

# Lithofacies And Depositional Analysis Environment of West Section Kolok Nan Tuo, Sawahlunto, West of Sumatera

Catur Cahyaningsih<sup>1</sup>, Anjas Latif Ritonga<sup>1</sup>, Shaury Aldila<sup>1</sup>, Zulhikmah<sup>1</sup>

<sup>1</sup>Department of Geological Engineering, Universitas Islam Riau, Pekanbaru-Riau, 28284, Indonesia

\* Corresponding author : caturcahyaningsih@eng.uir.ac.id

Tel.:+81-72-867-1686

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## Abstract

Study areas were located to the west of Kolok Nan Tuo Village. Geographically this area is located at coordinates 00° 36' 57,85" - 00° 37' 56,89" latitude and 100°42' 10,08 " 100°43' 47,28" longitude. The methods used in research is geological mapping. Based on the results of stratigraphic research area is divided into three units: Crystalline Limestone Unit (SBGK) consisting Crystalline Limestone of and mudstone lithofacies, Conglomerate Units (SK) consists of polymic conglomerate and sandstones greywacke lithofacies while claystone Unit (SBL) lithofacies consists of claystone with sedimentary flake structures. Result of research suggested that depositional environment based on type of lithofacies include of grain size, sedimentary structures and content of fossils. SBGK interpreted as basement of basin, SK depositional environment was debris unit limestones, which can be seen from fragments of conglomerates that consist of crystalline limestones and mudstone that deposited in alluvial fan (deposition surface). Clay lithologies where mudstone generally deposited in current flow that form flake structures and calcareous, that interpreted deposited in neritic environment.

**Keywords:** Ombilin basin, geological mapping, lithofacies, Kolok Nan Tuo

## 1. Introduction

The Geological process is a process associated with the formation of the earth regarding both tectonic and regarding its constituent rocks. While the field study conducted by researchers intend to map the distribution of rocks in the West Section of Kolok Nan Tuo (Fig. 1), which will be grouped based on the lithology of their respective characteristics and the depositional environment is also different. So that the results of these studies will produce a geological map.

## 2. Basic Theory

Many experts define different facies. However, they generally agree that the facies is characteristic of sedimentary rock units. According to Selley (Walker, 1985 and James 1992) facies sediments is a body of rock that can be identified and differentiated from other rock units by geometry, lithology, sedimentary structures, fossils, and the pattern of their ancient stream. Armed with the physical, chemical, and biological environments can be reconstructed in the deposition of sedimentary rock sequences and are called facies analysis. While Lithofacies based on characteristics of the composition, physical, and chemical at a rock.

Geologically of study area, West Section of Kolok Nan Tuo belongs to the Ombilin Basin.

Ombilin basin is divided into several formations which are distinguished by lithofacies and the depositional environments (Koesomadinata and Matasak, 1981):

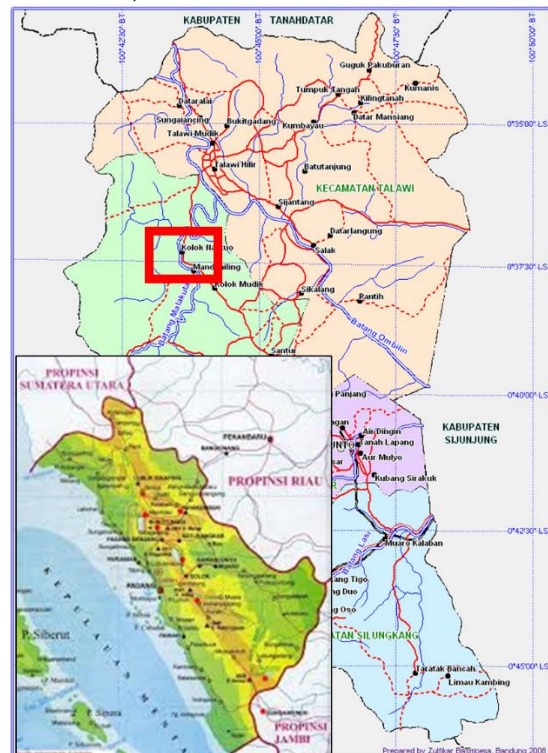


Fig. 1. Administrative map of study area

## 2.1. Pre-Tertiary rocks

The Pre-Tertiary rock is a rock the underlying basin Ombilin. These rocks are exposed at the western and eastern parts of basin. Pre-Tertiary rocks exposed in the western part of the basin consists of (Koesomadinata and Matasak, 1981):

- Silungkang Formation, composed of coral limestone lithology of volcanic rocks. Rock consists of andesitic volcanic lava, as well as the basaltic tuffs. Age formations are the Pleistocene-Carbon content of fossil Fussulinid in limestone.
- Tuhur Formation, consisting of lithology slate, Shale Members and Limestone Members. This formation was Triassic Age.

