

ANALYSIS OF GEOMORPHOLOGICAL ASPECTS OF SURADE SUB-DISTRICT, SUKABUMI DISTRICT, WEST JAVA

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ABSTRACT

The current form of the earth's surface romance is the result of geological processes that have taken place during the geological period which can show how the characteristics and distribution of the constituent rocks. This research was conducted to find out how the geomorphological conditions by analyzing the aspects of morphography, morphometry, and morphogenetics as a form of geomorphology in an area. The research location is in Mekarjaya Village, Ciemas Sub-district, Sukabumi Regency, West Java, which has geomorphological conditions influenced by the activity of an old submarine volcano which was then uplifted and experienced an intensive tectonic process. The method used in this study combines qualitative and quantitative aspects supported by satellite imagery, data processing applications, and references from previous research results. The results of this study show that there are 2 geomorphological units, namely the Slightly Steep Volcanic Hills Unit and the Steep Volcanic Hills Unit with the distribution of andesitic lava and volcanic breccia rocks. The drainage pattern that develops is rectangular.

Keyword: Surade, geomorphology, morphography, morphometry, morphogenetics

INTRODUCTION

Geomorphology as a field of science that studies how the romance of the earth's face will be closely related to geological processes that have taken place in an area. The geomorphological conditions of a geological area will be closely related to geological processes and the existing rock order so that the characteristics of the area can be explained (Adiba, 2021). Vertsappen (1985) states that rock types will have different resistance so that they will form different morphologies.

Geographically located at coordinates 106°34'31.4"- 106°37'13.57" East and 7°14'6.95" - 7°16'50.36" LS. Administratively, the research area is located in Surade District, Sukabumi Regency, West Java. The research conducted focuses on the study of geomorphological aspects as an agent of forming the earth's surface romance seen from the aspects of morphography, morphometry, and morphogenetics in order to know how the characteristics and grouping of geomorphological units in the study area. The study area is physiographically located in the Southern Mountains Zone which was formed due to the subduction of the Indian-Australian Plate and the Asian plate in the Late Oligocene which stretched from west to east along Java Island. (Katili, 1975). Later, Van Bemmelen (1949) divided West Java into 5 zones, namely (1) Jakarta Coastal Plain Zone; (2) Bogor Zone; (3) Bandung Zone; (4) Bayah Mountains Zone; and (5) Southern Mountains Zone (Figure1).

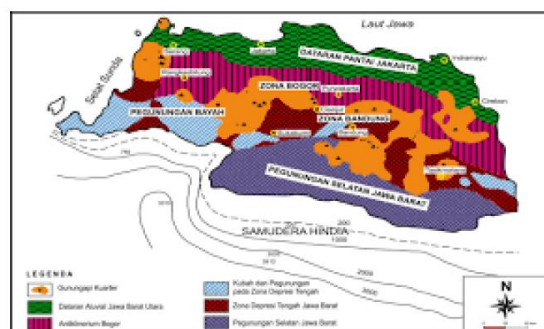


Figure 1. Modified Picture of Physiography of Java Island (Bemmelen, 1949)

RESEARCH METHOD

Analysis of geomorphological aspects combines qualitative and quantitative aspects supported by data processing applications, satellite imagery, and results from relevant previous research. Remote sensing (satellite imagery) is a technology that can provide convenience to obtain information on the earth's surface quickly and accurately (Nurfaika, 2015). To facilitate the analysis process, researchers grouped geomorphological units based on morphographic, morphometric, and morphogenetic conditions in order to know how the geomorphological characteristics in the study area.

The first aspect of geomorphology is morphography where this aspect can explain how the earth's surface romances qualitatively based on topography by looking at absolute

height (Zuidam, 1983). In addition to the shape of the earth's surface, drainage patterns are also analyzed where certain patterns can show the resistance of rocks in the watershed and tectonic influences referring to Zuidam (1983) as a modification of Howard (1976). Second, is the morphometric aspect that explains quantitatively how the landform in the study area so that it can be known how the influence of erosion, erosion rate, as well as slope referring to Zuidam (1983). Geological

conditions will be shown by how the landscape characteristics that include watershed dimensions, flow patterns, morphological straightness, and flow density (Sukiyah, 2007). The third aspect of geomorphology is morphogenetics, which can explain qualitatively how the origin of the formation of a landscape (morphology) by correlating between exposed rocks, drainage patterns, landforms, geological structures, and the characteristics of each rock scattered in the research location.

