

THE GEOLOGICAL CHARACTERISTICS OF THE WESTERN PART OF BARDHAMAN DISTRICT

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ABSTRACT: : *The western part of Bardhaman district is formed of Archaean (Precambrian) rocks containing a multitude of variations of granitoid and schistose which had crystallized at least 900 million years ago (Gaz, Burd. 1994: 29). Geologically, the area consists of the meta sedimentary rocks of the Precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and Upper Tertiary sediments. Laterites have developed on these older rocks as well as on early Quaternary sediments. The most relevant fact in this context is the presence of a series of coal measures which played the fundamental role in emergence of mine as well as industries. Among those coal measures, the Barakar measures occur as an irregular belt roughly parallel to the northern boundary (Gaz, Burd. 1994:32) of the area in question, covering nearly 155 Km² area and thickness 640 meters. The areas of Ironstone shales is 113 Km² and thickness is 365 meters. The Raniganj measures crop out along the southern half of the famous Raniganj area (Gaz, Burd. 1994:33). The area of Supra Panchet is 13 Km² and thickness is 300-600 meters.*

Key Words:

INTRODUCTION

The area under study is a part of the eastern margin of the Chhotanagpur plateau and it resembles a promontory extending out from western plateau region. The area consists of barren, bare and rolling land with occasional laterite covers. Broadly speaking, the area forms the major part of the Ajoy-Damodar interfluvium, excepting its westernmost part that lies under the Ajoy-Barakar divide. The Ajoy-Damodar interfluvium is a convex upland tract, actually being the extension of the Chhotanagpur plateau, the average altitude being 150 meters. The surface gradient of this part is westerly towards the west, northerly towards the Ajoy and southerly towards the Damodar (Peterson, J.C.K.1910: 7).

Metamorphic rocks of the Archaean age are exposed to the north, west and south of the Coalfield. Talcher is exposed along the northern edge of the eastern part of the region and the Damuda comprises the Barakar Ironstone shale's, Raniganj measures Panchet and Supra Panchet .

THE STUDY AREA

The coal deposition of the western part of Bardhaman district developed mainly in the series under the Gondwana system in Geological time scale. The western part of Bardhaman district of West Bengal, has been taken the area of study. The area is rich in coal deposits promoting coal mining as a principal activity and there have grown a number of iron-steel and engineering industries wherein a large number of workers including females are engaged to earn their livelihoods. (Peterson, J.C.K. 1910: 26)

OBJECTIVES

To find out Coal seams formation in the western part of the Bardhaman District

To find out Land Subsidence and Abandoned mines in the study area

METHODOLOGY

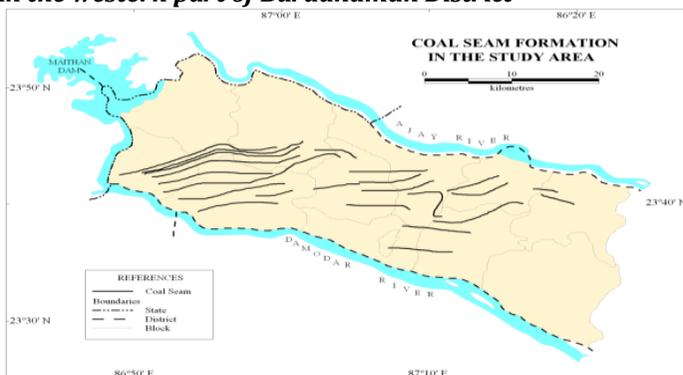
The pre-fieldwork stage of methodology followed in this work pertains to the collection of information regarding physical, geographical aspects like geology, topography, surface and subsurface hydrology, soil, climate and vegetation; collection of data on mining, industrial and other activities, population and gender characteristics, rates of female participation in production activities in various times, wage-rates of labours in different times; collection of data on ethnic characteristics, administrative changes, industrial strikes, labour unrests etc.

COAL SEAMS

Several coal seams are found in both the Raniganj and Barakar measures of this field. There are 23 seams measuring over 1.2 meters in thickness of these 11 are located in the Raniganj and 12 in the Barakar

measures. Coal Seams in the study area are below upwards-Taltor, Sanctoria-Ponihati, Halnal Koithi, Dishergarh-Salma, Bara Dhemo-Raghhunathbati-Rana-Pariharpur-Satgram Sonpur, Sripur-Topsi-Kenda,Chora-Purushottampur, Kajora-Jamad-Bankola,Gopalpur-UperDhadka-Ghusik-Upper Kajora (Office of the CMPDIL). Igneous Intrusive are mainly mica-peridotite and dolerites widespread in certain areas of the Raniganj Measures, continue, and narrow dykes into the overlying Panchet Strata in the Southern part of the region.

