# Sedimentology Of Coal Conglomerate Deposits Within Channel Facies In Samarinda Region, East Kalimantan

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## *Description*

Conglomerate beds with generally rounded to subrounded coal fragments are common within channel deposit facies in Samarinda Region (East Kalimantan, Indonesia, Figure1). These beds occur as interbeds with fluvial-deltaic Balikpapan Formation (Figure 2).

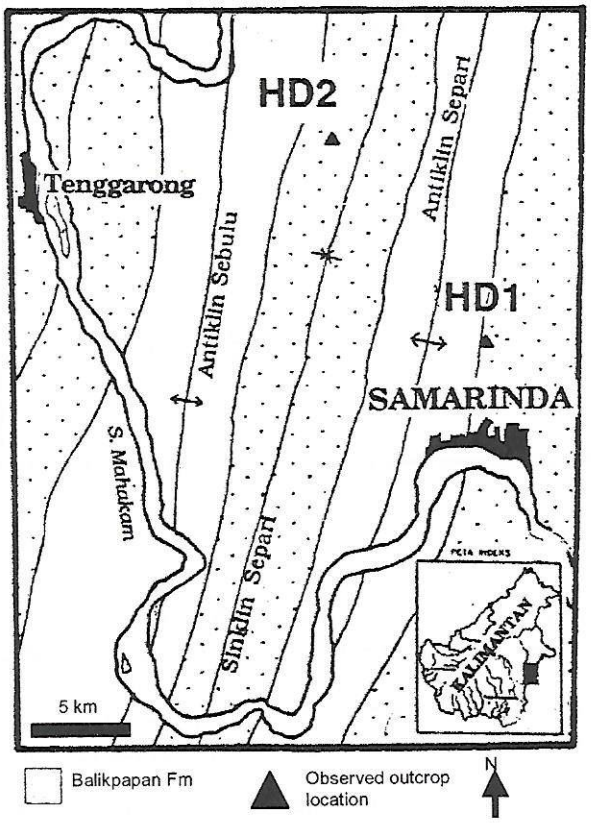



Figure 1: Simplified geological map showing the distribution of Balikpapan Formation and observed outcrop locations.

There are two possible sedimentation process of these coal fragments:

1. Transported wood cuts which deposited together with other sediment materials.
2. Reworked coal fragment originally from an older coal seam.

Coal conglomerate were observed in several location in Samarinda area and Figure 3 show typical section from two outcrops in the area. The coal conglomerate occur in 3 facies type and base on Miall (1978) they are classified as Gp, Sp and Gms lithofacies (Figure 4). The conglomerate facies are described as the following:

| Age | | Formation | Lithology | Thick. | Depositional System |
|---|---|---|---|---|---|
| Quart. | Pleistocene | Aluvial | Sand, Shale, Silt | | Fluvial and Lacustrine |
| Tertiary | Pliocene | Kampung Baru Fm | Sandstone Silt Coal | ± 900 m | Litoral Delta - Fluvial |
| | Middle - Late Miocene | Balikpapan Fm | Sandstone Silt Coal Limestone | ± 3000 m | Proximal Delta - Distal Delta |
| | Early Mio | Pulau Balang Fm | Shale Limestone Thin Sandstone | ± 2750 m | Inner Shelf |

Figure 2: Stratigraphy of Samarinda Area

1. Gp Lithofacies

Gp lithofacies is well observed in Hd1 location (Figure 4 & 5) This lithofacies is dominated by very coarse grain to granule size coal fragments. Plannar cross bedding is common in this unit. The coal fragments is range from 0.25 to 10 cm in diameter, generally rounded to sub-rounded. Imbrication structure is common, formed by the coal fragments. Wooden texture is very obvious in some large fragments and sometimes only occur in the surface of the fragments. The bedding is about 30-50 cm think and it is pinching and disappear laterally.

The matrix of this lithofacies is very limited in general, composed of smaller coal fragments, chert, quartz, metamorphic and volcanic rock fragments. The matrix mostly white to light gray in color and gradually change to brown to reddish brown surround the large coal fragments. The change of color probably due to oxidation process of the coal fragment. The size of the matrix range from medium to very coarse grained.

