

A NOTE TO THE LIGNITE OCCURRENCE IN LUKUNDOL, KATHMANDU

R. M. TULADHAR

Department of mines & Geology, Lainchaur, Kathmandu, Nepal.

सारांश

काठमाडौं उपत्यकाको सरोवरिय श्रेयोमा (Lacustrine sediments) निम्न स्तरको लिगनाईट (एक किसिमको कोईला) प्रसस्त पाईन्छ । यस्तो लिगनाईट पाईने ठाउँहरू मध्ये लुकुन्डोल एउटा नमूना स्थल मानिन्छ । प्रस्तुत लेखमा लुकुन्डोलको लिगनाईट बारे वर्णन गरिएको छ ।

ABSTRACT

The Quaternary fluvio-lacustrine sediments of Kathmandu Valley are characterized by the occurrence of low quality lignite. The lignites are more confined to the lower part of this deposition in the Lukundol Formation, consisting of clay, silt, sand and coarse sand. These lignites show ambivalent characters between lignite and peat.

GENERAL GEOLOGY

The Lukundol village lies in the southern fringe of Kathmandu Valley and is defined by latitude- 27°35'00" N and longitude 85°18' 15" E. Of all the Quaternary fluvio-lacustrine sediments exposed, Lukundol is one of the type locality for the lignite bearing valley-fill sediment (Lukundol Formation).

The fluvio-lacustrine sediments of over half a kilometre thickness (Notojima et al., 1980) were unconformably deposited on the Precambrian basement rocks and mid-Paleozoic metamorphics. The valley-fill sediments can be divided into four formations based upon their dominant lithological character. Generalized lithological succession is given in table 1.

Table 1 Lithological succession of valley-fill sediments (after Dhoundial, 1966)

| Formation | Lithology | Approx. Thickness (in m) | Age |
|-----------------------|----------------------|--------------------------|-----|
| Chapagaon Fm. (South) | Pebbles, fine sands, | 110 | |

| | | | | |
|-------------------|----------|---|-------|-------------|
| Sankhu Fm. | (North) | silts, and clays. | | Recent |
| Kalimati Fm. | (Centre) | Fine carbonaceous clays, silts, and sands. | 400 | |
| Lukundol Fm. | (South) | Pebbles, sands, clays and Lignite seams. | 65-81 | to |
| Basal Boulder Bed | | Boulders and pebbles. | 100 | Pleistocene |

Unconformity

Basement rocks—schists, quartzites, phyllites, limestones, sandstones, shales etc and granites.

However, the thick Kalimati Formation, consisting mainly of carbonaceous matter, but devoid of Lignite, is possibly equivalent to Lukundol Formation, and is found only in the central part of the valley. Overlying the Kalimati clays is the Chapagaon Formation in the present area and its equivalent Sankhu Formation on the northern side consisting of sands, clays and pebble beds with minor lignites.

LUKUNDOL FORMATION

In the Lukundol area, overlying the Basal Boulder Bed, a distinct lignite bearing horizon consisting of clays, silts, sands, gritty sands (pebbly sometimes) are exposed which has been named as 'Lukundol Formation' by Dhoundial (1966) after the name of the village Lukundol.

It is observed that the thickness of the formation varies from place to place between 65-81m and is partly due to uneven base and partly may be due to depositional environment. The lower contact of the formation is distinct. It is marked by a thin zone of clayey material, which is always followed by a layer of sand. However, it is difficult to draw a sharp boundary between these clays and sand layers. A substantial facial change-vertical as well as lateral, is seen within the formation, although it was deposited in a narrow limited basin (25 km long and 19 km wide). For instance, in Lukundol area, fine sands at basal part become coarser giving a pebbly look at the upper part, while in the central part of the basin a thick Kalimati clay is met with. In fact, the upper coarse sand (pebbly nature) confuses with the overlying Chapagaon Formation due to its pebbly nature. However, the contact is usually very near to a thin layer of carbonaceous to lignitic material. The lignite horizon of varying thickness occur at different depths of the formation (Fig. 2). In general, it is observed that the lignite horizon is underlain by a zone of black carbonaceous clay and is overlain by a thin zone of sand.