## 2.2. Tertiary rock

### 2.2.1 Brani Formation

Brani Formation consists of conglomerates with fresh color is purplish brown, grain size is gravel, with a wide variety of fragments such as andesite, limestone, slate, argillite, granite, quartzite, arkose with coarse-grained, massive and generally not plated. This age formation is based on relationship with Sangkarewang Formation which allegedly Paleocene to Eocene. The formation was deposited as a precipitate Brani estimated alluvial fan (Koesomadinata and Matasak, 1981).

### 2.2.2 Sangkarewang Formation

According to Koesomadinata and Matasak (1981), consists of shale formations Sangkarewang layered thin dark gray-brown to black, plastic, containing calcareous carbon material, mica, pyrite, and the rest of the plant. These formations have inserts in the form of layers of sandstone with thick are generally less than 1 m, there are fragments of quartz and feldspar, calcareous gray to black, clay matrix disaggregated mica and carbon-containing material and the presence of slump structures. Inset These sandstones show a pattern fining upwards. Based on pollen analysis estimated age of this formation or pre-Eocene Eocene. Formation Sangkarewang estimated deposited at lake environment.

### 2.2.3 Sawahlunto Formation

According to Koesomadinata and Matasak (1981), this formation consists of shale sequences gray-brown, silty shale and siltstone with quartz sandstone inserts gray-brownish and characterized by the presence of coal. Generally carbonaceous shale. Sandstone has a characteristic sequence of fining upwards, has a layered sedimentary structures cross- maze, ripple lamination and firm base erosion that shows a sequence of point bar. Coal interspersed with the generally gray siltstone and carbonaceous clays. This Sawahlunto Formation Eocene based on the analysis of pollen shows Paleocene to Eocene age. The presence of carbonaceous shale, coal, particularly sandstone-type point bar shows the depositional environment

of formation. This is a floodplain with a winding river where coal is deposited.

## 3. Methodology

The research method used is the analysis of maps and field studies (mapping). Map analysis is used to determine the state of the landscape and slope (Putra and Choanji, 2016; Suryadi, 2016) as supporting activities to facilitate field research activities.

The field research aimed at obtaining more field data according to research materials to be analyzed. At this stage, do some work done, including determining the location of the observations and the observations of outcrops.

At every outcrop, observations do plotting observation station location on the map and delineate the megascopic framework outcrop. Outcrop observations include:

- Measurement outcrop dimensions, Fig.graphs, and sketches.
- Description lithology, *strike-dip*, coating thickness, and sedimentary structures.
- Sampling.

After the field data obtained is then performed the data analysis stage so characteristic lithological types and lithologies in the study area can be determined.

## 4. Result

Based on field data, the rocks in the study area can be classified into three rock units:

- Limestone Crystalline Unit
- Conglomerate Unit
- Claystone Unit

Lithologies as each have a different lithofacies, crystalline limestones facies units composed of limestone *crystalline* and *mudstone*, conglomerate unit consists of a conglomerate facies and facies greywacke sandstone and mudstone facies units consist of claystone facies which sometimes contained in the form of thin layered sandstones.

## 5. Discussion

Based on the results of the analysis of field data, lithologies in the area of research can be grouped into three lithologies.

### 5.1 Crystalline Limestones Unit

Unit crystalline limestones located in the Eastern part of the study area. Crystalline limestones unit is composed of crystalline limestone and limestone. *Mudstone* referring to the regional geology, rock units is comparable to the old Silungkang Formation Permian-Carbon era. Crystalline limestones unit is marked in blue on a geological map of the study area. Lithology on this unit are:

### 5.1.1 Crystalline Limestone Facies

Crystalline Limestones facies are dominant in the Eastern part of the study area. Description detailed crystalline limestones have weathered gray color and a fresh color white whitish-grey. With component binder matrix deposition and grains have crystallized so that no fossils of both types of macro and micro. (Fig. 1)



Fig. 1. Crystalline limestones with directions N65°E

### 5.1.2 Limestone Mudstone Facies

Limestone mudstone facies are dominant in the Southeast area of research. Description limestone mudstone a detailed have weathered blue-white color and a fresh color bluish grey because it is a carbonate rock. According to the classification of this rock called Dunham, mudstone because it has granules of less than 10% and this rock was not found fossilized. The texture of this rock is non-crystalline, amorphous because the constituent mineral crystal and type of compactness is quite loud. (Fig. 2).

