

Drainage Pattern Characteristics of Jatinangor Area, Sumedang Regency, West Java

Pradnya Paramarta Raditya Rendra¹, Nana Sulaksana², Murni Sulastr¹

¹Geomorphology and Remote Sensing Laboratory, Universitas Padjadjaran, Jatinangor, West Java, Indonesia

²Applied Geology Department, Universitas Padjadjaran, Jatinangor, West Java, Indonesia

Email address: radityarendra90 @ yahoo.com

Abstract— The research area is located on Jatinangor District, West Java at coordinate 6°52'57,9" S - 6°57'33,1" S and 107°44'55,9" E - 107°49'0,5" E. This research aims to identify drainage pattern to the physical characteristics of the research area. This research was conducted through studio analysis using several thematic maps such as drainage pattern, slope, and geological map and also satellite images. Based on the results, it can be seen that the research area has parallel drainage pattern. The parallel drainage pattern shows that the research area is an elongated landform. In addition, it also shows that the research area is composed by relatively hard rocks such as volcanic rocks. It is consistent with the results of previous geological research which show that the research area consists of several types of volcanic rock. The characteristics of drainage patterns, slopes, and rock types are interrelated so that analysis of drainage pattern is important and useful for identifying the physical characteristics of a particular area.

Keywords— Drainage pattern, geology, Google Earth, Jatinangor, slope.

I. INTRODUCTION

The research area is located on Jatinangor District, West Java at coordinate 6°52'57,9" S - 6°57'33,1" S and 107°44'55,9" E - 107°49'0,5" E. The research area is in the southeast of Mount Manglayang, precisely at the foot of slope. The slope area is interesting to study because it is a transition area from the top of the mountain to the plain. In addition, the parallel topographic features or elongate landforms are also influenced by slope control. This research aims to identify drainage pattern to the physical characteristics of the research area.

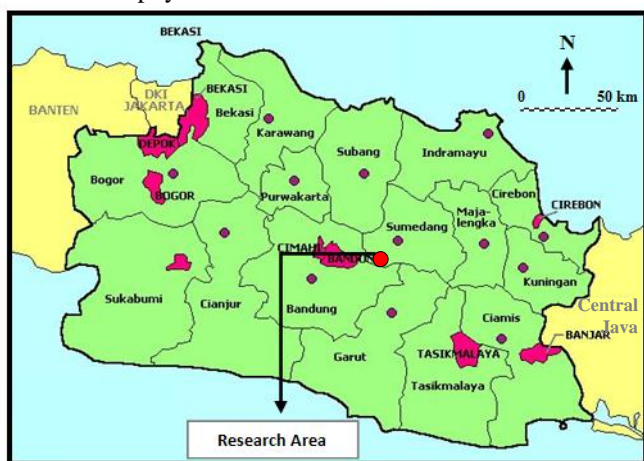


Fig. 1. The research area in the Jatinangor District

Mountain slopes or hilly regions can be characterized by the presence of gullies and complex process that controlled by lithology, soil type, topography, land use, and vegetation [1]. Land use changes can result in change the gullies development [2] and relief transformation [3]. One of the physical processes that can change the shape of the earth's surface is gully erosion [4]. The development of intensive gully erosion can result in geo-environmental degradation in a particular area [5][6].

Remote sensing can be applied to detect and identify land use. Various land use changes that occur in an area can be observed through satellite images [7][8]. Then, monitoring land use change is one of the important things that needs to be done to maintain sustainable development [9][10]. Therefore, this research will also use remote sensing satellite images to help data analysis.

II. METHOD

The research was conducted through studio analysis using several thematic maps such as drainage pattern, slope, and geological map and also satellite images. Drainage pattern of the research area were obtained from topographical map of Indonesia that had been digitized previously. Slope map of the research area is obtained from SRTM DEM with spatial resolution of 30 meter. Geological map of the research area is obtained from the result of previous geological research [11]. This research was conducted by observing the characteristics of drainage pattern on drainage pattern map and comparing it with other maps. The classification of drainage pattern has been studied by researchers [12][13].

