THE PRESENCE OF REVERSE SLIP FAULT AND ITS IMPLICATION TO GEOMORPHOLOGY DEVELOPMENT AND LITOLOGY DISTRIBUTION AT CIKASO REGION, CIAMIS DISTRICT, WEST JAVA.

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ABSTRACT

Distribution of stratigraphic sequence as the basis of various geological studies has been carried in many researches. The presence of various rock can be affected by tectonic events that have occurred before, during, and after their formation. Besides that, control of geological structure will support other research such as geomorphology, and stratigraphy. This research purpose to know what structure develop and correlation between structure and rock distribution, in Cikaso Region, Ciamis District, West Java. The method of this paper are geological mapping and studio analysis. Geological mapping carried to take out data of lithology strike dip and structure. And studio analysis to processed data with software. Geomorphology of research area are four units, that are structural hills of steep slope unit, structural hills of rather steep slope unit, structural plain of sloping slope unit, and structural plain of very sloping slope unit. There are two geology structure, are Cikaso Thrust Fault and Cigayam Sinistral Shear Fault. Based on lithostratigrapgic aspect, they are five rocks units. From old to young are Volcanic Breccia, Non Carbonate Sandstone, Clastic Limestone, Carbonate Sandstone, and Carbonate Claystone.

Keyword: *geological mapping, structural geology, reverse fault, geomorphology.*

INTRODUCTION

Distribution of stratigraphic sequence as the basis of various geological studies has been carried in many researches. The presence of various rocks can be affected by tectonic events that have occurred before, during, and after their formation. Besides that, control of geological structures will support other research such as geomorphology and stratigraphy. That condition occur in Cikaso area, Ciamis Regency. Which is the location of the study.

Therefore, it is necessary to know what kind of geological structures developed in the research areas which controlled the formation of morphology and distribution of the rock. Hopefully, this preliminary study can be used for further research in the future.

Administratively, the research area in sprecifi Cikaso region are included in the Banjaranyar District, Ciamis Regency, West Java Province and geographically located between longitude E 108 ° 33 '28,5552 to E 107 ° 36' 11,8404 and latitude S 7 ° 32 '44,1168 to S 7 ° 30' 2,2356.

Literature Study

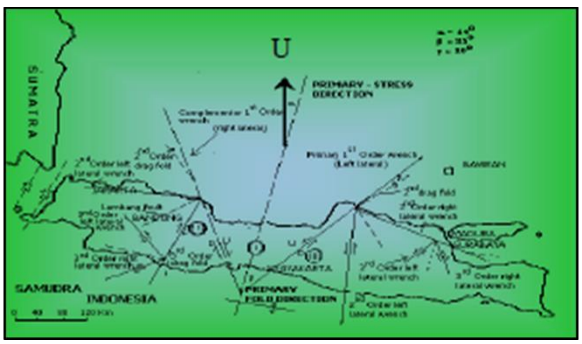
Regional Geological Structure

The geological structure of West Java is dominated by fold structures and upward faults with the east-west direction, and the other part is a horizontal fault with northwest-southeast

E-ISSN : 2579 – 3136

and northeast northeast. Horizontal fault on Java Island with Wrench Fault Tectonic concept (Situmorang, 1976) are :

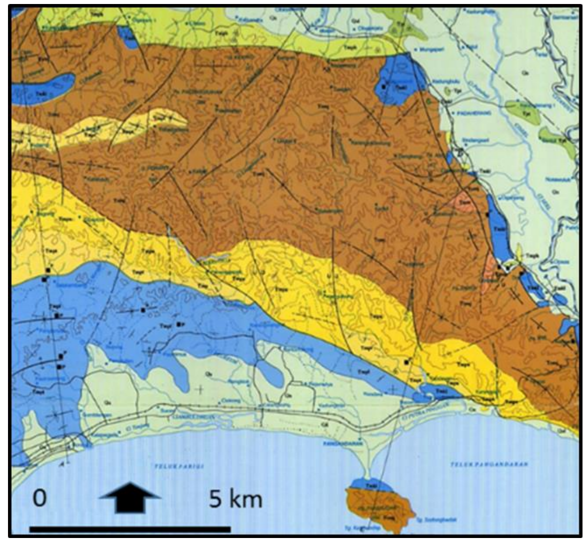
1. The fracture system formed on Java Island, is a lateral North-South directed compression that is closely related to the relative movement of the Indian-Australian Ocean Plate to the North from the Southeast Asian Plate.
2. First, second and third order can be found on Java, and folds generally follow the primary fold system. Only a few folds around Jakarta are assumed to originate from secondary order drag.



