E-ISSN 2541-2116
ISSN 2443-2083

Jurnal Geomine, Volume 9, Nomor 2: Agustus 2021, Hal. 88 - 94

Relationship Of Tectonic Activity To The Geomorphic Evolution In Banjarnegara Regency Central Java, Indonesia

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ABSTRACT

The plate tectonics hypothesis provides new insight into interpretation of the geomorphic history of the Banjarnegara Regency Central Java, Indonesia. The competition is most evident in tectonically active regions, where tectonic forces are responsible for uplift and the creation of relief. The purpose of the preliminary exploration activities is to identify the general geological conditions of the Concession Area. The scope of work in the field is the detailed activity of geological mapping of the track conditions include geomorphology, lithology, sample check for lithology outcrop, and recorded photograph. Morphology on research area was classified into undulating hill step and undulating hills. Based on regional geology, research area include on complex tectonic and geological structure. Thus complexity processes are formed lithology deformation known as Melange complex and majority force from regional mentioned direction from Northwest to Southeast.

Keyword: *Banjarnegara, Geomorphic, Tectonic, undulating hill step, undulating hill*

SARI

Hipotesa lempeng tektonik memberikan wawasan baru tentang interpretasi sejarah geomorfik Kabupaten Banjarnegara, Jawa Tengah, Indonesia. Peristiwa tersebut terjadi di daerah aktif tektonik, di mana proses tektonik mengakibatkan adanya pengangkatan dan pembentukan relief. Tujuan dari kegiatan eksplorasi pendahuluan adalah untuk mengidentifikasi kondisi geologi umum Wilayah Konsesi. Ruang lingkup di lapangan adalah kegiatan pemetaan detail kondisi lintasan geologi meliputi geomorfologi, litologi, pengecekan sampel singkapan litologi, dan rekaman foto. Morfologi pada daerah penelitian dikelompokkan menjadi *undulating hill step* dan *undulating hills*. Berdasarkan geologi regional, wilayah penelitian termasuk pada struktur tektonik dan geologi yang kompleks. Dengan demikian, proses terbentuk akibat dari deformasi litologi seperti kompleks Melange dan struktur regional mayoritas dari arah Barat Laut ke Tenggara.

Kata kunci: Banjarnegara, Geomorfik, Tektonik, *undulating hill step, undulating hills.*

How to Cite: Jamaluddin, Battu, D.P., Waskita, J.K., 2021. Relationship Of Tectonic Activity To The Geomorphic Evolution In Banjarnegara Regency Central Java, Indonesia. Jurnal Geomine, 9 (2): 88-94.

Published By:
Fakultas Teknologi Industri
Universitas Muslim Indonesia
Address:
Jl. Urip Sumoharjo Km. 05
Makassar, Sulawesi Selatan
Email:
geomine@umi.ac.id

Article History:
Submite 02 Juli 2021
Received in from 05 Juli 2021
Accepted 30 Agustus 2021

E-ISSN 2541-2116
ISSN 2443-2083

INTRODUCTION

The area of Karangsambung, Kebumen regency, Central Java (Figure 1) is one of the foundation sites of mixed rocks, the Melange Lok ulo complex which is in late chalk to Paleocene (Asikin, 1974, Wakita et al., 1994 in Harsolumakso and Noeradi, 1996). This unit is the result of a Subduction process between the Indo-Australian plate and the Southeast Asian continental plate (Asikin, 1974 in Harsolumakso and Noeradi, 1996). Then on it is deposited a younger unit composed of clay with a foreign fragment mixed in it which is considered as olissostrom (Asikin 1974; Asikin et al., 1992 in Harsolumakso and Noeradi, 1996). Then on it is precipitated breccia from Waturanda Formation and Sandstone Pumice - Claystone from Panasogan Formation (Asikin 1974 in Hadiyansyah, 2005).