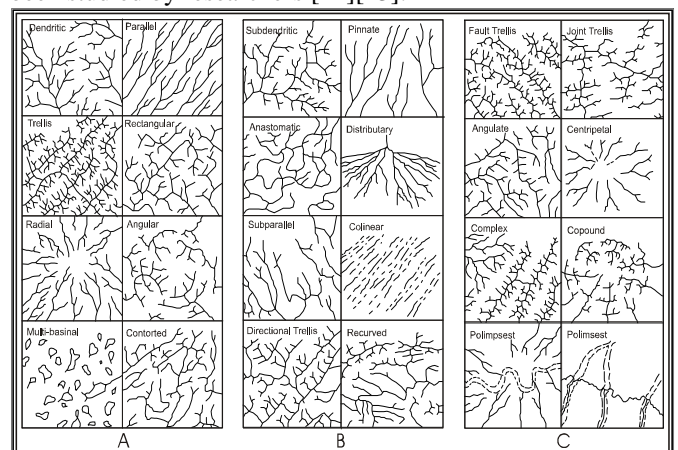


Fig. 2. Drainage pattern classification [13]: (A) Basic drainage pattern; (B and C) Modified basic drainage pattern

Land use in the research area can be identify and analyze using remote sensing satellite images. Satellite image is one of the main dataset that can be used in various applications, one of which is regional development [14]. It is useful in helping to determine and analyze the land use characteristic of a particular area using Google Earth [15][16][17].

III. RESULT AND DISCUSSION

The research area and its surroundings have parallel drainage pattern. Several rivers in the research area namely Cikeruh, Cibesi, Cicaringin, Cileles, and Cikeuyup river. The entire river flows from the north to the south of the research area. It can be seen in Fig. 3 that only a radial drainage pattern can be found in the east of the research area. The parallel drainage pattern is indicated by the elongated river and nearly parallel to one another [12]. There is no complex drainage pattern present in the research area.

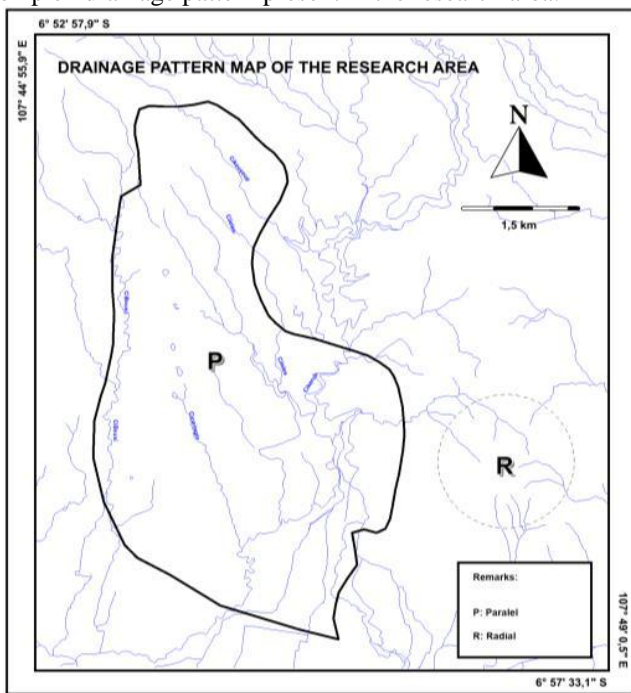


Fig. 3. Drainage pattern map of the research area

Parallel drainage pattern implies moderate to steep slope of parallel topographic features or elongate landforms [13]. It can be proven from the slope map (Fig. 4) which shows that the research area has a relatively steep slope. In addition, a parallel topographic features can be seen in satellite images (Fig. 5).

Based on the geological map of the research area (Fig. 6), it can be seen that the research area is composed of volcanic rocks. The research area is composed of Undifferentiated Young Volcanic Products (Qyu) such as tuffaceous sand, lapili, lava, and agglomerate in the middle to the north; Young Volcanic Product (Qyl) namely lava in the east; and Lake Deposits (Ql) such as tuffaceous clay, sandstone, gravel, and conglomerate in the middle to the south. It proves that the parallel drainage pattern is correlated with volcanic rocks.

