

# Geomorphological Characteristics of Rancaekek Area, Sumedang Regency, West Java

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**Abstract**— The research area is located on Rancaekek District, West Java at coordinate 6°54'49,6" S - 7°2'55,3" S and 107°41'33,7" E - 107°50'15,6" E. This research aims to identify and analyze the geomorphological characteristics of the Rancaekek area. This research activity was conducted through a studio analysis approach with several media such as slope, drainage pattern, and geological maps, and also satellite images. Based on the results obtained, it was found that the research area has very gentle to flat morphological characteristics and dominated by anastomotic drainage pattern. The anastomotic drainage pattern proves that the research area has a modified drainage pattern condition from several interlocking river channels. The research area is composed by the dominance of lake deposits without any developed geological structure.. It can be seen from the geological map of the research area. Moreover, satellite imagery shows that the research area is dominated by residential, industrial, and shopping areas. Based on these geomorphological characteristics, it can be concluded that the research area has a high flood potential. Therefore, it is necessary to have a good regional planning to minimize the impact of flooding in the future.

**Keywords**— drainage pattern, geomorphology, Google Earth, Rancaekek, slope

## I. INTRODUCTION

The research area is located on Rancaekek District, West Java at coordinate 6°54'49,6" S - 7°2'55,3" S and 107°41'33,7" E - 107°50'15,6" E. The research area is located in a very gentle to flat area that surrounded by several hills and mounts. The research area is interesting to study because of its relatively high potential for flooding. Some researchers state that the research area does have a fairly high potential for flooding [1]–[4]. Therefore, this research has a major impact on people's lives in the research area.

This research aims to identify and analyze the geomorphological characteristics of the Rancaekek area. Certain geomorphological characteristics can also affect land use condition in an area [5]–[8]. Several parameters of geomorphology that can be studied such as slopes, rivers, landscapes, etc. It can physically be seen through various approaches, either through field observations or remote sensing.

Remote sensing is a tool that can be used in geomorphological surveys [9], [10]. Remote sensing is used as a way to determine land use conditions in the research area [11]–[13]. Variations in land use can be identified through satellite images [14], [15]. On the other hand, monitoring of land use change is needed to determine the vulnerability of an area and maintain sustainable development of a particular area

[16]–[18]. Therefore, the remote sensing approach is important and will use in this research.

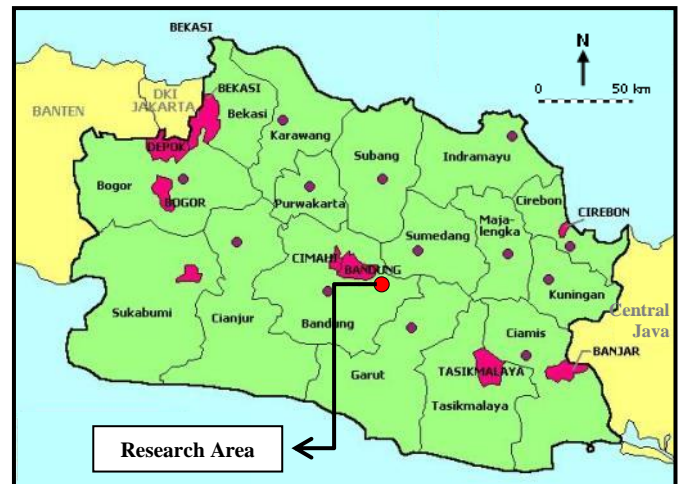


Fig. 1. The research area in the Rancaekek District

## II. METHOD

This research activity was conducted through a studio analysis using Map Info software with several media such as slope, drainage pattern, and geological maps, and also satellite images. The slope map of the research area was obtained from the results of SRTM DEM media processing with a spatial resolution of 30 meters. The drainage pattern map was obtained from the processing and extraction of river data on the topographic map of the research area. The classification of drainage patterns has been made by previous researchers [19], [20]. The geological map was obtained from the results of the regional geological map processing of previous researchers [21], [22]. Based on the several media, identification and analysis of the geomorphological characteristics of the research area can be carried out.

Remote sensing method is used to identify land use in the research area using satellite imagery media. Satellite images that appear relatively detailed and easy to analyze can be obtained from the Google Earth application. Satellite images from Google Earth can be used for various purposes, such as identification and analysis of land use conditions in an area [23]–[25].