Coal seams formation in the western part of Bardhaman District



Source: Geological Survey of India

The Indian schools of mines and Applied Geology, Dhanbad, have made the following stratigraphic classification of the Archean rocks around Raniganj- Jharia coal –basin:

Stratigraphic classifications of the Archean rocks around Raniganj- Jharia coal –basin:

Later post-Dharwar Injection complex	Streaky,injection, augen and Sillimanite gneisses. Rapikivi-bearing gneisses and epidiorites.
Earlier post Dharwar Intrusives	Granites, pegatites, aplites and some quartz veins Metadolerites and metanorites with or without olivine
Dharwar	Gnisses, amphibolites, epidiorites and hordblended Schists. Quartzites (granulitic and schistose)and Calc-gneisses.Micaceous schists.

Source: Gaz, Bardhaman: 31

Faults and Dykes

The present tract of Gondwana in the study area represents a small portion of Gondwana sedimentation which has been faulted down within the Archean period. The main complex boundary fault with Gondwana rocks deposited largely exist in the major portion of the study area south of the Ajoy river. The northern boundary one of natural deposition affected by strike or oblique-faults represent the uneven Archean land surface in early Gondwana times, which has been complicated by a number of cross faults .The main southern boundary fault is a single unbroken displacement and a large strike fault running an Echelon (the main boundary fault).South of the Damodar River, a second main boundary fault, called the panchet hill. On the northeastern part of the study area, the large oblique strike fault of the Ajoy River had affected the preservation of the Trans-Ajoy strip of Damuda sediments.The entire area is affected by many dips; strikes and oblique faults .Some of these faults is contemporaneous with the deposition and coalification period. This region as been extensively intruded by both ultra basic and basic intrusive. The former occurs as both dykes and sills of laprophyres. The most predominant dolerite dyke is the Salma dyke.

Laterite and Associated deposits

Wide tracts of laterite rock overlie the northeastern parts of the Raniganj and Durgapur strata. This laterite deposition is composed of numerous quartz grains and of numerous quartz grains and these quartzose laterities pass in lateritie conglomerates and latrite gravels. Different types of lateritic deposits have been founds, accordingly to their principal lithological character of these latritic types all of the sandy of gravel beds. These are true laterite gravels and conglomerates. Sandstone, clay ironstone together with lateritic deposition occurs in the study area. Fossil wood is also associated with lateritic deposits.Lateritic

occurrences mainly quartzose gravels are found in the Pancheyt and Raniganj beds of the North and south of the Damodar River .

Coal measures

The Barakar measures occur as an irregular belt roughly parallel to the northern boundary of the coalfield and cover nearly 155km (Gaz,Burd.1994:32).The Barakars consist of conglomerates, sandstones (which are often coarse and felspathic), shales and coal seams of a somewhat irregular character thinning out at short distances. Above the Barakar group in the Raniganj coalfield and a few other coalfields of the Damodar valley, there is found a great thickness of coarse and fine sandstones, mostly false bedded and felspathic, with shales and coal seams, which are frequently continuous over considerable Ares. The coarse white felspathicgrits and conglomerates, very common in the Barakar measures (Peterson, J.C.K. 1910:17).

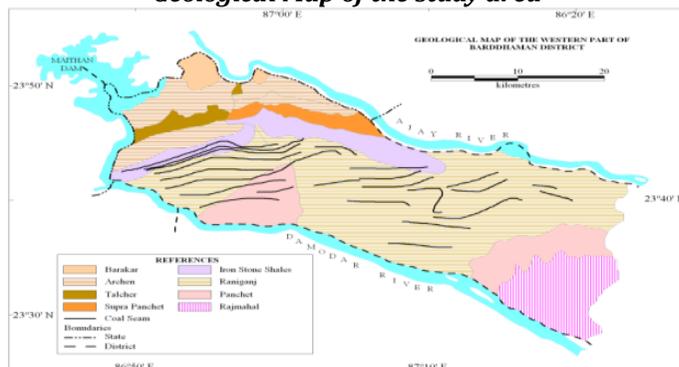
The *Panchets* consist chiefly of thick beds of coarse felspathic and micaceous sandstones often of a white or greenish white colour with subordinate bands of red clay. All these groups have yielded plant fossils; the Panchet rocks contain, in addition, reptilian and fish remains.This series is composed mainly of alternations of fine red clays and coarse sandstones.The sandstones are reddish, yellowish and brownish. The rocks of the panchet series ar exposed in the vicinity of Asansol and southwards across the Damodar river over an area of 240 km (Gaz, Burd. 1994:34).

Ironstone stage comprising mainly of carbonaceous shales with clay ironstone nodules.Its alternative name is 'Barren Measures' due to the absence of any workable coal seam (Gaz, Burd.1994.;32).

Rajmahal series are exposed in the southeastern portion of this region.The Durgapur beds are Rajmahal series, which consists of lava flows with intercalated carbonaceous and siliceous shales and clays.

