelum berumur 40 tahun.

Sejak mendedikasikan dan "mewakafkan" laboratorium pendidikan IPS FKIP ULM sebagai pusat penulisan, Deasy menjadi pegiat tangguh. Deasy pemeriksa artikel, dari yang tidak jelas sampai perbaikan sederhana. Saya patok, tidak boleh dibocorkan, siapa yang memberi bantuan koreksi untuk diperbaiki. Deasy paling kontributif. Terima kasih.

Buku *Menulis Artikel Jurnal Internasional Bereputasi Terindeks Scopus* kumpulan artikel Deasy sebagai "bukti" penulis hebat. Bersama Ismi Rajiani, Deasy pendekar kami untuk Scopus. Setiap anggota penggiat menulis, menulis lebih dari 12 artikel setiap tahun dan dibukukan.

Sebagai editor, saya menikmati pekerjaan menyenangkan ini, dari memilih artikel, melayout, menyeting sampai merancang kulit bersama "Tim Penerbit Pendidikan IPS FKIP ULM", para mahasiswa yang dilatih dan diberdayakan dalam penerbitan buku. Pendidikan IPS FKIP ULM telah mendapatkan 50 ISBN dari Perpustakaan Nasional Indonesia.

Sebagai editor, saya mohon maaf bila ada kekurangan di sana-sini. Semogalah buku *Menulis Artikel Jurnal Internasional Bereputasi Terindeks Scopus* bermanfaat dan berkah. Aamiin Ya Rabbal Alamin.

Banjarbaru, 7 Mei 2023

Prof. Datu CH, Dr. Drs. **Ersis Warmansyah Abbas,** BA, M.Pd,

Pengantar Penulis

Assalamualaikum warahmatullahi wabarakatuh

Salam menulis.

Alhamdulillah. Puji syukur ke hadirat Allah SWT atas diterbitkannya buku *Menulis Artikel Internasional Bereputasi Terindeks Scopus*, kumpulan tulisan yang ditulis bersama kolega di Universitas Lambung Mangkurat maupun dari universitas lainnya. Artikel-artikel dalam buku ini merupakan kumpulan artikel terindeks Scopus tahun 2022 sebagai bukti kerja keras yang berhasil dipublikasikan.

Buku ini menjadi karena ide dari Prof. Ersis Warmansyah Abbas sekaligus sebagai editor. Pada awalnya, sebagai penulis artikel-artikel dalam buku ini, tidak berpikir karya artikel saya dapat disusun menjadi buku. Pada kenyataannya menjadi buku. Karena itu, saya mengucapkan terima kasih. Beliau orang hebat yang memotivasi saya, untuk menulis, menulis dan terus menulis. Prof. Ersis selalu memotivasi dan memberi tauladan kepada dosen-dosen muda.

Dalam pada itu, artikel-artikel saya banyak direview Dr. Ismi Rajiani, MM. Beliau orang hebat yang memberikan masukan untuk perbaikan artikel-artikel saya. Hal tersebut semakin menjadi dikarenakan saya ikut pelatihan menulis artikel jurnal internasional bereputasi yang diselenggarakan Program Studi Pendidikan IPS dan Jurusan Pendidikan IPS FKIP Universitas Lambung Mangkurat. Dr. Ismi Rajiani, MM sebagai narasumber pada pelatihan tersebut. Hasil pelatihan yang bertumpu kepada menulis dan memperbaiki tulisan, bukan mendengarkan ceramah tentang artikel yang baik saja, menjadikan artikel-artikel tersebut diterbitkan di berbagai jurnal internasional bereputasi.

Artikel-artikel saya memuat isu-isu lingkungan pada lahan basah, seperti masalah kebakaran lahan gambut, bagaimana monitoring kebakaran pada lahan gambut, bagaimana memberdayakan masyarakat dalam mengelola lahan gambut, dan aspek spasial terkait dengan kebakaran lahan gambut dengan memanfaatkan citra penginderaan jauh. Selain itu, ada beberapa tulisan mengenai penghidupan masyarakat pada lahan basah dengan memanfaatkan potensi pada lahan basah dan karakteristik lingkungan lahan basah. Artikel-artikel tersebut sangat relevan dengan visi Universitas Lambung Mangkurat, sebagai pusat unggulan pada lingkungan lahan basah.