Picture 1 The Java Island Fault Distribution System compatible to the concept of "Wrench Fault Tectonics" (Situmorang, 1976).

Regional Stratigraphy

Referring to regional geological map of Pangandaran (Simanjuntak and Surono, 1992), the sequence of the oldest to youngest rock formations along Banjar-Pangandaran is the Oligocene - Early Miocene of Jampang Formation, Middle Miocene - Late Miocene of Kalipucang Formation, Middle Miocene - Late Miocene of Halang Formation.



Picture 2 Geology Regional Map Pangandaran Sebagian (Simandjuntak dan Surono, 1992)

Methods

The methods of this paper are geological mapping and studio analysis. Geological mapping carried to take out data of lithology strike dip and structure. And studio analysis to processed data with software.

To determine morphology in study area was analyzed by morphographic maps using MapInfo software, DEM (Digital Elevation Model) map analysis, and morphometric map analysis using ArcGIS software.

To determine the geological structure that develops in the area of research based on several aspects, including analysis of DEM Map (Digital Elevation Model), analysis of river flow patterns, and retrieval of field data which will then be processed data using DIPS software.

Geological mapping was carried to determine distribution of lithology in the study area through observing descriptions in megascopic handlebars and microscopic samples through

E-ISSN : 2579 – 3136

petrographic analysis. So the lithology distribution data were presented in the form of Geological Maps.

Variable control of rock distribution such as geomorphology, structural geology, and lithology type. The output of three variables is a geological map.

Result and Discussion

Variable Control of Rock Distribution

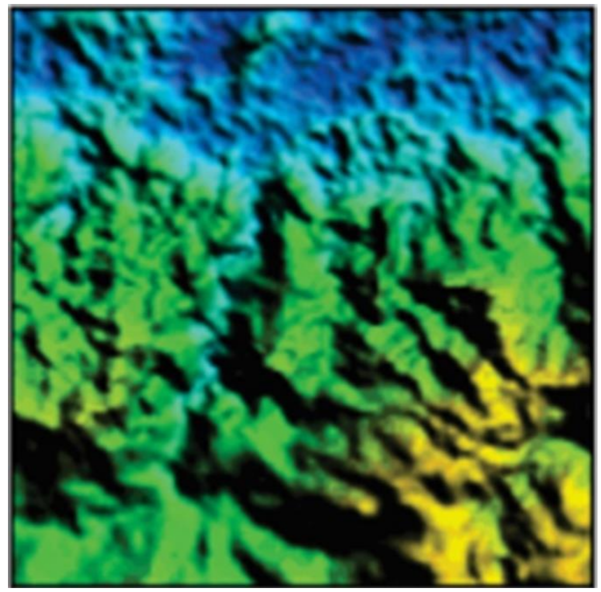
There are three lithology distribution control used in the study, such as geomorphology, structural geology, and lithology type.

