

ENVIRONMENTAL IMPACT OF COAL MINING— A BIOSOCIAL ANTHROPOLOGICAL STUDY

R.K. Pathak* & J.W. Dkhar**

Planet Earth is subjected to a lot of unnatural/modern commercial activities that are exploiting the natural environment by over consumption causing wide range of degradation. Mining activities cause massive damage to flora and fauna of the area being exploited. The State of Meghalaya is very rich in coal deposits from the upper Tertiary rocks. The Jaintia Hills District has large share out of an estimated 600 million tons of coal deposits in Meghalaya. There are nine important areas of coal deposits in this district. Meghalaya – predominantly a tribal state, falls under the 6th Schedule of the Indian Constitution, and thus the land is owned by individuals/communities/villages. Therefore, coal mining is privately controlled as small-scale business. In Jaintia Hills the coal reserves have been increasingly exploited during the last few decades through unscientific methods of sub-surface mines known as 'rat – hole mines'. This crude method of mining and related activities have not only caused various environmental problems related to land, water and vegetation, but, directly or indirectly have also had an adverse impact on other life forms including human beings, in the area. Roy (1985) has noted that mining "is a devastating operation that not only destroys the natural ecosystem particularly if it is surface mining, but also introduces tremendous distortions into the social fabric". Therefore, its impact on nature as well as on society should provide the background for analyzing the question of the environmental impact of coal mining. The present biosocial anthropological study has been conducted in Jaintia Hills District to assess the impact of coal mining activities on the people of the area. The data comprise of people directly involved in coal mining activities, as well as people who are residing in the area but not directly involved in mining activities. It has been observed that due to various environmental problems caused by mining activities people are having health problems. Besides, in such a change from subsistence to commercial economy, socio-cultural aspects of the Jaintia society have been affected.

Introduction

From the pre-historic days man has been interested in the Planet Earth—for its mineral wealth. Beginning with crude stone implements of the early Paleolithic period to post-Neolithic pottery, the Egyptian Pyramids, iron and copper smelting, to modern steel-age, are all records of mining activities of man. In a sense, the history of mining is the history of civilization (Khoshoo, 1984).

Without any regard to the consequences, natural resources have been intensively exploited for centuries, causing reduction in forest cover; greater soil erosion; air, water and land pollution;

* Department of Anthropology, Panjab University, Chandigarh-160014.

** Department of Anthropology, N.E.H.U., Shillong-793021.

and reduction in biodiversity (UNESCO, 1985). And all of these not only adversely affect human health but also introduces distortions into the social fabric (Roy, 1985).

The first evidence of the use of coal appears in the writings of Aristotle and Theophrastus. Coal was known to the Chinese before Christian era, the Greeks knew about the its use in the 4th century AD, and it was used as a domestic fuel in England in the 9th century. The invention of the steam engine and consequent industrial revolution in the 18th century provided greater impetus to coal mining, which further got a boost with the use of coal in iron ore smelting industries (Brown *et al.*, 1975). Today, coal is used primarily to produce electricity, and to a lesser extent, by heavy industries such as iron and steel.

India ranks the third largest coal producer of the world next only to China and USA. Coal is the most abundantly available fossil fuel in India and provides a substantial part of energy needs. It is used for power generation, supply of energies to industry as well as for domestic needs. Coal mining in India started in the year 1774 in West Bengal. At the beginning of 20th century the total production of coal was only about 6 million tones per year which increased to 298 million tones in the year 1997-98 (CIL, 1997).

One of the seven north-eastern states of India – Meghalaya, is bestowed with rich natural vegetation as well as large reserve of mineral resources, such as, coal, limestone, sillimanite, etc. Though commercial exploitation of coal in Mehalaya started in the Khasi Hills during the 19th century, these activities proliferated to other parts of the state, viz., Jaintia Hills and Garo Hills in the 1970s (Directorate of Mineral Resource, 1992).