Dalam pada itu, tulisan-tulisan saya yang dipublikasikan pada berbagai jurnal terindeks Scopus merupakan karya yang menjadikan saya meraih jabatan guru besar. Semoga saya terus konsisten menulis meskipun sudah berhasil meraih jabatan guru besar.

Akhirnya, semoga tulisan dalam buku ini bermanfaat bagi pembaca, meskipun masih ada kekurangan. Prinsip saya, lebih baik menulis daripada banyak berbicara, tetapi minim karya.

Terima kasih.

Wassalamualaikum warahmatullahi wabarakatuh

Banjarmasin, 7 Mei 2023

Prof. Deasy Arisanty, S.Si., M.Sc.

DAFTAR ISI

1. Characteristic of Mass Movement in Riam Kanan Watershed, Indonesia

D Arisanty[1], K P Hastuti [2], A N Saputra[3], M Muhaimin[4], F A Setiawan[5]

ABSTRACT

Mass movement occurred in upstream in Riam Kanan Watershed due to this area is part of Meratus Mountain. The objective of study is to analyse the vulnerability class of mass movement in the upstream of Riam Kanan Watershed and to analyse the characteristics of the mass movement in the upstream of Riam Kanan Watershed based aspects of morphology and morphogenesis. This study used the survey method, to determine the vulnerability class mass movement using slope maps and vegetation density map. Aspects of morphology and morphogenesis are used to determine the characteristics of mass movement. Aspects of morphology are slope of hill. Aspects of morphogenesis includes soil depth and rock weathering. The research area is dominated by medium and high vulnerability classes i.e. 54,804.47 Ha and 36,546.04 Ha. The mass movement type in the landform of weak eroded of denudation hills, metamorphic rock material (D1) is rotational landslides and rock fall. Rotational landslide has the characteristic of slope > 25^0, the soil thickness ranges from 1-2 m and occurring of rock weathering. Rock fall has the characteristic of slope > 45^0, about 30 cm of soil thickness, low vegetation density, further weathering.

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INTRODUCTION

Soil movements occurs frequently around the world, specifically in Indonesia [1]. Some area in Indonesia such as in Central Java and Yogyakarta Special Region, there are several zones, which potential of mass movement disaster [2]. Landslides in Indonesia in the period 2018-2019 was 3,998 incidents, with 10,239,533 people suffering and displaced based on DIBI Data, National Disaster Management Agency of Indonesia. Mass movement events will increase during the rainy season.

South Kalimantan Province is vulnerability area of mass movements. The landslide incident in South Kalimantan in the period 2018-2019 was 128 incidents, with 19,396 people suffering and displaced. The South Kalimantan region is among the highest in the occurrence of landslides compared to other Provinces in the Kalimantan region based on DIBI Data, National Disaster Management Agency of Indonesia.

Mass movement prevalent in the northern part of the watershed area of Riam Kanan having a mountainous topography. In year 2017 has been a landslide in the village of Tiwingan Lama, which is the upstream part of the Riam Kanan Watershed [3]. The landslide-prone areas in Tiwingan Lama in the upstream part of the Riam Kanan watershed consist high, medium and low class of vulnerability [4].

1. Type of Mass Movement

The mass movement is the movement of soil or rock material making up the slope caused by factors force of gravity on the slope which has a sliding plane [5]. The mass movement is an important process in the evolution of the landscape in the mountainous region [6]. Mass movement can be divided into various types, falls, slides, spreads, and flows [7–9].