Tectonically due to Subduction activity in the Cretaceous those rocks were intermixed with flysch sediments led to produce Luk-Ulo Complex and sheared Serpentine. During Eocene-Oligocene reef limestone was deposited (Bransden and Matthews, 1992). Late Oligocene to Early Miocene tectonics led to produce olissostrom deposit whereas in Early Miocene Waturanda turbidite was deposited. Middle Miocene is characterized by transgression and Penosogan Formation was deposited in the southern quadrangle is concomitant with the Rambatan deposition the Northern part. Diorite intrusion taking place in the Middle Miocene was continued by the Late Miocene-Early Pliocene tectonics, sedimentation and volcanism (Jefferson et al.,2013). These activities produced the Pemiron, Tapak, Halang, Kumbang and Kalibiuk Formations. In the late Pliocene-Early Pleistocene the area was uplifted folded, and faulted (Harsolumakso, 2004; Prasetyadi, et al., 2006a,2006b). Within the tectonic event, the Damar and Liguang Formation were deposited in the transitional-terrestrial environment. Volcanism in the Late Pleistocene caused the deposition of Jembangan Volcanic, then continued by the deposition of the younger rock (Condon et al., 1996).

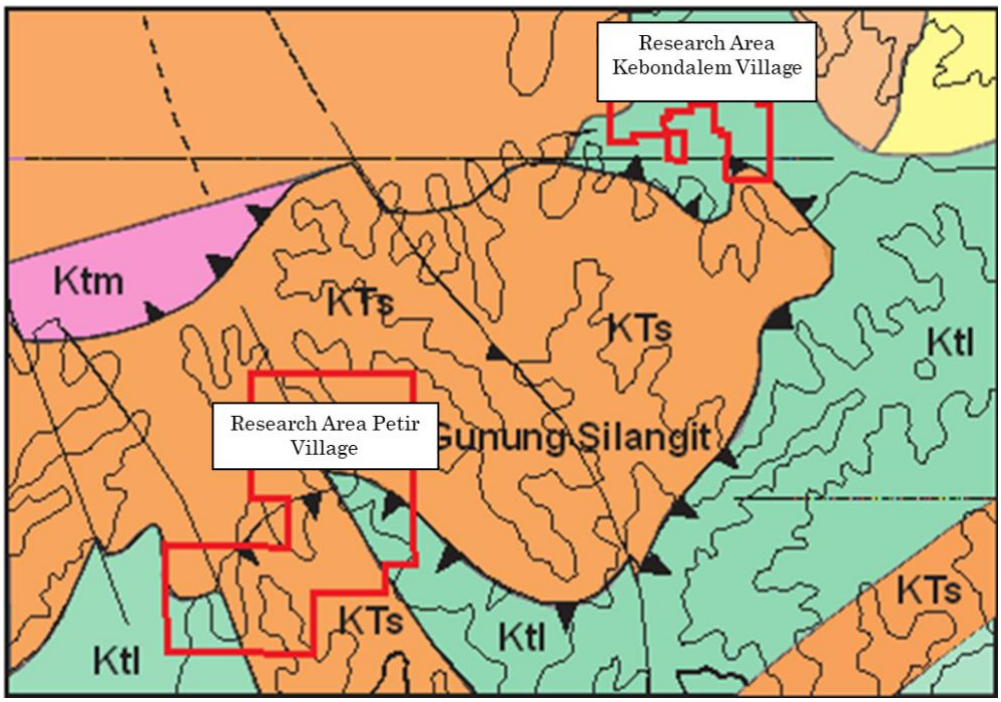

Figure 1. Regional Geology map of Research Area Banjarnegara and Pekalongan scale of 1: 100.000, (Condon et al., 1996).

E-ISSN 2541-2116
ISSN 2443-2083

The purpose of the preliminary exploration activities is to identify the general geological conditions of the research area include geomorphology. Meanwhile, the results of this study would be helpful in better understanding relationship of tectonic activity to the geomorphic evolution through space and time.

METHODS

Tectonic geomorphology depends on identifying features of surface morphology that are characteristic of an active landscape. These features are usually studied by tectonic geomorphologists. Geological information was also compiled to decipher the effect of lithological contrasts on shapes of channel longitudinal profiles. Consequently, major lithological and tectonic knickpoints are mapped and differentiated. In addition, we carried out field surveys to verify the results of our geomorphological analysis.

RESULT AND DISCUSSION

Generally, research area at Petir village has morphology is affected by complexity tectonic and structure thus known by lithology formed. Morphology that found was undulating hills steep morphology with characterized 21-55% slope of contour difference and found on all research area (Figure 2).