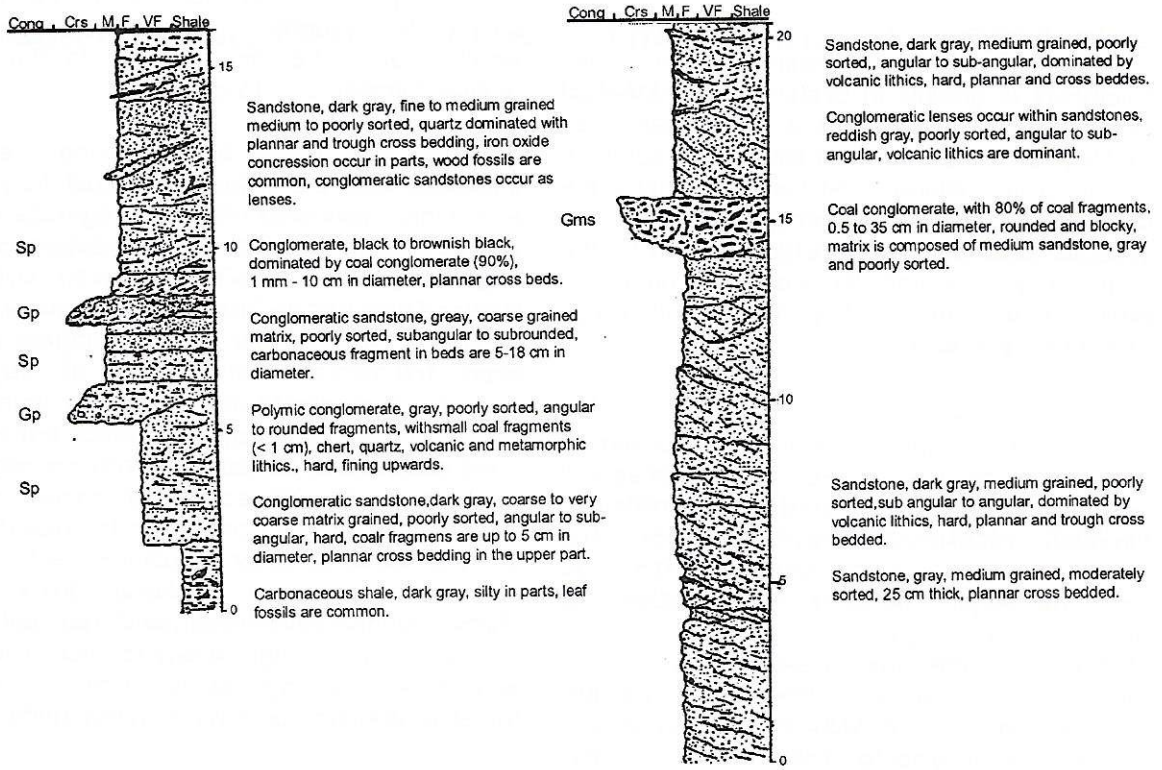



Figure 3: Sections of observation locations Hd1 and Hd2 in Samarinda, East Kalimantan

| Facies (Mial, 1978) | Sediment Structure | Lithology | Coal Fragment Max. Size | Dimension | | Inter pretation | Location |
|---|---|---|---|---|---|---|---|
| | | | | Thickness | Wide | | |
| Gp | Plannar Cross bedding | Conglo merate | 15 cm | 1.5 m | 30 m | Point bar | Hd1 |
| Sp | Plannar Cross bedding | Sandstone | 18 cm | 3-5 m | 30 m | Point bar | Hd1 |
| Gms | Chaotic | Conglo merate | 40 cm (blocky) 9 cm (rounded) | 1 m | 4 m | Proximal Channel | Hd2 |

Figure 4: Summary table of lithofacies with coal fragment description

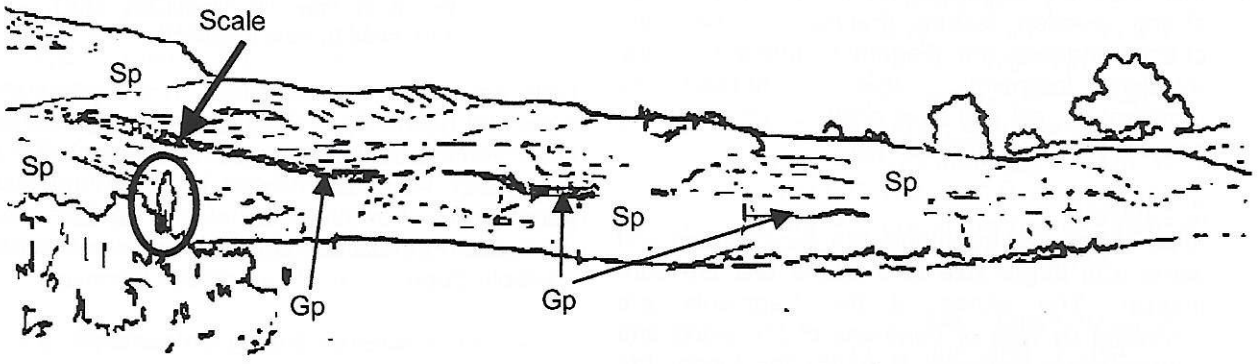



Figure 5: Outcrop Hd1 which dominated by Sp facies. Gp lithofacies is darker in color due to the coal fragments, occur as lenses within Sp lithofacies. Cross beddings are obvious within these two lithofacies.