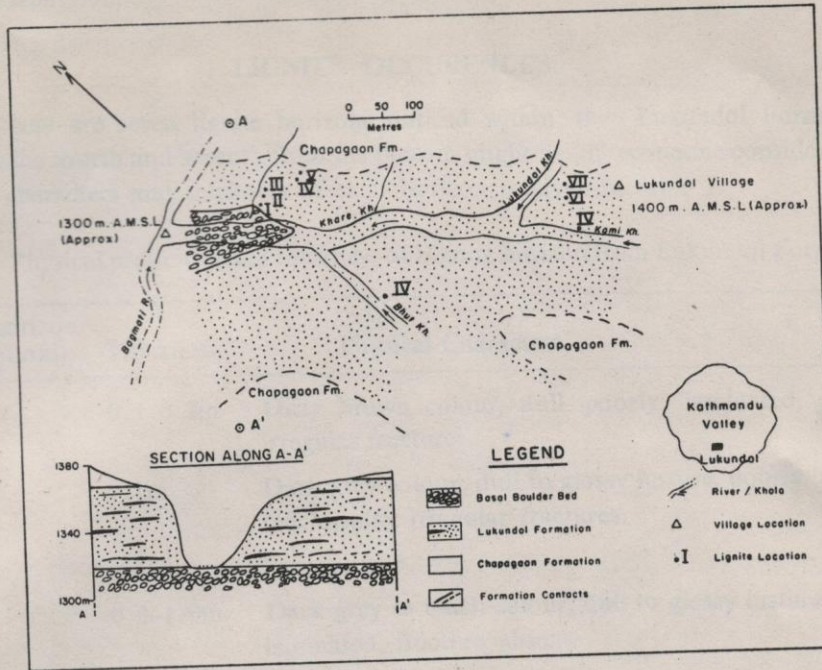


Fig. 1 Geological sketch map of Lukundol area

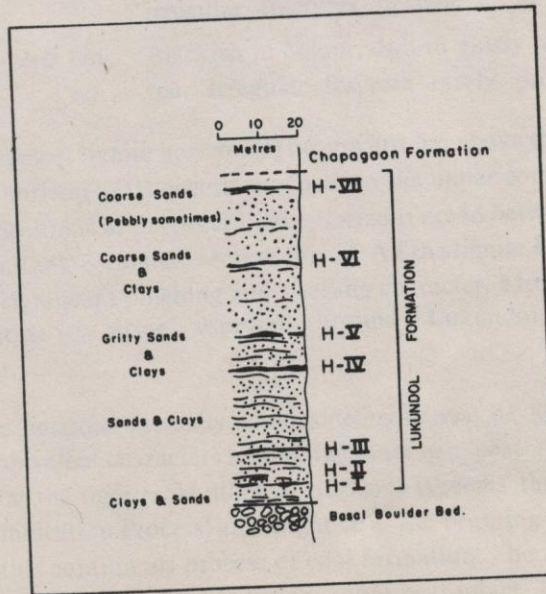


Fig. 2 Generalised vertical section of Lukundol Formation

LIGNITE OCCURENCES

There are seven lignite horizons noticed within the Lukundol Formation, of which, the fourth and seventh from the bottom might be of economic consideration. Physical characters and thickness of each horizon is given in table 2.