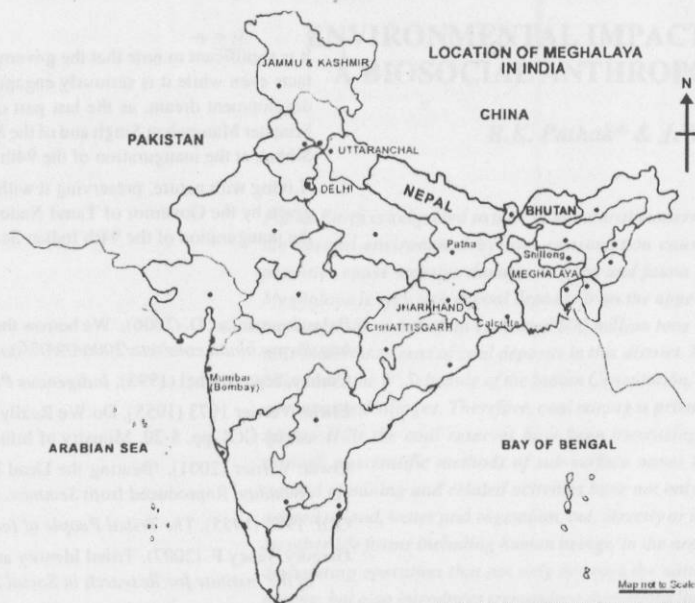
Because of the complex landholding systems and exclusive rights of land owners on land resources as guaranteed under 6th Schedule of Indian Constitution, very little governmental control can be exercised on the lands in Meghalaya. Mining is done under customary rights and is not covered by any mining act, rule or regulation, and no environmental rules can be enforced in these areas. As a result, in most parts of the state coal is being indiscriminately mined in unscientific manner, causing large-scale damage to the natural ecosystem (Tiwari, 1996).

Study Area

Jaintia Hills District lies between 91°58' E to 92°50' E longitude and 25°02' to 25°45' N latitudes, and is bounded by Assam state in the north and east, by East Khasi Hills District of Meghalaya in the west, and Bangladesh in the south. The total area of the district is 3819 sq.km. which is about 17% area of the state.

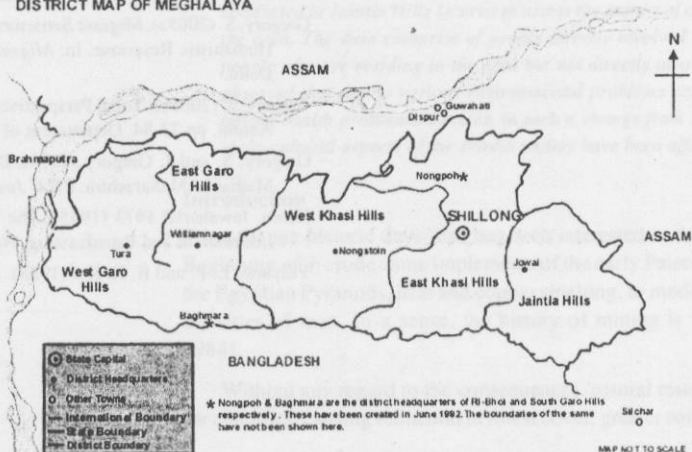
Jaintia Hills District forms a continuous part of Meghalaya Plateau, and is composed of formations ranging from Pre-cambrian to recent different period. The elevation of the district experiences a tropical monsoon climate, with highest rainfall in month of June. The annual temperature ranges between 7° to 25°C, approximately. The soil is sandy and reddish brown to yellowish-brownish colour. According to census of India 2001, the total population of the district is 2,95,692.