The *Raniganj measures* crop out along the southern half of the Raniganj coalfield .The Raniganj stage consists of sandstones and shales.The coarse white felspathic grits and conglomerates are absent in the Raniganj stage(Gaz,Burd.1994:33).These areas contain coal seams ranging up to about 12.5 m in thicknes. Reserves of coking coal in this coalfield have been conservatively estimated at 82 million tons up to 1,000 ft. and 250 million tons up to a depth of 2,000 ft. In addition, there are vast reserves of superior non-coking and inferior quality coals.The Raniganj coalfield also contains large reserves of iron ore, occurring chiefly as nodules in the ironstone shales.Formerly these ores used to be smelted at the Kulti Iron Works.Good quality fireclay occurs in the Barakar stage of the Raniganj coalfield. The clay occurs in the form of seams very much like coal. Such clays are found both above and below the coal seams, as bands in coal seams and separately in the sandstone sequence.

Geological Map of the study area



Source:Geological Survey of India,

Particularly the whole of the area falls under the Archaen system of rocks. These are the oldest rocks found in Chhotanagpur plateau. These *Archaean rocks may be subdivided* into two main groups:-

1. The sedimentary rocks associated with extrusive lavas and intrusive basic igneous rocks.
2. The great granite intrusions which dominate the central Chhotanagpur plateau from east to west.

Land Subsidence and Abandoned mines

The Director General of Mines Safety (DGMS) has declared 4458.41 hectares of land in this region as 'unsafe' due to land subsidence.The area include the towns of Barabani Police Station, Kulti, Barakar, Jamuria market area, Some part of Salanpur Police station,some part of Barabani Block, eastern part of Asansol (MC), Raniganj town and Behula Bazar, with 17 other villages and a few santhal basties.In fact, the entire stretch of land between Andal and Barakar townships are in danger of Subsidence (Office of the CMPDIL, 2008). In the western part of Barddhaman District, good quality non-coking coal occurring in thick seams at shallow

depth was mined indiscriminately with very small size pillars. In past, when the surface was not densely populated, the operators had extracted as much coal as possible. With the growing industrial importance of this area, many townships have come up in the periphery during the last century and further growth is ensuing, even though, some of the areas fall among those declared unsafe by DGMS. After the subsidence breathing of air will cause spontaneous combustion. Once the workings are on fire. Environmental problems will become more acute. The main source of illegal mining of coal and theft is abandoned mines. Many abandoned mines can also be seen in Salanpur Area, Bankola Area, Kenda Area, Pandabeswar Area, Kajora Area, Satgram Area and Kunustoria Area .After economic extraction is over, the remaining coal in an abandoned mine is stolen by coal mafias, villagers leading to roof falling, water flooding, poisonous gas leaking, leading to the death of many labourers in the western part of Barddhaman District (Field Survey,2006-2009). There are total 203 illegal mining sites in the study area. In 1966 there were 4 coal mine fires in the study area. The number increased to 9 in 1976. The number of the fires increased further and was about 12 covering an area of about 4 sq km in 2006(CMPDIL,2009). Many Fire affected places are seen in Jamuria MC, Jamuria Block and Pandabeswar Block. Unstable location are seen in the areas of North -Western portion of Salanpur, Western portion of Asansol MC, Northern portion of Raniganj Block, Eastern portion of Pandabeswar and Western portion of Andal .Sitaldas Opencast Project under J. K. Nagar Fire Project of Satgram, Area, ECL, is located in the central part of Raniganj Coalfield for extraction of 6 - 6.5 m thick Nega Seam .The major outcrop of the Nega seam is exposed in Nimcha Village (population approximately 3000). Cracks and fractures were developed because of unscientific extraction of coal under shallow cover and resulted in spontaneous fire and subsidence in the area, due to air ingress. In 4th of January 2008 near southern part of Nimcha village Smoke and toxic gases were coming out from potholes, which is endangering the village and affecting environment (CMPDIL, 2009). Mine fires have been raging in different coal fields of the study area causing danger to safe mining operations and loss of substantial coal reserves.

Area of subsidence in hactor

Area	No of Subsidence	Area of Subsidence in hactor	Volume of subsidence in million cubic metres
Salanpur	3	6.38	0.34
Sripur	8	1046.92	3.84
Satgram	14	1336.52	7.66
Kunustoria	11	399.21	3.56
Kenda	9	120.96	0.8
Kajora	13	370.31	2.6
Pandabeswar	6	49.62	0.14
Sitarampur	10	460.71	1.74
Bankola	12	538	4.9
Sodepur	9	129.78	1.03
Total	95	4458.41	26.61

Source: Feedback Report CMPDIL, 2019

Conclusion

Coal has been defined a compact stratified mass of mumonified plants. Raniganj coal belongs to bituminous types.

The Indian coals grading broad classified coal of the western part of the study area are such a way

- i. Cooking coal of superior quality-Sanctoria and Dishergarh seam in Raniganj measures.
- ii. Non-cocking coal of superior quality (selected grade-1) Begunia, Laidihi.
- iii. Coal of inferior quality-Gourangdih-Churulia(Office of the CMPDIL,2009)

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