RESULT AND DISCUSSION

The morphography of the research area includes two things, namely landform types and drainage patterns. Determination of landform type will refer to van Zuidam's (1985) classification, while drainage pattern type will refer to Howard's (1967) classification.

a) Based on the landform, the elevation of the study area ranges from 200-325 meters above sea level. The highest elevation point is in the eastern part of the study area, while the lowest point is in the western part of the study area adjacent to the end of the Cikarang River. Based on van Zuidam's (1985) classification, the landform in the study area is hilly (Figure 2).

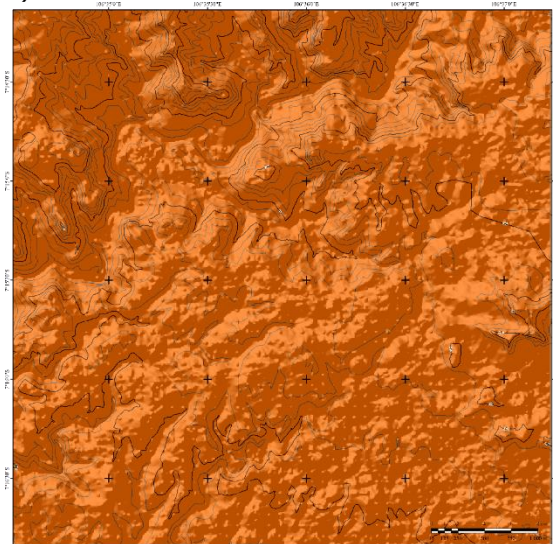


Figure 2. Morphographic Map of Surade and Surrounding Areas

b) Drainage patterns were analyzed based on topographic maps containing incisions of intermittent river channels and the main river in the study area which was then compared with the basic flow patterns and modified flow patterns (Howard, 1967). In the study area, the flow patterns that developed were

Dendritic and Sub-parallel Drainage Patterns (Figure 3).

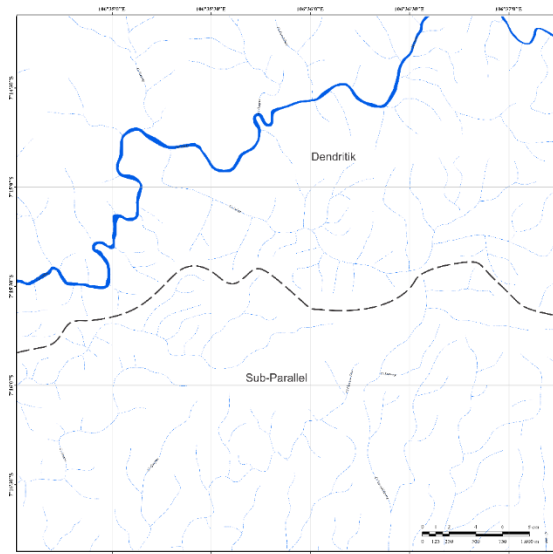


Figure 3. Map of Drainage Patterns of Surade and Surrounding Areas.

The morphometric aspect of the study area assessed based on slope angle analysis provides information that can complement the geomorphological conditions of the study area. Based on the morphometry map, the northern part of the study area tends to have a general slope value that varies in the range of 8° to $> 55^\circ$. The northern area is dominated by the moderately steep slope class, which is 8° to 16° (van Zuidam, 1985). While the southern part of the study area generally has relatively lower slope values that vary in the range of 0° to 16° . The southern area is dominated by the gentle slope class of 2° to 4° (van Zuidam, 1985) (Figure 4).