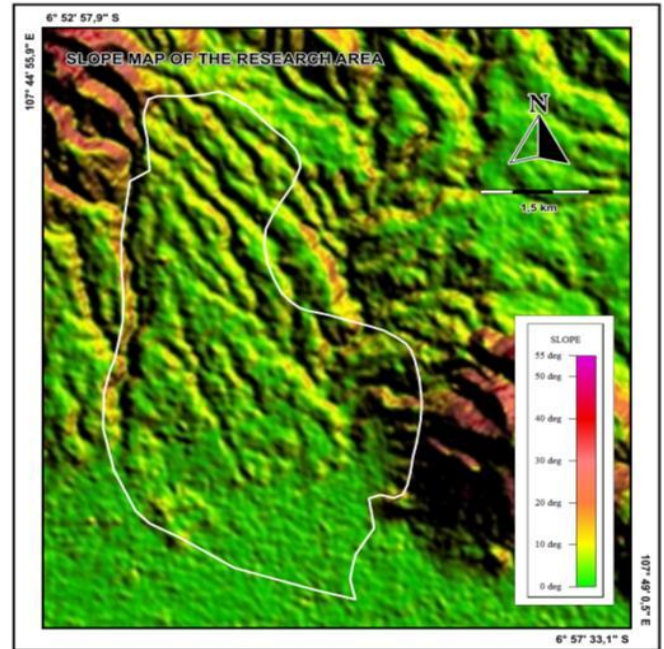


Fig. 4. Slope map of the research area

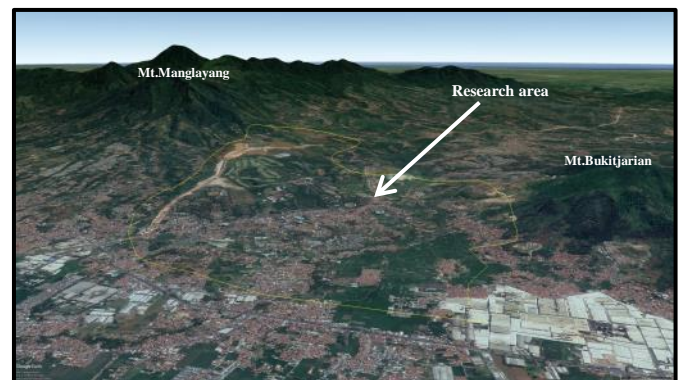


Fig. 5. 3D view of satellite image of the research area (source: Google Earth, 26 July 2020)

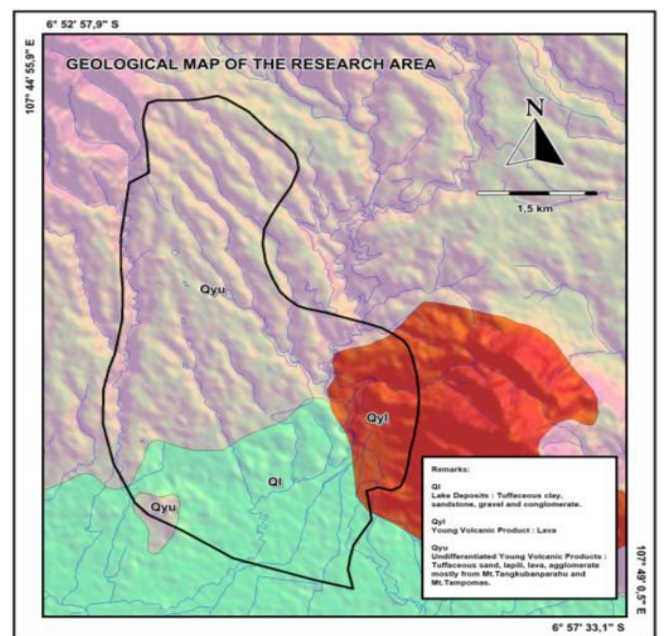


Fig. 6. Geological map of the research area (modified after [11])