Falls are forming material falling slope movement in the air, with no interaction between the parts of the landslide material [7]. Falls began with the release of soil or rock, or both, from along the steep slopes with little or no shear displacement occurs. Movement of materials consists of falling, bounce or spin [9]. Some types of falls are rockfall and topple. Rockfall is

a downward movement suddenly from rock or soil or both were released from steep slopes or cliffs. The speed of the movement depends on the slope [9]. Topple is the movement of debris material that occurs in a very steep rock slope to erect fields that have relatively vertical discontinuities [7]. Topple sometimes controlled by gravity, can also be caused by water or ice in the cracks. Cutting bedrock can accelerate the occurrence of debris [9, 10].

Slides are a downslope movement of soil or rock mass that occurs on the surface of the broken or thin zone of strong shearing strain [9]. Avalanches are a mass displacement of soil or debris that were weathered in all areas of the landslide. The landslide occurred the sloping terrain, topography makes an important component to the occurrence of landslides. These factors also control whether the landslides triggered including local soil conditions and rock substrate. Below the ground level occurs complicated combinations such as geology, topography, hydrology, historical, climatological, and biological factors, as well as interacting random noise that affects the landslides occurred. Landslide is often unpredictable. The land that was originally the stable may become unstable due to the influence of human or non-human [11].

Based on the geometry of the field slip, landslides can be divided into two types i.e. rotational landslides and translational landslides [7, 9]. Rotational landslides occur on the surface with a curved field upwards (spoon shape). The landslide occurred on land with a homogeneous material and has a slow speed (0.3 m or 1 ft. every 5 years) to medium speed (1.5 m or 5 ft. per month) up to high speed. Translational landslide is a downward movement in or out, along a relatively planar surface with a slight rotational displacement [9].

Spread can be caused by liquefaction or the flow of a softer material. Type of spreads is a block spread, spreads liquefaction and lateral spreads. Lateral spreads always occur on a gentle slope or flat, where the top layer of rock or soil that is stronger suffered extensive additions and moves over a layer of softer, weaker underlying. Failures are accompanied

by some general subsidence. Elongated and broken solid ground, move away slowly from the ground is stable and moves over the weaker layers without having to form a rupture surface that can be recognized. Unit softer, weaker can, under certain conditions, forced upward into the fractures that divide the layers lengthwise into blocks. On earth spreads, the top layer of stable lengthwise along with a weaker base unit, liquefaction streamflow or plastic deformation. Spreads have occurred on the ground to thaw. Liquefaction is generally not restricted only occur in areas of seismic activity [9].

The flow is the movement of crushed material down the slope and flows like a viscous liquid. Flow often occurs in a relatively narrow shear field. Material carried by the flow can consist of a wide variety of soil particles (including large stones), wood, and twigs [7]. Mudflow occurred in areas with a slope of 50-150. Mudflow occurs in clay cracks or dense clay, which is between the layers of fine sand. Debris flows are a form of mass movement at high speed. Material debris flow is a flow that occurs in coarse-grained material. Debris flows can occur in a region with deep gullies or canyon, where a state of deep gullies and the canyon is devoid of vegetation [7, 9]. Debris avalanches occur in a relatively large area, very fast, which occurs when the collapse of unstable slopes. Avalanches debris speed is 100 m/s. Earth flows can occur on gentle to moderate slope, fine-grained soil, clay, or silt, in conditions of very weathered, clay-bearing bedrock. The flow velocity can be slow to very fast. Creep is the slow earthflow. Creep occurs because sufficient internal shear stresses the flow velocity can be slow to very fast. Creep is the slow earthflow. Creep occurs because sufficient internal shear stresses the flow velocity can be slow to very fast. Creep is the slow earthflow. Creep occurs because enough internal shear stress to cause deformation, but not enough to cause failure [9].