### 5.2. Greywacke Sandstone Facies

Facies lithic sandstones greywacke dominant is in the Southern part of the study area. In the flow of the river, Malakutan discovered sedimentary layering structure.

Description sandstones greywacke lithic in detail which has a color weathered gray dark and fresh colors gray, grain size medium kind of Well rounded, medium sorted, permeability moderate, compactness bit loud, for component grains were observed in macroscopic using loops consist of 40%

quartz, 30% feldspar and debris 30%. Matrix percentage is more than 15%. (Fig.. 4)



Fig. 2. Limestone mudstone with directions N84°E - N264°E



Fig. 3. Conglomerates with fragments of limestone *crystalline* and limestone mudstone with direction N246°E



Fig. 4. Greywacke lithic sandstones with Fig. directions N125°E

For classifying the sandstone use classification of Pettijohn, 1986. (Fig. 5). Facies sediment may have formed tectonically unstable when appointed by poorly sorted, and sedimentary structures indicate that the slow lorises rock units are the result of the Silungkang Formation debris deposited on the environment precipitation inland. (Fig 6).

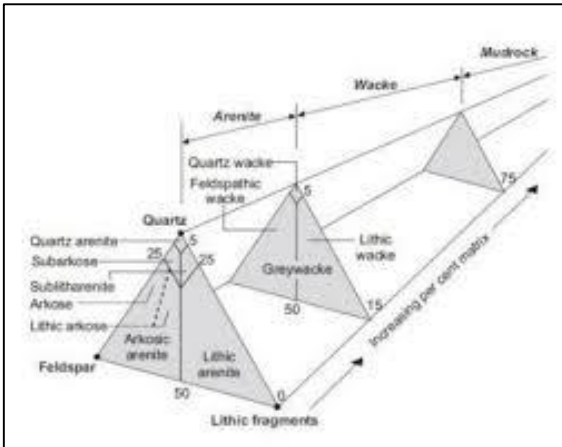


Fig. 5. Triangular sandstone classification (Pettijohn, 1975)

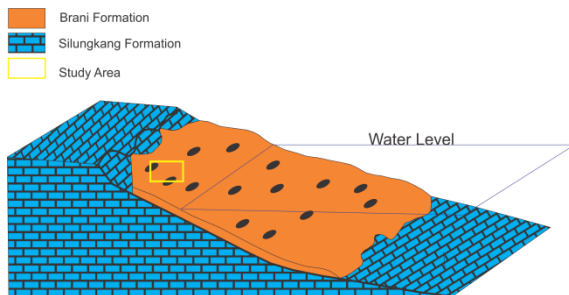


Fig. 6. An illustration of formation of conglomerate rock units as a result of debris and forming alluvial fan.

### 5.3 Claystone

Unit claystone is in the Central part of the study area that spreads from North to South. These

lithologies of claystone and sometimes there is a fine sandstone insert. Members of this unit included into the Lower Formation Ombilin old when Late Oligocene-Early Miocene. This unit is marked in green on a geological map of the study area. The lithofacies on this unit are:

#### 5.3.1 Mudstone Facies

Clay facies predominantly located in the southern part of the study area. Description claystone detailed flake has weathered grey color and a fresh color grey-brown, clay 1/256 mm grain size, very well rounded, closed containers, thin laminated sedimentary structures, low permeability, well sorted, indicating that environmental carbonate deposition on this rock is in the form of land environment, the type of soft compactness. (Fig. 7)



Fig. 7. Claystone unit with flakes structures with photo directions N 125° E - N 305°E

For facies sedimentary depositional environments is deposited in neritic environment which can be seen from flake structure of the sediment, indicating that the current relatively quiet and nature carbonate facies sediments showed that the sedimented on the marine environment. (Fig. 8).