Figure 2. Morphology hills steep Southern area Kali Pundung Sewu.

This morphology lies at western part of research area. It occupies around 14.68 ha (37.81%) north side of Kalipelusan. It has slope range between 14-20% and mostly used as corn field and particularly area found as mining area (Figure 3). According to the regional geology, research area formed by tectonic and structure lithology where boundary lithology was really affected by those geological process (Raharjo and Saifudin, 2008). Endogenic process to create morphology was contained with tectonic process that happened with two periodic time different. By geomorphology type known if this area include on unstable area and relative accessible to have landslide and lithology movement (Figure 4).

E-ISSN 2541-2116
ISSN 2443-2083

Figure 3. River cross section basement metamorphic series.

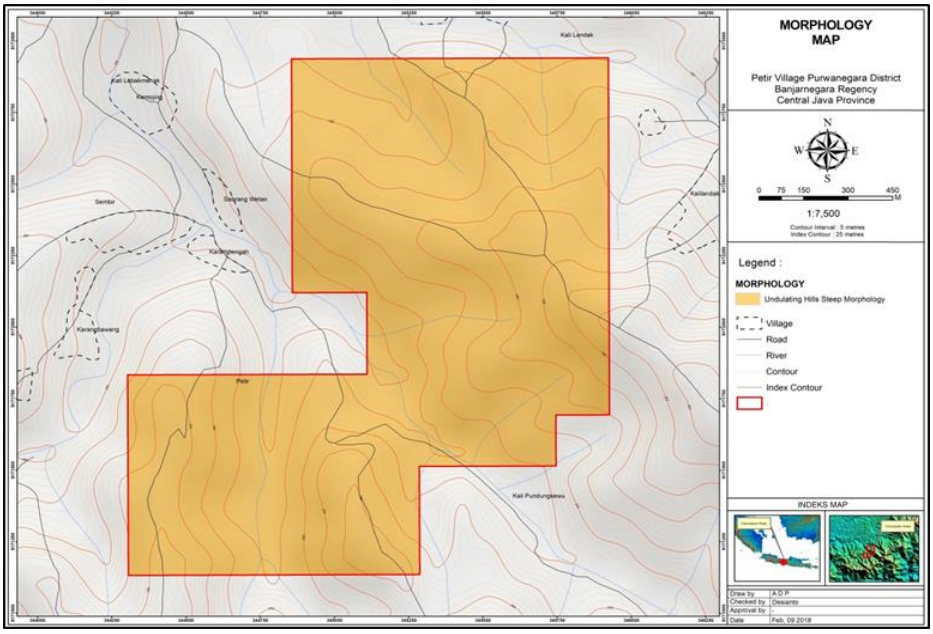

Figure 4. Morphology classification research area Petir village.

Research area located at Kebondalem village has morphology slightly low topography compare with research area Petir Village. Topography level used to classified morphology on this research area. This morphology lies at western part of research area. It occupies around 14.68 ha (37.81%) north side of Kalipelusan (Raharjo, 2017). It has slope range between 14-20% and mostly used as corn field and particularly area found as mining area (Figure 5). Occupied about 24.14 ha (62.18%) of the total area, mostly found at eastern side on research area and characterized by 21-55% of slope topography (Figure 6). This morphology was used as cassava, corn field, villages some were used for Pete plantation. It lies from central to east of research area. On this morphology also found open mining activity (Figure 7).

E-ISSN 2541-2116
ISSN 2443-2083

Figure 5. Undulating hills morphology.