Geomorphology

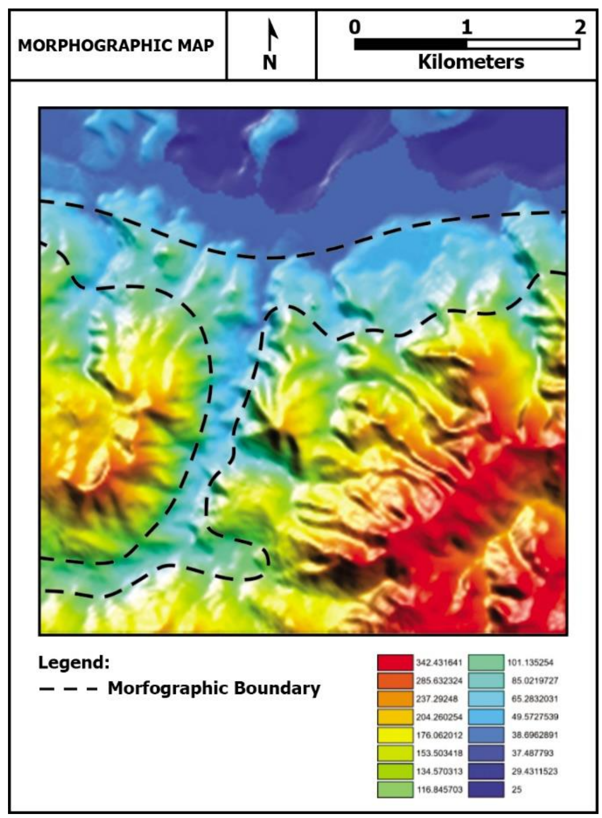
Geomorphology of research area become one indication of geological history condition. Geomorphology in study area was divided based on morphography, morphometry, and morphogenetics according to Van Zuidam (1985), and DEM (Digital Elevation Model) analysis was used.

According to DEM, the morphology of study area was divided into three, they are the lower relief area in the north, the relief height in the east-south and west, and the lower relief in the middle part of the study area.

According to morphographic data, the morphology in study area is divided into 4, they are areas with an altitude of 25-62.5 masl in the north, an altitude of 62.5-100 masl in the middle, an altitude of 100-200 masl in the west, and a height of 200-425 masl in the south-east part of the research area.



Picture 3 Digital Elevation Model (DEM) of research area.



Picture 4 Morphography Map

According to morphometric data, the morphology in the study area is divided into 4,

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they are with a slope of 2-7% in the north, 7-15% in the middle, 15-30% in the west, and 30-70% in the south-east research.

Therefore, the geomorphology of the study area is divided into 4 units, that is:

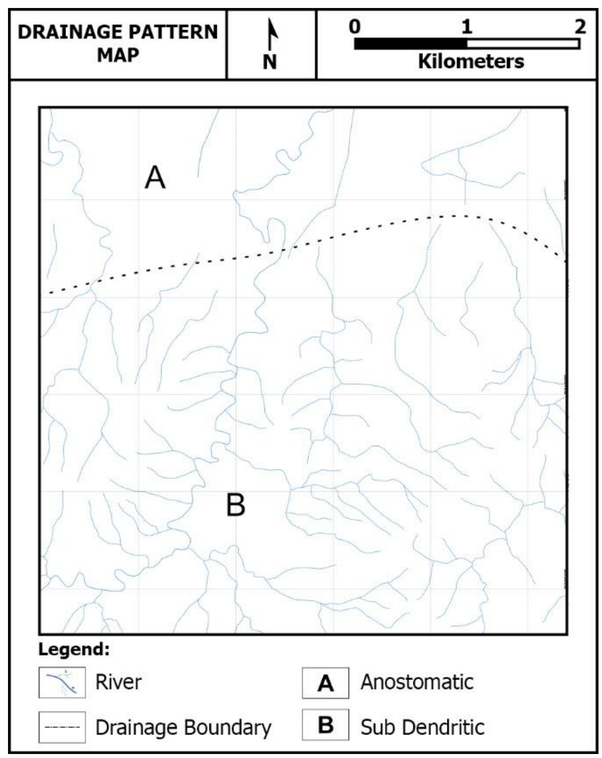
1. Structural hills of steep slopes, with high hilly landforms, have elevations at 425-200 masl, slope 30-70%, located in the east-southeast in research area.
2. Structural hills of slightly steep slopes, with low hilly landforms, have an elevation at 200-100 masl, slope 15-30%, located in the west part in research area.
3. Structural plain of sloping slope unit, with sloping plain landforms, have an elevation at 62.5-100 masl, slope 7-15%, located in the middle in research area
4. Structural plain of very sloping slope unit, with low sloping landforms, have an elevation of 25-62.5 masl, slope 2-7%, located in the north in research area.