2. The Trigger Factor of Mass Movement

The mass movement that occurs in a region affected by the characteristics of the local physical environment and land use [12]. Many factors that cause mass movements or often referred to as landslides, among other conditions of geology, hydrology, topography, climate, soil, and weather

changes that lead to the occurrence of landslides [12]. Land sliding is either a characteristic procedure or it happens because of human exercises which irritate the slant solidness. These marvels vary as indicated by their shape, size of the dislodged mass, moving components, speed, and different qualities [8]. Mass movement is highly dependent on the geological structure and morphological characteristics. Lithology and morpho structural characteristics determine the type of mass movement. Activities of anthropogenic origin triggered slope instability. Various anthropogenic activities that trigger a mass movement are deforestation and burning trash, logging on the slopes for building infrastructure and housing, water leakage, the vibration of the vehicle, the engine spins the use of explosives in mining jobs, and creating terracing [13].

The mass movement can occur due to factors that are internal passive and external factors that are active. Internal factors are factors that already exist on the landform. These factors are morphometry, morphography, and passive morpho structural and active morpho structural landforms. Morphometry is the slope and shape of the slope, morphography is class relief, passive morpho structural is soil and geology, and the active morpho structural is joint of rock. External factors are external factors that worked on the landforms. External factors consist of morpho dynamic. The morpho dynamic factor is the seepage of water, land use, and land management. Passive factors are already existing factors on the landform, and active factor is trigerring factor [14].

Triggering factors of mass movement consists of human and nature factors. Slope gradient and overpressure (morphometric), worldwide environmental changes, rain fall, and tectonic events are nature triggered factor to mass movement [15, 16]. Strong earthquakes are several the top triggering factors of landslides, which may additionally block rivers, forming landslide dams [17]. Slope movement-related elements together with slope gradient, slope aspect, topographical elevations, lithology, faulting, drainage system, road network, land use, precipitations, and seismic disturbances were taken into consideration as independent variables [18].

The mass movement caused more damage, either directly or indirectly. Damage caused by direct mass movement is the destruction of public facilities, agricultural land, and human victims. Loss or reduction in the surface layer of soil (topsoil) that infertility is the negative impact of the mass movement in the long term [19]. Damage indirectly caused by the mass movement is paralyzing the activities of development and economic activity in the affected areas and surrounding areas. When compared with other natural disasters, mass movements have the highest frequency and geographically, the distribution of the mass movement is widespread.

Based on the background, the purpose of this study is to analyze the vulnerability class mass movement of soil and rocks, and to analyze the characteristics of the mass movement in the upstream watershed Riam Kanan based aspects of morphology and morphogenesis.

RESEARCH METHODS

1. Landform Mapping

Landform map is based on the results of the interpretation of Landsat 8. Classification of landforms- based morphology, genesis, and lithology. Based on these aspects' landform landforms are grouped into the main unit. Giving the letter symbols for the major landforms and its details by using numbers. The interpretation of Landsat 8 coupled with lithology information from the Geological Map. Validation results of the interpretation done by field check based on the processes occurring in the landform in the field and the constituent material.

2. Slopes Mapping

Map slope created from the data of the National Digital Elevation Model with a spatial accuracy of 5 meters is cut within the limits of the study area in upstream of Riam Kanan Watershed by using ArcGIS 10.3 extract extensions by the mask. Results of Digital Elevation Model (DEM) is classified based on the slope (Table 1). Each classification is given a score of 1-5 to give the weight of vulnerability to landslides. As the basis of the analysis

geomorphometry, DEM can be used for analysis geomorphometry field. DEM can be used to understand the surface process [20, 21]. The morphometric evaluation was achieved by using Geographic information system (GIS), through a DEM data to get the geomorphic attributes [22].