2. Sp Lithofacies
Sandstone with very coarse grains with fragments of granule to pebble in size is typical of Sp lithofacies (Figure 4 & 5). Planar cross bedding and imbrication structure also common in this facies. Although relatively rare here, the coal conglomerate size can go up to 18 cm. Wooden texture is very obvious especially for the larger fragments and the color is change to brown in the inner part. The maximum thickness of this facies is 80 cm.

3. Gms Lithofacies
In Gms facies, the material is composed of granule to pebble (Figure 4). No observed sedimentary structure in general but imbricated structure occasionally occur in parts. The fragments are very chaotic range from 0.5 to 30 cm. The larger fragments still preserved its original wooden shape.
Medium to coarse grained sandstones occur in this facies as matrix, composed of volcanic materials in general with some quartz and smaller coal fragments. The thickness of this facies can easily reach 1 m thick.

## Coal fragment description

Coal fragments occur in the outcrops in different size and shape as shown in figure 9 and below are the description.
1. Texture
Wooden texture are very common on the surface of the coal fragments and sometimes in their inner part as well. This texture clearly indicate that they are originally wooden cuts which deposited in the channel. Many of those have choncoidal and blocky fracture as well, which are common in coal seams.

2. Color
The coal fragments of the conglomerate are mainly black. The larger fragments they are gradually change to brown towards the core and this kind of fragments have generally have strong wooden texture (Figure 9). The color change indicate the diagenetic process of the wooden fragments, which controlled by temperature, pH and local chemical environment, also the wood composition itself.

3. Structure
Most of the coal fragments are sub-rounded and some with larger size in a debris unit are sub-angular. The shape of the fragments are controlled by type or hardness of the wood and transportation distance. Naturally the longer the transportation distance and the softer the wood type will give the more damage on the original shape. The rounded fragments are generally small in size (3-6 cm) compare to the more angular fragments (8-15 cm).

A study was made by comparing the bed thickness with the diameter of coal fragments and other fragments (process eg. chert and quartz) to understand the sedimentation process (Figure 6). Generally the fragment size will increase with bed thickness. As the coal or wood fragments have smaller density compare to the chert fragments, the increase of fragment diameter compare to bed thickness is higher. There are also coal fragments which are off the trend curve which indicate that they are originally came from different source or came through different mechanism compare to the rest (Figure 6). Anomalous diameter of coal fragments clearly indicated they were originated from wood chunks. On the other hand, small fragments (< 1 cm) is hard to distinguish due to unclear texture and shape. The origin of the smaller fragments therefore is inconclusive base on this study.

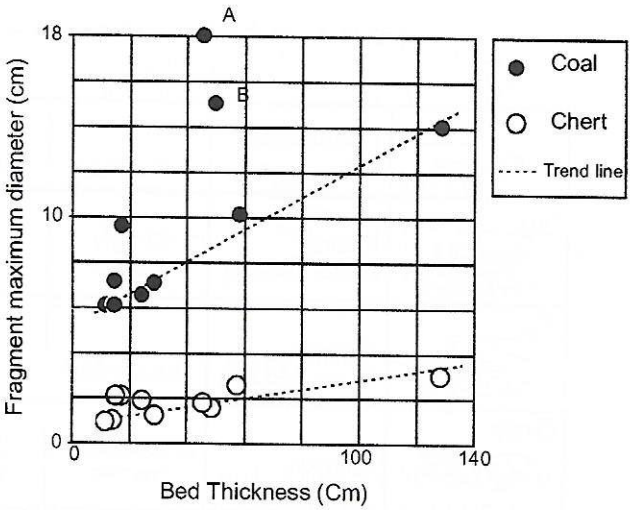



Figure 6: Maximum grain size versus bed thickness plot to compare the coal and chert fragments distribution in Hd1 location. For the same bed the maximum coal fragment size is always larger than the maximum chert fragment. Fragment A is from Sp facies and probably indicate closer source and B is from Gp lithofacies which is dominated by coal fragments..

Coal fragments characteristics in conglomerate beds and typical Gp and Sp facies characteristics show that the coal fragments were deposited in a point bar influenced by a flooding process (Figure 6); however the Gms facies was deposited in proximal channels with a steeper unstable slope.