Structural Geology

Geological structure in research area was form of faults and joints. The data processed by DEM (Digital Elevation Model) analysis, field data analysis such as fault plane strike dip and joint plane strike dip, and analysis of river flow patterns.

Fault can be seen from significant height differences of DEM, and the ridge alignment. At northern part of research area there was a very significant height difference, which was thought to be a thrust fault . Whereas in central part of research area there is anomaly ridge line, which is thought to be a shear fault.

The river drainage pattern in the study area is divided into 2, they are Anostomatic Flow Pattern found in the northern part, and Subdendritic Flow Pattern found in the middle to the south of research area. Anostomatic drainage pattern is a modified flowing pattern, found in the downstream of the Cikaso River, developing in areas with very tenuous topographic relief, this flow pattern shows dominant horizontal erosion control. Whereas the subdendritic flow pattern is a modification flow pattern of the dendritic drainage pattern but is not perfect due to being controlled by regional structures or more generally controlled by structure.



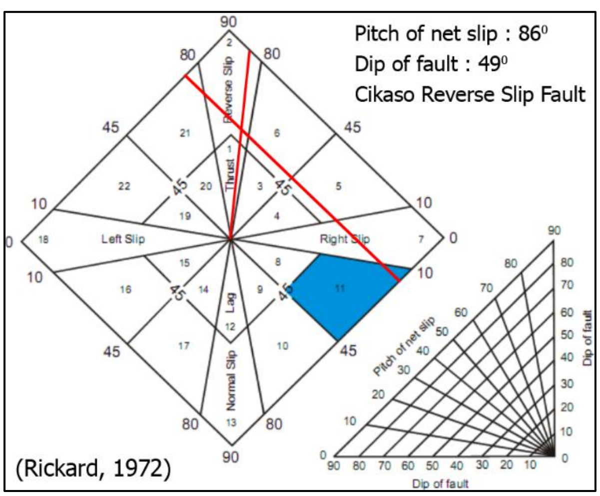
Picture 5 River Flow Pattern Map

From the results of DEM analysis and river flow patterns analysis, concluded that the area is controlled by the structure. Beside that there is evidence in the field, there is slicken side found

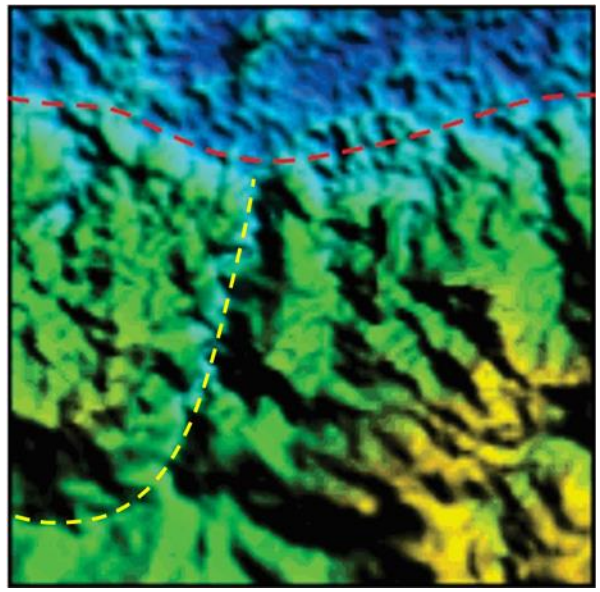
E-ISSN : 2579 – 3136

on limestone, N 45° E / 49°, Pitch 86° NE, step up features, found in the north, the presence of thrust fault is on the River Cikaso, so the author named it Cikaso Reverse Slip Fault (Rickard, 1972). Whereas, in middle part of research area, according to DEM analysis data there are showing ridge lineament anomaly, this is also supported by differences in strike dip data found in the field, the presence of these horizontal faults along the Cikaso River, Cigayam River, Cigayam Village so the writer called it Cigayam Sinistral Shear Fault.