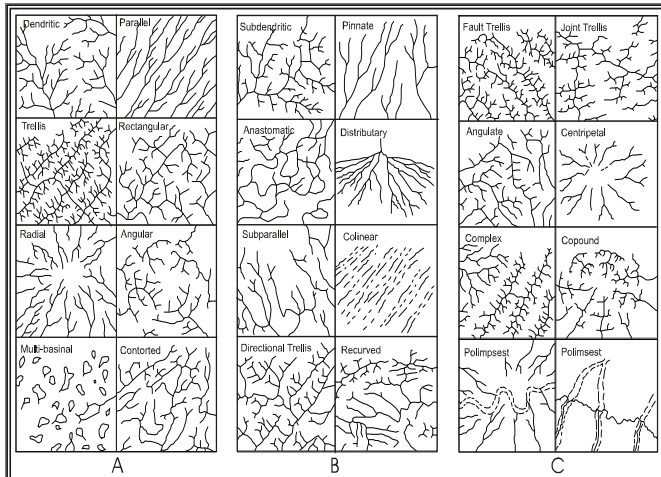


Fig. 2 Drainage pattern classification [19], [20]: (A) Basic drainage pattern; (B and C) Modified basic drainage pattern

### III. RESULT AND DISCUSSION

Based on the identification and analysis of the slope map, the results show that the research area is a very gentle to flat area. Hills and mounts are relatively close around the research area, it can be seen in Fig. 3. On the other hand, the research area has a dominant anastomotic drainage pattern (Fig. 4). The anastomotic drainage pattern proves that the research area has a modified drainage pattern condition from several interlocking river channels. It shows a number of river flows that are many and interconnected with each other so that they will appear dense on the map. It also confirms that the morphological characteristics of the research area is very gentle to flat.

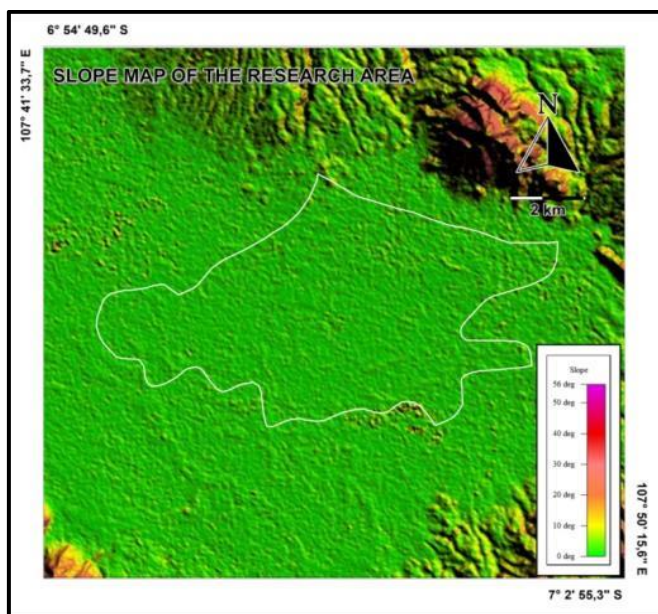


Fig. 3. Slope map of the research area

The anastomotic drainage pattern in the research area is identical to floodplain [19], [20]. Floodplains are generally found in very gentle-flat areas, sloughs, and bayous [26]. On the other hand, parallel drainage patterns around the research area indicate the foot of slope area. It can be seen also in satellite

images (Fig. 6) which shows that the research area is a very gentle to flat area so it tends to be a floodplain area whereas surrounding the research area are hills and mounts, such as Mt.Malabar, Mt.Mandalawangi, Mt.Manglayang, Mt.Kareumbi, and Mt.Bukitjarian.

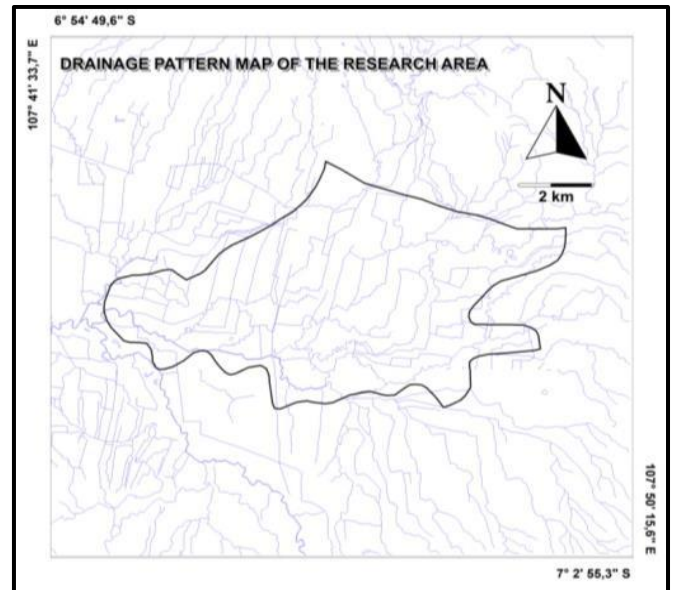


Fig. 4. Drainage pattern map of the research area

Based on the geological map, the research area is composed by the dominance of lake deposits (Ql) without any developed geological structure (Fig. 5). It also can be seen that surrounding the research area are composed by volcanic products such as Undifferentiated Young Volcanic Products (Qyu) namely tuffaceous sand, lapili, lava, and agglomerate, Young Volcanic Products (Qyl) namely young lava, Old Volcanic Products namely old lava, etc. It also proves the relationship between rock characteristics with slopes and drainage patterns [6], [27].