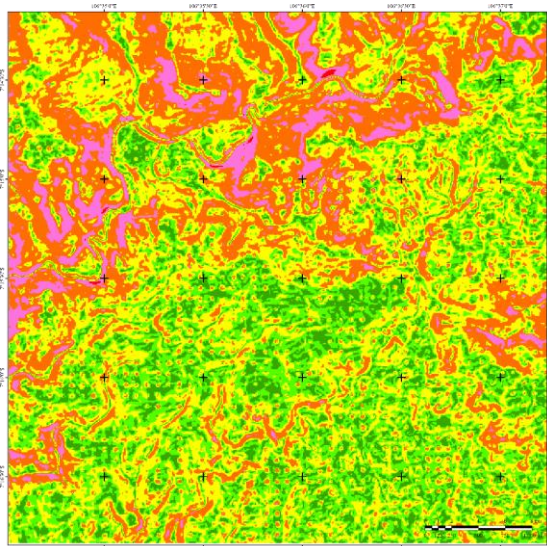


Figure 4. Morphometric Map of Surade and Surrounding Areas

The morphogenetics of the study area is determined based on three aspects. These aspects are the influence of internal origin (endogenous), external origin (exogenous), and the type of origin material. Endogenous forces that play a role in the research area are volcanism activities that produce volcanic sediment products and tectonism that produces folded geological structures. Exogenous forces that play a role in the research area in the form of weathering and erosion activities with different intensities and their continuity continues to this day. The activity is indicated by the presence of incisions that form valleys or rivers in the study area. Then the material origin can be identified from the type of deposits exposed on the surface, namely the presence of deposits of volcanic origin and deposits resulting from sedimentation processes.

Based on morphography, morphometry and morphogenetic aspects, the study area can be divided into two geomorphological units, namely the Rather Steep Volcanic Hills Geomorphology Unit and the Rather Sloping Fluvial Hills Geomorphology Unit. Field facts can guide geologists to strengthen the way of determining geomorphological units in the research area based on factual natural appearances. The following are field facts that can support the determination of two geomorphological units, namely the Geomorphology Unit of Slightly Steep Volcanic Hills and Geomorphology Unit of Slightly Sloping Fluvial Hills.

Geomorphology Unit of Slightly Steep Volcanic Hills (Figure 5), field facts were found including:

- The lithology spread in this area is in the form of volcanic deposits, such as volcanic breccia, sedimentary breccia, and andesite lava.
- It has tight contours with elevations between 212.5 - 325 meters above sea level and slopes of 8° to 16°.
- It has a rather steep landform and a predominance of V-shaped valleys, characterizing that vertical erosion plays a greater role.
- Exogenous processes such as erosion and weathering activities are quite intensive.
- The area coverage of this geomorphological unit is estimated to reach 35% of the study area.



Figure 5. The appearance of volcanic hills geomorphology unit is rather steep from Cikarang Village.

Geomorphology Unit of Slightly Sloping Fluvial Hills (Figure 6), field facts were found including:

- The lithology scattered in this area is the result of sedimentation processes, such as sandstone, claystone and limestone.
- It has contours that are not tight (tenuous) with elevations between 225 - 250 meters above sea level and slopes of 2° - 4°.
- The landforms are Slightly sloping and dominated by U-shaped valleys, characterizing the role of horizontal erosion.
- Exogenous processes such as erosion and weathering activities are very intensive.
- The coverage area of this geomorphological unit is estimated to reach 65% of the study area.



Figure 6. The appearance of the fluvial hills geomorphology unit is slightly sloping from Tanjung Village.

CONCLUSION

The geomorphologic processes that take place in Surade Subdistrict, Sukabumi District are generally influenced by tectonic activities that have occurred in the past. Based on the drainage pattern map, the study area has a Dendritic and subparallel pattern. The study area is genetically formed by Slightly Steep Volcanic Hills and Slightly Sloping Fluvial Hills. It can be concluded that there are two geomorphological units that can be grouped based on morphography, morphometry, and morphogenetic aspects, namely the Volcanic Hills Geomorphology Unit Slightly Steep and the Fluvial Hills Geomorphology Unit Slightly Sloping.

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