Picture 6 Slicken side on limestone with strike dip N45°E/49° net pitch 86° NE



Picture 7 Fault classification according to Rickard (1972) classed Cikaso fault as Reverse Slip Fault based on degree of pitch of net slip and dip of slip.



Picture 8 Cikaso Thrust Fault (red line) and Cigayam Sinistral Slip Fault (yellow line) controlled morphology and rock distribution.

Rock Distribution

Geological mapping needed to collect rock data distribution. From the results, it was found that lithology in research area was related to the existence of the structure.

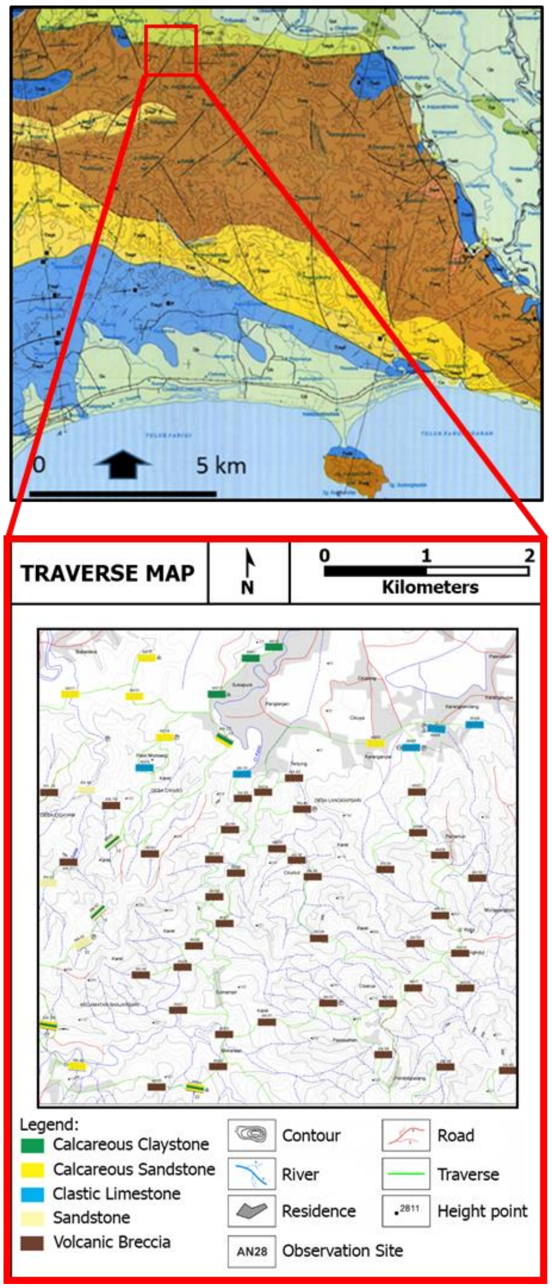
The southern part is dominated by pyroclastic rocks which is volcanic breccia and epiclastic rocks which is non-carbonate tuffaceous sandstones. In the central part, clastic limestones were found which occupy regional boundaries with high landforms and low landforms. Whereas in the northern part, it was dominated by sedimentary rocks which is carbonate sandstones and carbonate claystones. So, the lithology in research area divided into 5 units as below:

1. Volcanic Breccia (Tombv)

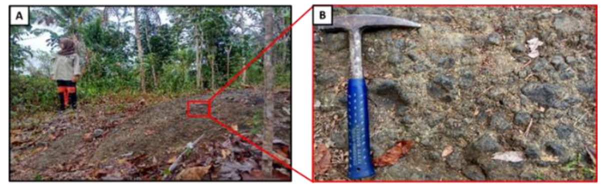
Include Cigayam Village, Cikaso Village, Cikaso River, Cisalak River, Sukamampir Village,

E-ISSN : 2579 – 3136

Mekarsari Village, Pasawahan Village, Langkapsari Village, Panamun Village, and Kidul Hill



Picture 9 Traverse Map

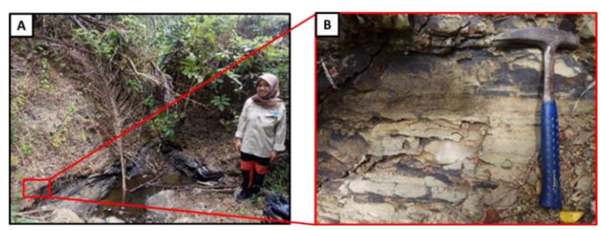


Picture 10 Outcrop View (A) and close up view (B) of Volcanic Breccia.

Volcanic breccia with grayish brown color, fine grain, well sorted, sub rounded – sub angular. Components is andesitic, with light gray color, porphyritic, contain quartz minerals, plagioclase, amphibol. And in some places limestone components are found. This unit is Late Oligocene – Early Miocene compared to the Jampang (Tomj) Formation according to Simanjuntak and Surono (1992).

2. Sandstone (Tombp)

Intercalated sandstone claystone with light grey color, fine grain, medium-well sorted, sub rounded, parallel lamiation, consist of quartz and plagioclase mineral.

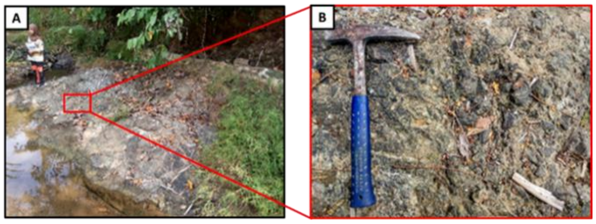


Picture 11 Outcrop View (A) and Close Up View (B) of Sandstone.

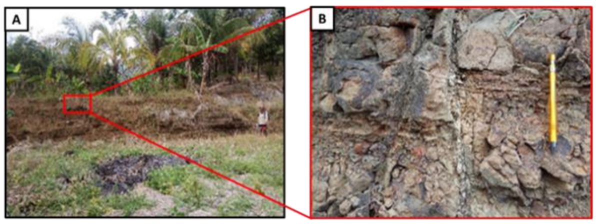
Volcanic breccia with brownish grey color, grain supported, size of fragment is gravel - pebble, igneous rock fragments and limestones, tuff matrix. Andesite rocks are grey color, mesocratic, porphyritic, hypocrystalline, inequigranular, vesicular structure, containing quartz minerals, plagioclase, biotite, feldspar.

E-ISSN : 2579 – 3136

Matrix with light brown color, coarse grain, subangular-subrounded, well sorted.



Picture 12 Outcrop view (A) and Close Up View (B) of Volcanic Breccia.

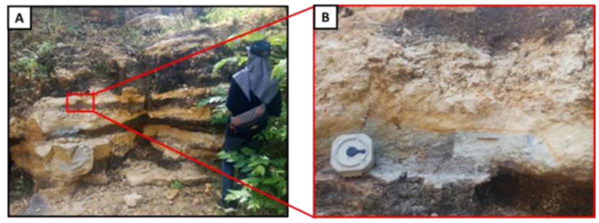


Picture 13 Outcrop View (A) and Close Up View (B) of Intercalated sandstone claystone.

Sandstone with brownish yellow color, fine grains, subrounded, well sorted, spheroidal weathering. Claystone with grayish brown color and non carbonate. This unit is Late Oligocene – Early Miocene compared to Jampang Formation (Tomj) according to Simanjuntak and Surono (1992).