Table 1. Classification of Slopes

No.	The slope (%)	Classification	Score
1	0-8	Flat	1
2	> 8-15	Sloping	2
3	> 15-25	somewhat Steep	3
4	> 25-45	Steep	4
5	> 45	very Steep	5

3. Density Vegetation Mapping

Map of vegetation density obtained from the extraction image Sentinel 2A by the transformed spectral Normalized Difference Vegetation Indices (NDVI), prior to the transformation of spectral advance correction of radiometric and atmospheric with the aim of reducing atmospheric disturbances, correction radiometric and atmospheric done instantly using pre-processing of data QGIS 3.6 , NDVI spectral transformation results further classified based on the density of vegetation and non-vegetation, each classification is given a score of 1-5 with the aim of giving the weight of vulnerability to landslides.

$$NDVI = \frac{NIR - RED}{NIR + RED} \quad (1)$$

4. Vulnerability Mapping of Mass Movement

Map of mass movement vulnerability created a mass movement of weighted overlay analysis results between maps of the slope with vegetation density, in which each variable mass movement is given a weighting based on the level of vulnerability. The level of vulnerability is made with 5 classes of vulnerability from the most basic, which are very not susceptible to class 1 to

very vulnerable to class 5. Slope vulnerability classes are seen based on the theory that the more sloping slopes are in the field the higher the class of vulnerability. Whereas for the class of vegetation density vulnerability seen from the level of vegetation density that the lower the density level, the higher the class of vulnerability. Overlays are run by giving a weight of 50% each for each parameter in the overlay process. The overlay results will then produce spatial information with classes of vulnerabilities 1-5 according to the number of classes from the input parameters.

5. Data Collection

The data collected in the field is based on the aspect of landforms characteristic, i.e. morphology and morphogenesis on each vulnerability class mass movement of soil and rock. Morphological data includes data slope. Data morphogenesis includes soil depth, rock weathering. Stages in identifying the mass movement in each of the landforms are 1.) To identify the types of movements (landslide, rock fall, debris, spread, or flow); 2.) The material identifying the dominant experience of the mass movement. Material that is experiencing a mass movement can be divided into three kinds of bedrock, the dominant crude and refined.

6. Data Analysis

Data analysis was performed by analysing the characteristics of the mass movement covering types and the identifier of the mass movement based geomorphological aspects are aspects of morphology and morphogenesis. The type of mass movement is analysed based on the classification of a mass movement from [9]. Determining the type and identifier of a mass movement based on the results of measurements and observations in the field.

RESULTS AND DISCUSSION

1. Characteristics of landforms

Characteristics and genesis of landforms will determine the type of any mass movement that occurs, Landform is the basis of the characteristics of the mass movement [14]. Landform in research location consists of the weak eroded

of denudation hills, metamorphic rock material (D1), the strong eroded of denudation hills, conglomerate rock material (D2), the moderate eroded of denudation hills, conglomerate rock material (D3), the moderate eroded of denudation hills, gabbro rock material (D4), the weak eroded of denudation hills, conglomerate rock material (D5), and the moderate eroded of denudation hills, metamorphic rock material (D6), weak eroded of denudation hills, ultramafic rock material (D7), colluvial plain, conglomerate rock material (D8), colluvial plain, breccia volcano rock material (D9), colluvial plain, metamorphic rock material (D10), and floodplain, conglomerate rock material (F1).