Location of Jaintia Hills District in Meghalaya, India

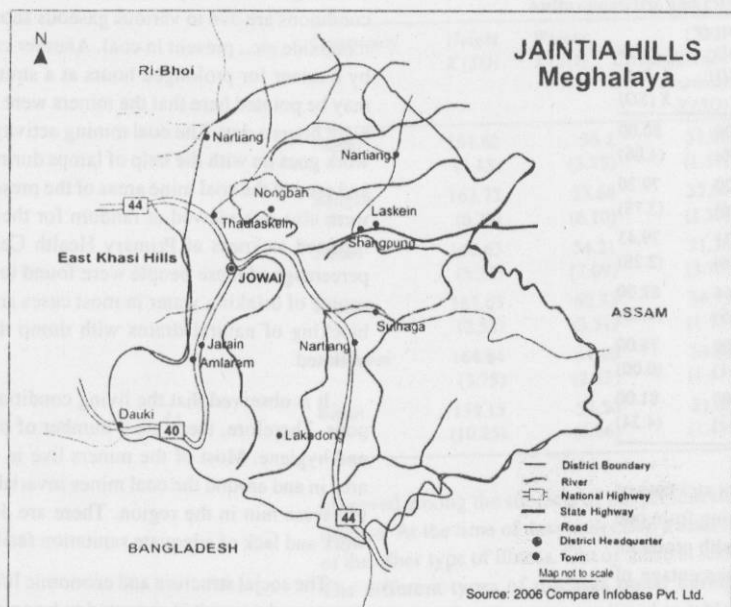


Source: Compare Infobase Pvt. Ltd. 2001-02

DISTRICT MAP OF MEGHALAYA



Source: Compare Infobase Pvt. Ltd. 2001-02



Source: www.mapsofindia.com

Coal Fields

There are 9 important coal deposit places, out of which Bapung and Lakadong are the most important. The other areas are: Lumshnong, Malwar Musiang Lamare, Mutanga, Sutnga, Jarain Tkentalong, Ioksi and Khliehrait. Most of the coal bearing areas are accessible by roads from Jowai-the Headquarters of Jaintia Hills District, 64 kms from Shillong. The coal bearing areas of the district presents a panorama of flat-topped low hills, devoid of vegetation, and plateau of rolling grasslands interspersed by river valleys. Though Jaintia Hills District has only 7% (40 million tones) of total coal deposits of the state (563 million tones), the district contributes more than 74% of total coal production of the state. Coal deposits occur as thin seams with thickness ranging between 30 cm to 150 cm in sedimentary rock, sand stone and shale of Eocene age (Guha Roy, 1991). The coal found in Jaintia Hills has low ash content, high volatile matter, high sulphur content, and is hard, lumpy, and bright.

The coal is extracted by surface mining method which is also known as 'rat-hole method'. The 'open-cast' mining is not popular. In this method, small tunnels are dug upto the coal seam, mostly at the foot hills or at the lower parts of the hill slopes. Prior to mining, however, the land is cleared by felling trees, and shrubs, and by destroying the ground vegetation. The unconsolidated and consolidated material overlying the coal seam, which comprise mainly sand and gravels, are brought out manually from the tunnels and dumped on adjacent unmined

land. The consolidated or unconsolidated material, called 'mine' spoil or 'overburden', cover large fertile land underneath. After the removal of sand and gravels, coal is dug and carried in basket or a wheel barrow and dumped on the nearby unmined area. Later, the coal is carried to the bigger dumping places near the highways from where it is loaded on the trucks for transportation to other parts of the country. The coal produced in these mines is used generally in the brick kilns.

Present Study

Though there have been some studies on the impact of coal mining on vegetation, soil, water etc., in Jaintia Hills, little attention has been paid to the fact that mining activities as practiced today have its impact on health, hygiene, nutrition, sanitation, accidents and anti-social activities. Therefore, its impact on nature as well as on society should provide the background for analyzing the question of the environmental impact of coal mining. With this objective in mind the present study attempts to analyze public health and social organization of the people of Khliehria, Stunga and Bapung coal field areas of Khliehria block of Jaintia Hills District. A total of 111 mine workers were investigated. In addition to the above, social organization among the people of the area with special reference to the impact of mining on these have been studied.

Observations

The mine workers belong to Nepali (59%), Bengali (22%), Jaintia (13%) and 2% each of Assamese, Kashari and Bihari communities. Some of these labourers do not have appropriate travel documents. All the workers range in age 17-46 years. About 45% of these workers are married and many are staying with their families near the work site. Some of these married workers are child less while some of them have upto 7 children. All the workers have been in this profession from minimum of 1 year to maximum of 13 years. During the field work division in 'type of labour' was observed based on community lines, i.e., the Nepali, Bengali and Kashari were found to be working in the pit, the Assamese and Bihari were involved in carrying the coal from pit to the surface, the Jaintia were involved in transporting coal from the surface to the dump.