### 6. Conclusion

In Kolok Nan Tuo area there are five lithofacies are: crystalline limestone, mudstone limestone, conglomerates, sandstones greywacke lithic, and claystone that can be grouped into three lithologies are limestone lithologies crystalline which is a basement in the basin the conglomerate unit formed on alluvial fan and it is resulted

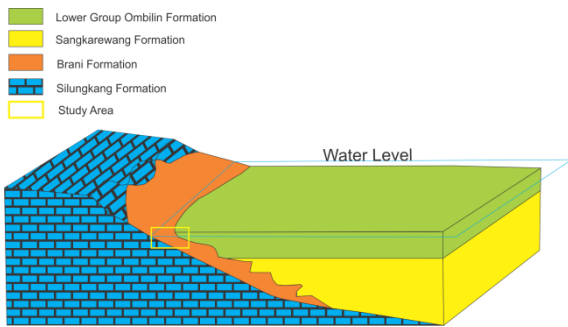


Fig. 8. An illustration of the state of environmental change precipitation to claystone unit

from debris unit of limestone crystalline which can be seen on the number of fragments of limestone crystalline and limestone mudstone in facies conglomerates which deposited on terrestrial environments (fluvial) as an alluvial fan. clay lithologies interpret deposited in neritic condition which can be seen from the content of which is the identifier sediment carbonate marine environment on clay facies. (Fig. 4.)

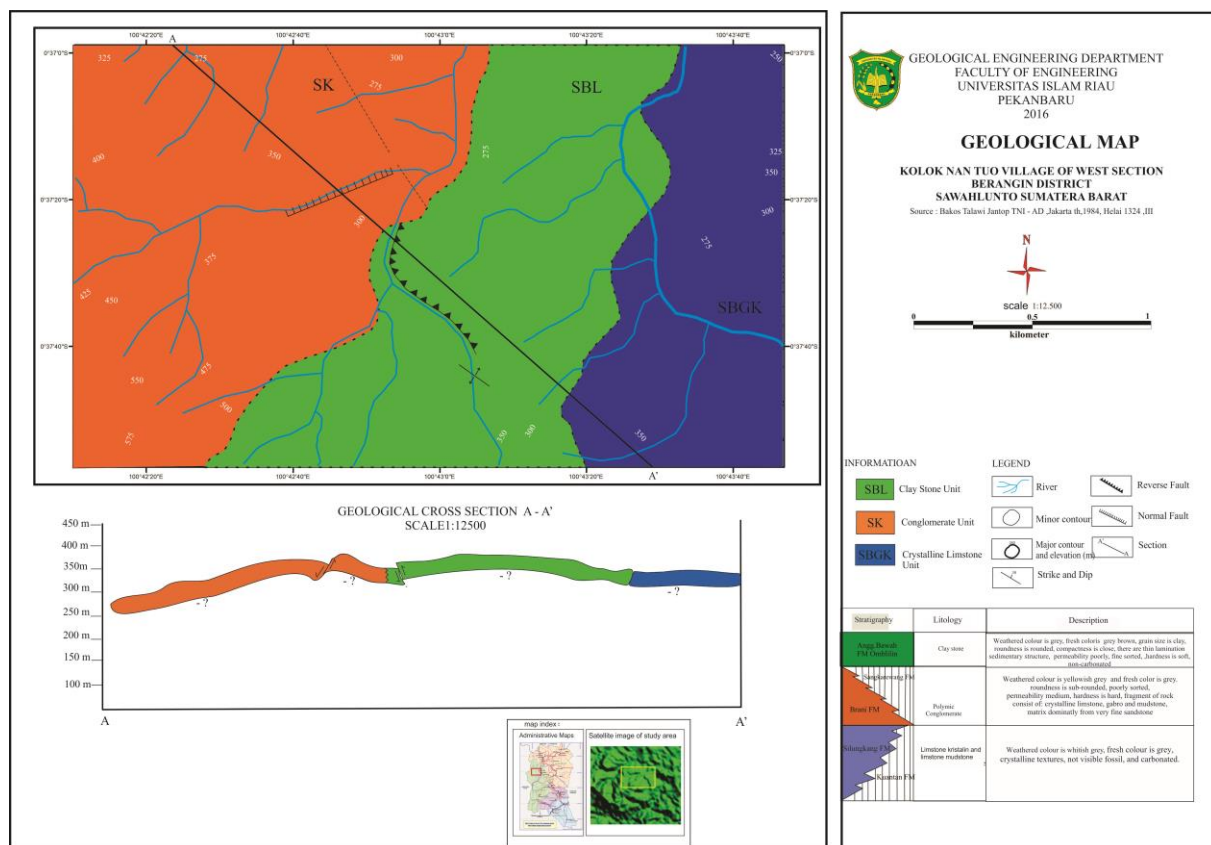


Fig. 9. Geological Map of the study area

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