Table 2 Physical properties and thickness of Lignite horizon from Lukundol Formation

| Lignite horizon (from Bottom) | Thickness | Physical Characters |
|-------------------------------|-----------|--|
| I | 0.1-0.2m | Dirty brown colour, dull poorly laminated, display irregular fractures. |
| II | 0.1m | Dark grey colour, dull to glossy lusture, poorly laminated, display irregular fractures. |
| III | 0.2-0.3 | Same as II. |
| IV | 0.3-1.0m. | Dark grey to black colour, dull to glossy lusture, fairly laminated, fracture absent. |
| V | 0.3-0.5m | Same as IV |
| VI | 0.1m | Blackish in colour, glossy lusture, lamination absent, irregular fractures present. |
| VII | 0.2-0.8m | Blackish in colour, dull to glossy lusture, fairly laminated, Irregular fracture rarely present. |

The bottom most lignite horizon (I) occurs just 5m above the Basal Boulder Bed while the topmost horizon (VII) occurs very near to the upper contact of the Lukundol Formation. The positions of the other lignite horizons are in between I and VII and are shown in the generalized columnar section (fig. 2). All the lignite horizons are lenticular in shape and have significant pinching and swelling character. Most of the lignite lenses are horizontal, but at few places, especially around Lukundol village it dips 8-18° towards north-east.

The lignite horizons (actually discontineous lenses) of Kathmandu Valley fill sediments, have ambivalent characters resembling more to a 'peat' than the actual 'lignite'. However, looking at the lignites of different horizons it seems that most of them have completed the 'Humification Process' and might be at the begining stage of 'Coalification Process'. Thus, in this continuous process of coal formation, here in this case, peat is only partially converted into the lignite leaving more peat intact. The physical and che-

mical properties of the lignites from Lukundol area are as shown in table 3.

Table 3 Physical and Chemical Properties of the Lignites from Lukundol area.

| Physical properties. | Chemical properties. |
|--|----------------------------------|
| <i>Colour</i> - Brown, darkgrey, black | <i>Inherent moisture</i> -7-11 % |
| <i>Lusture</i> - Dull to glossy | <i>Ash</i> -42-47% |
| <i>Lamination</i> - Poor to Moderate | <i>Volatile matter</i> -33-38% |
| <i>Fracture</i> - Irregular, if present, | <i>Fixed carbon</i> - 7.5-15% |
| <i>Hardness</i> - Soft. | |
| <i>Sp. gr.</i> - 1.3 to 1.5. | |

CORRELATION

The lignites of Karewa Formation is a low grade one and shows 15% moisture content, 28% volatile matter, 2-7% fixed Carbon and 30% ash, at Handware (Sharma and Ram, 1966), which is very much similar to the lignites of the study area. The Lukundol Formation can be more or less correlated lithologically and paleontologically to the Karewa Formation of the Kashmir Valley of Post-Tertiary (Pleistocene) age which is a fluvial deposit consisting of fine loam, yellow sandy clays, soft sandstones and the lignite seams (Gupta, 1975).

CONCLUSION

The fluvio-lacustrine deposit of Kathmandu valley at its outskirts, is characterized by the occurrences of many lignite horizons, at least seven, in the Lukundol area, of which, fourth and seventh might be of techno-economic consideration and can be correlated with Karewa of Kashmir on Lithological and paleontological evidences.

ACKNOWLEDGEMENTS

Author is grateful to Mr. M. N. Rana, Director General of the Department of Mines & Geology, H.M.G., Nepal for permitting to publish this paper, which is primarily based on the investigations carried out by the department.

REFERENCES

- Dhoundial, D. P., 1966. Investigation of Lignite deposits in Kathmandu Valley, Nepal. Unpub. G.S.I. report, 34 p.

- Gupta, V., 1975. On the stratigraphic position of the Kathmandu Valley sediments, Nepal. *Geol. Helvetica*.
- Notojima, Koji et al., 1980. Natural gas Resources in Kathmandu Valley. Unpub. report, JICA, 82p.
- Pettijohn, F. J., 1969. *Sedimentary rocks*. Oxford & IBH, 588-647.
- Sharma, N. L. and Ram, K.S.V., 1966. *Introduction to the Geology of coal and Indian coalfields*. Oriental Publishers, 183 p.