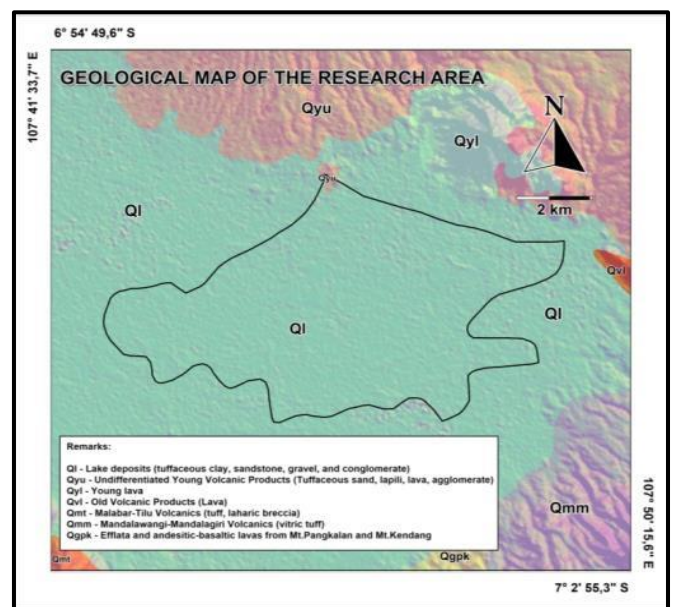


Fig. 5. Geological map of the research area (modified after [21], [22])

Based on the satellite image (Fig. 6 and Fig. 7), it can be seen that the research area is dominated by residential, industrial, and shopping areas. Changes in land use are unavoidable because of the increasing number of people and heavy transportation traffic. In addition, the morphological condition of the research area which tends to be flat also makes it easier for people to change the land use. However, it should also be noted that the research area is very gentle-flat and has a lot of river channels which has the potential to cause flooding. Therefore, it is necessary to consider carefully and wisely in developing a sustainable research area while still considering disaster mitigation, especially flooding.

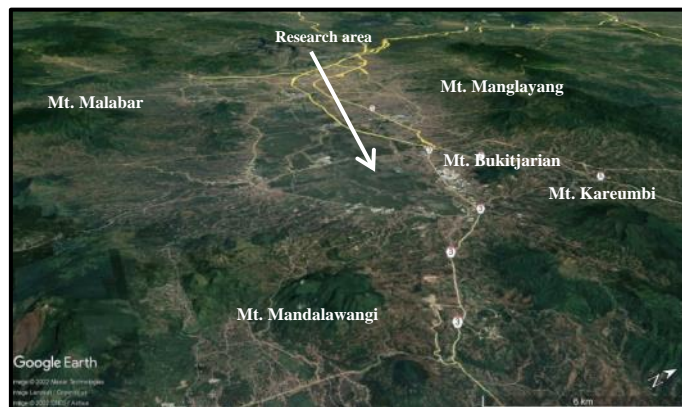


Fig. 6. Satellite image of the research area (source: Google Earth)

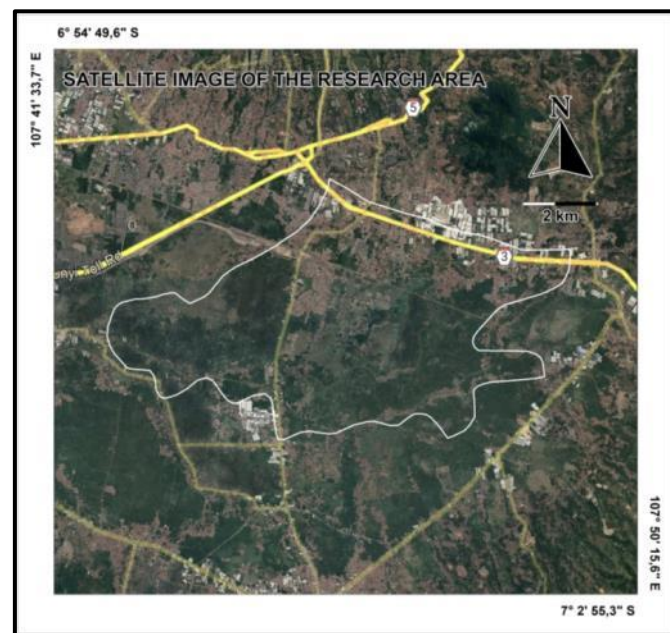


Fig. 7. Satellite image of the research area (source: Google Earth)

#### IV. CONCLUSION

The research area is located on Rancaekek District, West Java. It is surrounded by several hills and mounts. The geomorphological characteristics of the research area can be determined by slope, drainage pattern, geology, and land use parameters. It can be analyzed using Map Info software with

several media such as slope, drainage pattern, and geological maps, and also satellite images. Based on the results, the research area has very gentle to flat morphological characteristics and dominated by anastomotic drainage pattern. The drainage pattern is identical to floodplain. The research area is composed by the dominance of lake deposits without any developed geological structure. Moreover, satellite images shows that the research area is dominated by residential, industrial, and shopping areas. It can be concluded that the research area has a high flood potential. Therefore, it is necessary to have a good regional planning to minimize the impact of flooding in the future.

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