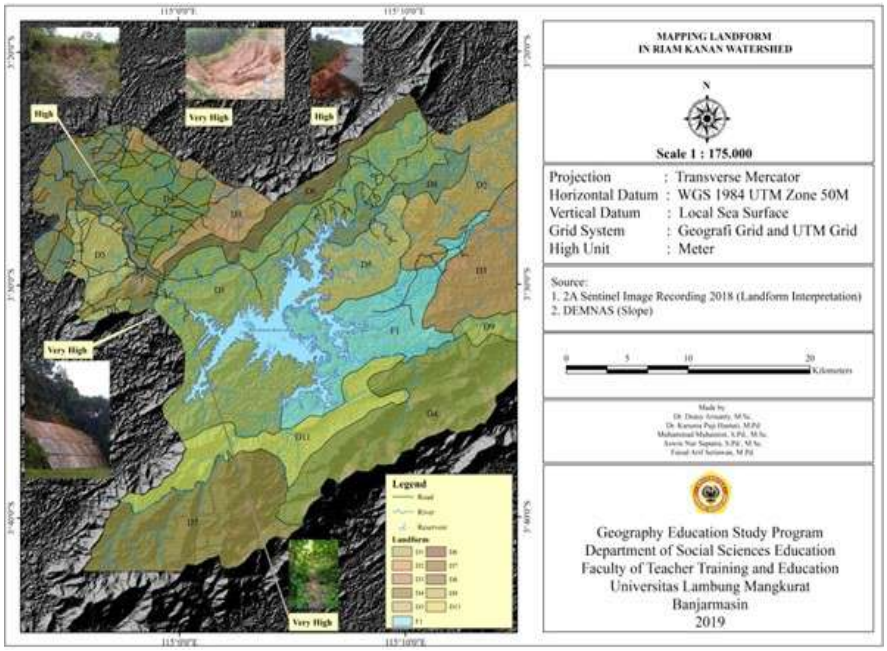

Figure 1. Map of landforms in the upstream of Riam Kanan Watershed

2. Slope

The slope is made using the Data National Digital Elevation Model (*DEMNAS*). DEMNAS provides Digital Surface Model (DSM) data to get the latest DSM data. The research area is dominated by sloping-rather steep. The research area is part of the Meratus Mountain, hence dominated by sloping- rather steep slopes. Flat slope is dominated by the floodplain, conglomer-

ate rock material (F1) and the colluvial plain, breccia volcano rock material (D9). Denudation hill landforms are dominated by steep- very steep. This condition causes the study area are vulnerable to mass movements of soil and rock.

3. Vegetation cover

Vegetation cover is dominated by high density vegetation and open fields. High vegetation density was found on the lower slopes and foot slopes of the hills. Shrubs and open field located on the upper slopes and hilltops. Some locations on hilltop are no vegetation.

Many of the absence of vegetation that existed at a place affected by the thickness of the soil. On the lower slopes and the foot slopes, the soil is thicker than the hilltops or on the upper slopes of the hills, because sedimentation occurs on the lower slopes or the foot slopes of the hills. The upper slopes or hilltops has the thin soil due to the erosion process. The condition causes the only shrub that can grow on the upper slopes or hilltops.

4. Vulnerability Levels of Mass Movement

Mass movement vulnerability map was created based on a slope map and vegetation density map. The extent of vulnerability class mass movement in the upstream of Riam Kanan watershed is presented in Table 2.

Table 2. Vulnerability Level of Mass Movement

No.	Vulnerability Class Mass Movement	Area (Ha)
1	Very low	5,934.33
2	Low	3,792.95
3	Moderate	54,804.47
4	High	36,546.05
5	Very high	1,137.70

The research area is dominated by medium and high vulnerability classes i.e. 54,804.47 Ha and 36,546.04 Ha. Slopes are dominated by a steep slope-very steep with vegetation covers such as shrubs and open field. Such conditions led to the research area becomes prone to occur mass movement of soil and rock.