3. Clastic Limestone (Tmbg)

Spread in the middle research area. Include Karanganyar Village, Karangkendang Village and Pasir Muncang Village. With brownish white color, calcilutite-calcarenite grain size, fossil fragments and calcite minerals, rounded grain shape, well sorted. This unit is Late Miocene based on the results of regional comparability, compared to Kalipucang Formation according to Simanjuntak and Surono (1992).



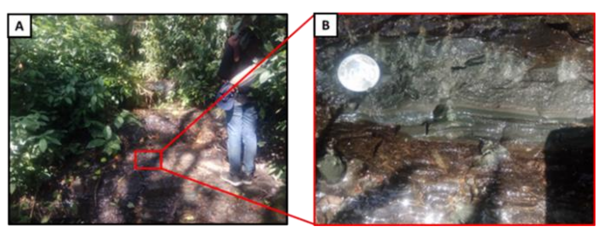
Picture 14 Outcrop View (A) and Close Up View (B) of Clastic Limestone.

4. Calcareous Sandstone (Tmbp)

Spread in the northwest - north and southwest in research area. Include Sukada Village, Karanganyar Village, Ciakar Village, and Cikaso River. This unit consists intercalated sandstone claystone, sandstone, and sandstone with interbedded claystone.

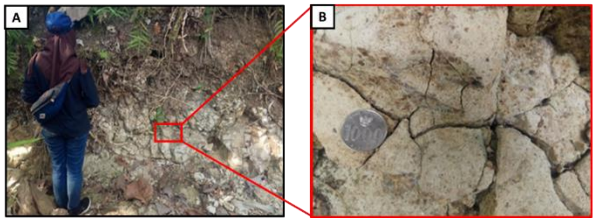
Sandstone with interbedded claystone with greyish brown color, medium – fine grain, rounded - subrounded, well sorted, carbonate, parallel lamination structure. Claystone with light grey color, carbonated.

Sandstone with light brown color, coarse-fine grain, subrounded-subangular, carbonated. Massive structure contain glass and volcanic mineral.



Picture 15 Outcrop View (A) and Close Up View (B) of batupasir sisipan batulempung.

E-ISSN : 2579 – 3136



Picture 16 Outcrop View (A) and Close Up View (B) of Carbonate Sandstone.

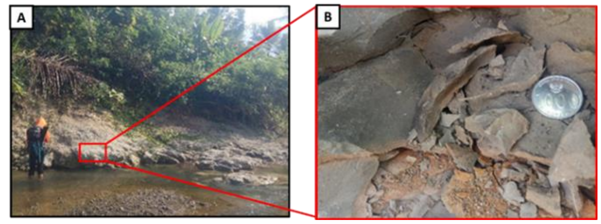
Picture 17 Outcrop View (A) and Close Up View (B) of Intercalated Sandstone Claystone.

Intercalated sandstone claystone with brown light color of sandstone, medium fine grain, subrounded – subangular, well sorted, paralel lamination. Claystone with light grey color, carbonated.

This unit is Late Miocene based on the results of regional comparability, compare to Halang Formation according to Simanjuntak and Surono (1992).

5. Calcareous Claystone (Tmbl)

Spread in north – northeast research area. Include Sukapura Village, Karangkedang Village, and Cikaso River. Claystone with light grey color, clay grain size, massive structure, carbonated.



Picture 18 Outcrop View (A) and Close Up View (B) of Carbonate Claystone.

This unit is Late Miocene based on the results of regional comparability, compare to Halang Formation according to Simanjuntak and Surono (1992).

The Geological Map of the research area

By analyzing geomorphological data, geological structure, and lithology distribution, it concluded that presence of fault affects the distribution of lithology in research area.

Research area is a thrust fault block with the northern part as footwall and the southern part as hangingwall. This proves in southern area, the outcrop aged Oligocene and in northern area the outcrop relatively younger, aged Late Miocene. Beside that, along at Cikaso River, both river wall and river floor, there are volcanic breccia.