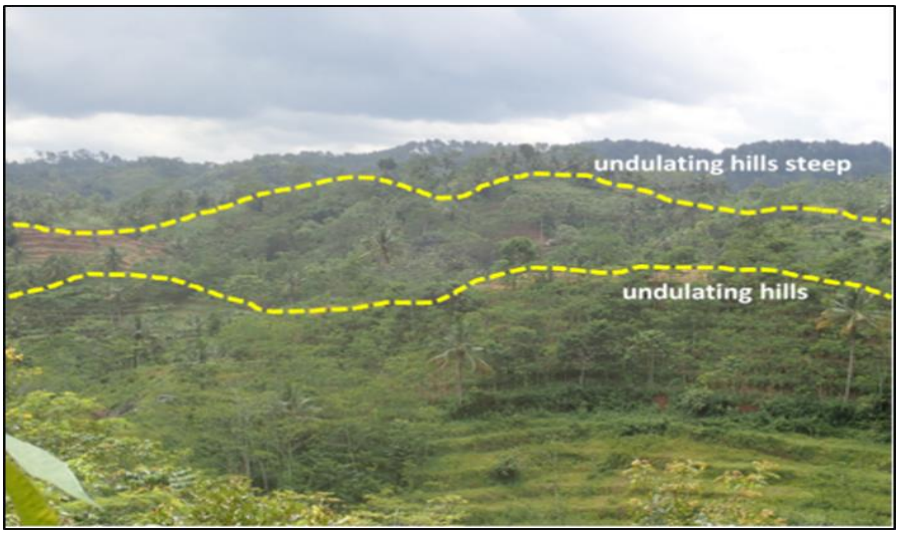

Figure 6. Undulating hills steep morphology.

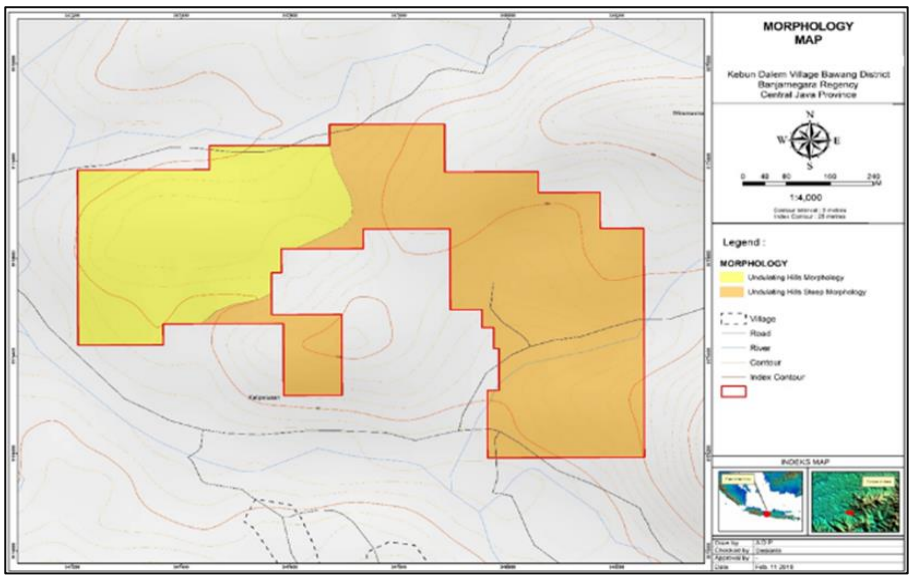

Figure 7. Morphology map classification research area Kebondalem village.

E-ISSN 2541-2116
ISSN 2443-2083

Based on regional geology, research area include on complex tectonic and geological structure. Thus complexity processes are formed lithology deformation, mixed with material source created particular lithology known as Melange Complex (Parkinson et. al, 1988). Majority force from regional mentioned direction from Northwest to Southeast. Thus major force created geological structure formed that known on this research area. Morphology and contour interpretation together with lithology deformation are recognized as geological structure result. Due to majority direction of geological force with Northwest to Southeast direction created thrust fault and slip fault together which consist of majority of lithology boundary on this research area.

CONCLUSIONS

Constituent rock on concession area has effected by strong tectonically and geological structure. Those lithology are effected each other by geological relation mostly controlled by tectonic and structure. Morphology on research area Petir village was classified into undulating hill step. Lithology unit consist of Basalt, Phyllite, Schist unit. Geological structure that growth on this area are folding, and thrust fault. Thickness of Schist average 4-8 m, and occupies about 134.01 ha or 67.68 of total research Area. Morphology on research area Kebondalem was classified into undulating hill step and undulating hills. Lithology unit was found as Schist for general and geological structure that growth on this area are thrust fault. Thickness of schist average 2-4 m and occupies for all research area. However this research area already has open mine activity for about 3.60 ha out of 38.22 of total research area.

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E-ISSN 2541-2116
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