Based on the satellite images (Fig.7 and Fig.8), it can be seen that the research area has experienced land use changes. Population and economic growth are important factors in land use change. The research area has been widely used as residential areas in the central to the south. There are also educational areas such as Universitas Padjadjaran (Unpad) and Institut Teknologi Bandung (ITB). It can be seen in the north and west of the research area that the area has changed gradually into toll road construction plan (Fig. 7 and Fig. 8). The development of the toll road which is located in the north and west of the research area can be seen through satellite images.

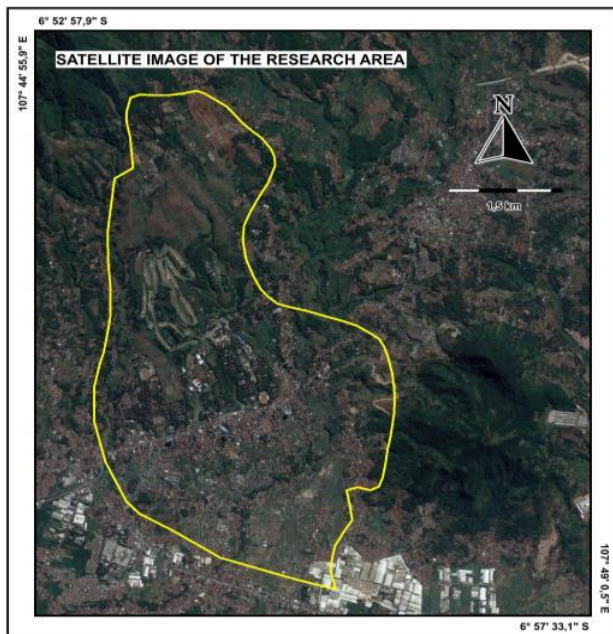


Fig. 7. Satellite image of the research area (source: Google Earth, imagery date 16 July 2017)

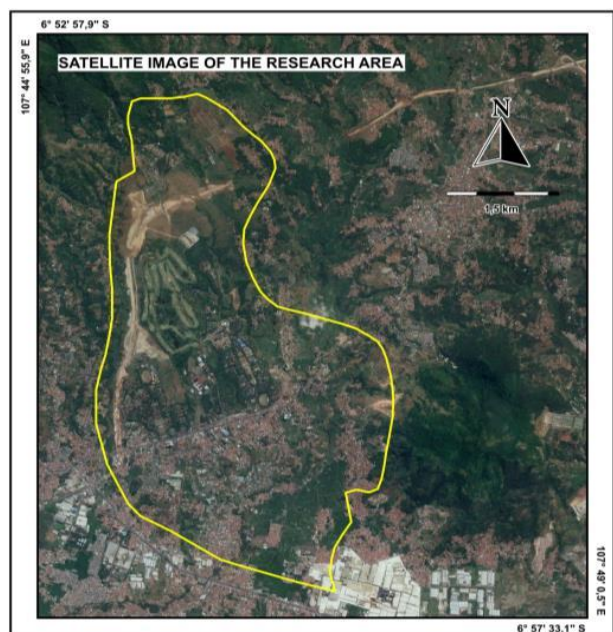


Fig. 8. Satellite image of the research area (source: Google Earth, imagery date 26 July 2020)

IV. CONCLUSION

The research area is located on the southeast of Mount Manglayang, precisely at the foot of slope. The drainage pattern in the research area is parallel which shows elongated river and nearly parallel to one another. It indicates that the research area is on a mountain slope which can be observed in slope map and satellite images. Based on satellite images, it can be seen that most of the research area are residential and educational areas. The parallel drainage pattern shows that the research area has relatively uniform and hard rock formation. It is evidenced by geological map showing various types of volcanic rock. The characteristics of drainage patterns, slopes, and rock types are interrelated so that analysis of drainage pattern is important and useful for identifying the physical characteristics of a particular area.

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