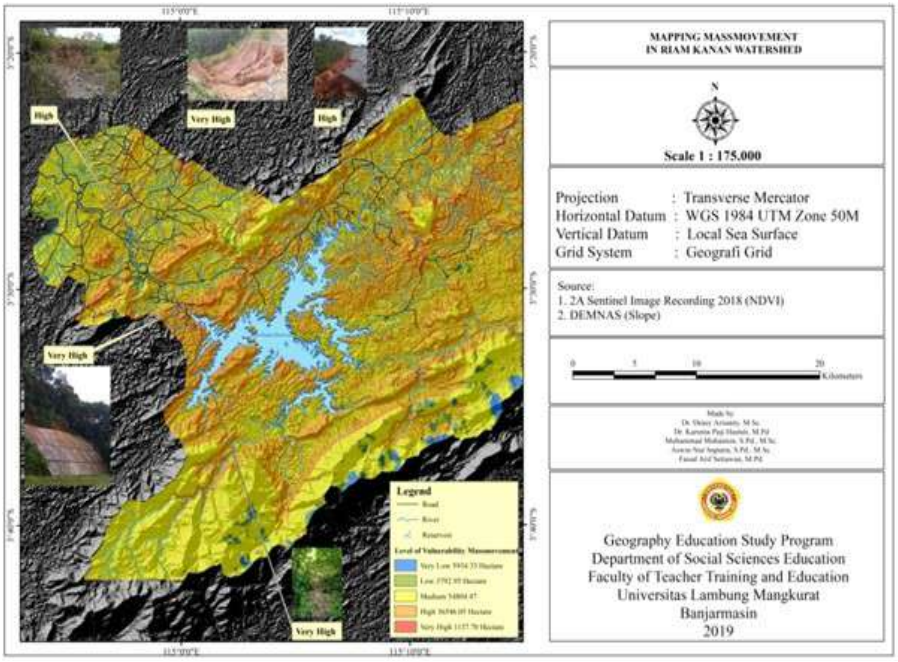

Figure 2. Vulnerability Map of Mass Movement on the Upstream Watershed of Riam Kanan

The weak eroded of denudation hills, material metamorphic rock (D1) has a vulnerability mass movement classes include high-very high. This area has the characteristics of a slope between > 25° for the location of the research included in the mountainous region and the mountains Meratus and Bobaris. The mass movement type rotational avalanches occur on slopes > 25°[23]. The rotational landslide is contained escarpment. The escarpment is part of the steep wall result of ground movement down the slope and crown landslides are areas that do not move. Landslides also occur on a slope with a thick weathered material. This landform has hilly morphology and thickness of soil depth (1-2 m). Material in this mass movement is dominated by fine material. Soil thickness can increase the potential for landslide [14]. The material of rock has been weathered condition, hence this condition vunerable for mass movement.

Human activity such as cutting slope for the road turns to trigger the landslide type. The slopes were cut for road construction causing the slope to become unstable and trigger a rotational landslide. Vegetation covers on rotational landslides are vegetation density medium. Vegetation should be able to withstand the slopes to avoid landslides. The slope cutting their lead to vegetation not able to hold ground, causing landslides. Humans play critical roles in those geomorphological processes [24]. Socioeconomic improvement has introduced about the increase of real values and the impact of unsustainable land use has regularly caused better susceptibilities [25].

Figure 3. Cutting Slope as Triggering Factor for Rotational Landslide

In D1 landform is also found mass movement type of rock fall. Characteristic of slope is > 45 °. The mass movement of this type is also found in D3 and D4, with the level of mass movement vulnerability are high-very high. [26] describes the rock fall occurred in the slope more than 40°. Landform morphological aspects have a concave shape slope, hilly morphology with a soil depth between 0-30 cm, because landform region has a thick layering of rocks and there are many rock outcrops above the mineral soil, cracks in rock, and occurred of weathering rock. Human activity is the triggering factor of rock fall. Rock mining occurs in the upstream of Riam Kanan watershed.

This causes the solid rock to be broken and susceptible to weathering. Open-pit mining also causes slope instability triggering a mass movement [11]. Mining activities may bring about rock mass deterioration and instability that may cause failure both in underground and open pit mine [27]. Failure of rock around the opening happens because of both excessive rock stress conditions and the presence of structural discontinuities [28].

Figure 4. Open Mining as Triggering Factor for Rock Fall

CONCLUSIONS

Landforms in the study area can be divided into 11 landforms dominated by landforms origin of denudation process. The type of mass movement in D1 landform is rotational landslides and rock fall. Rotational landslide has the characteristic slope > 25°, the soil thickness ranges from 1-2 m and occurred of rock weathering. Rock fall has the characteristic slope > 45°, the thin of soil depth of about 30 cm, the density of low vegetation dominated by shrubs and open field, and further weathering. Human activity such as road construction and rock mining are triggered factor of mass movement vulnerability. This research recommended to decrease the triggering factor such as rock mining to reduce the effect of mass movement in research area. This research can be the basis for further research on the impact of human activities on mass movement because human activities have a major influence on mass movement events at the research location.

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