So the river just filled with older rock aged Oligocene. And the limestone at the boundary between high and low landforms, shows it formed after a fault and it submerged by sea water. So, the sediment supply with a younger age, Miocene, will be in the northern part, which is a lower part (footwall).

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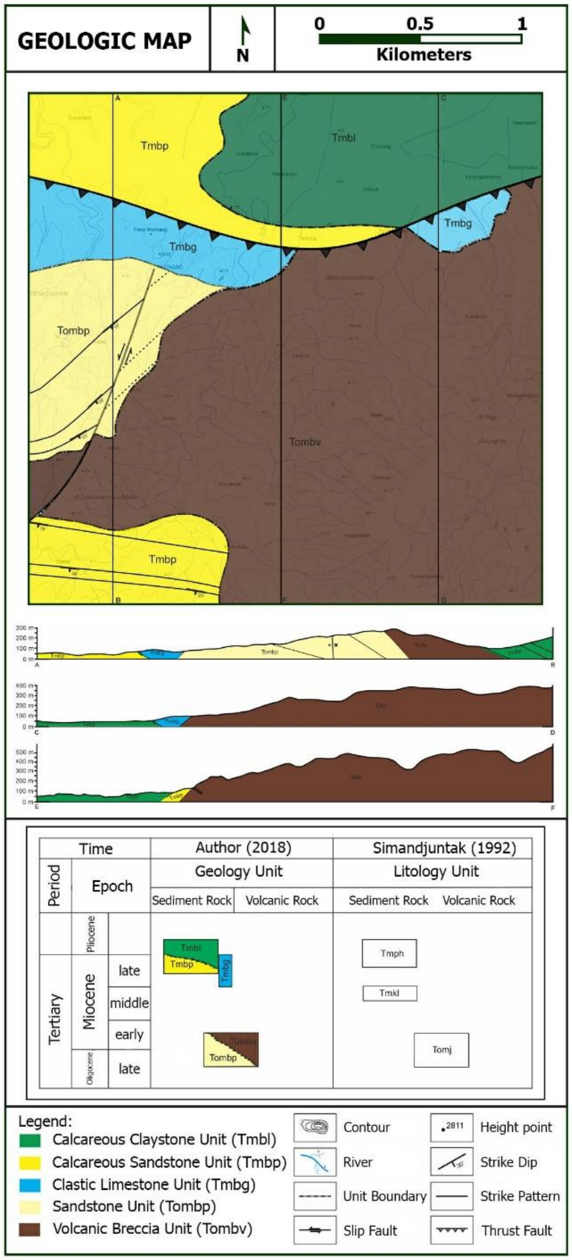

Picture 19 The Geological Map of the research area

Conclusion

According to result of study can be concluded that:

1. Geomorphology of research area are distunguished become four units, that are structural hills of steep slope unit, structural hills of rather steep slope unit, structural plain of sloping slope unit, and structural plain of very sloping slope unit.
2. There are two geology structure in research area, are Cikaso Thrust Fault and Cigayam Sinistral Shear Fault.
3. Based on lithostratigrapgic aspect, research area distinguished become five rocks units, from old to young are Volcanic Breccia unit, Sandstone unit, Clastic Limestone unit, Calcareous Sandstone unit, and Calcareous Claystone unit.
4. From the results of geomorphology analysis, it concluded that significant height differences are indicative of presence faults in the form of Cikaso Reverse Slip Fault and Cigayam Shear Fault. This is proves by discovery of slicken side, anomaly of ridge lineament, and lithology strike dip pattern.
5. Research area divided into two part, they are footwall in the north and hangingwall in the south.
6. The faults affected the distribution of lithology, where oligocene-aged volcanic breccias are found in the form of high land, and late miocene-aged sandstones and claystones are found in lower landforms, and limestone at the boundary between high and low landforms, prove it grows after a fault with sea water submerged conditions. So, sediment supply with a younger age will be found in the northern part.

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