The average values of Height and Weight of the workers are less as compared to the control samples of the respective communities. The Body Mass Index values are also relatively lower, thereby indicating nutritional deficiency in the case of mine workers. When compared with average standards, the normal and expanded chest circumference values obtained in the present study do not show much difference from the respective populations. It was expected that due to the nature of labour performed by the subjects, they would at least possess greater chest expansion. But perhaps because of the impact of the environment present in coal mining area this factor is negated to some extent. Similarly, the mean systolic and diastolic blood pressure values, and mean pulse rate values do not reveal significant differences as compared to the established standards for the respective population groups. It is believed that inhalation of large amounts of dust fumes and gases, not only in underground mines, but also in open coal quarries cause hypertension, among other diseases (Das, 1988). However, no hypertension

Table 1
Anthropometric and Physiological Characteristics

Community	Height	Weight	Chest	Circumference (expanded) X (SD)	ChestBlood Pressure		Pulse Rate X (SD)
	X (SD)	X (SD)	Circumference (normal) X (SD)		Systolic X (SD)	Diastolic X (SD)	
Nepali	161.62 (4.15)	55.2 (3.75)	31.92 (1.57)	34.56 (1.69)	108.53 (6.17)	78.00 (4.96)	80.00 (4.06)
Bengali	162.72 (6.23)	53.68 (6.10)	32.04 (1.30)	33.96 (1.63)	104.00 (10.42)	77.20 (8.46)	79.20 (3.78)
Jaintia	160.63 (5.22)	54.21 (7.09)	31.36 (3.73)	33.78 (3.09)	106.85 (5.12)	74.71 (6.16)	79.43 (2.28)
Kashari	167.67 (2.52)	62.33 (3.51)	34.33 (1.53)	37.33 (1.15)	112.00 (5.29)	78.66 (3.05)	82.00 (4.00)
Assamese	164.84 (3.75)	57.00 (2.82)	33.00 (1.41)	35.25 (1.06)	95.00 (7.07)	71.00 (1.41)	78.00 (0.00)
Bihari	158.15 (10.25)	52.50 (6.36)	31.00 (1.41)	33.75 (3.18)	109.00 (1.41)	78.00 (2.83)	81.00 (4.24)

observed among the subjects of the present study. Each subject was interviewed for sickness or disease. At the time of data collection a total of 77.88% of the workers were suffering from one or the other type of illness. Out of these at least 71.00% reported more than one health problem. The different types of diseases noted during the course of the study and the percentage of workers reporting the same are listed in table 2.

Table 2
Percentage of Workers Reporting Various types of Diseases/sickness

Diseases/Sickness	Percentage
Low back pain	54.87
General body ache	32.74
Chest pain	29.20
Leg pain (Calf)	27.43
Abdominal pain	25.66
Joint pain	24.78
Gastric troubles	18.58
Head-ache	16.81
Eye irritation	7.96
Cough/throat pain	6.20
Malaria	6.20
Drowsiness	1.76

The incidence of chest pain may be symptoms of Pneumoconiosis or incurable black-lung disease which develops because of the deposit of cold dust in the lower lung and which leads to

breathing difficulty and other respiratory problems. A majority of miners with cough were also suffering from chest pain. Inhalation of cold dust also causes Silicosis and Bronchitis. All these conditions are due to various gaseous substances like sulphur dioxide, nitrogen dioxide, carbon monoxide etc., present in coal. Another cause is perhaps the kind of physical labour performed by a miner for prolonged hours at a stretch and that too in an improper work environment. It may be pointed here that the miners were seen to be engaged their work activities for more than eight hours a day. The coal mining activity during November and December is so hectic that the work goes on with the help of lamps during the night also. On the other hand, people residing in and around the coal mine areas of the present study but not directly involved in mining activities, were also interviewed at random for their health history. In addition, the pattern and kind of reported sickness at Primary Health Centers in the study areas was also noted. A sizeable percentage of these people were found to be suffering from gastric trouble. This is because the source of drinking water in most cases are common for the miners and non-miners. Due to the blocking of natural drains with dump debris generated by mining activities, the water gets polluted.

It is observed that the living conditions of coal mine workers, of the present study, is very poor. Therefore, there are a number of problems and diseases associated with poor sanitation and hygiene. Most of the miners live in small makeshift huts at or near the site of work. The area in and around the coal mines invariably remain damp, due to mining activity as well as due to excess rain in the region. There are drainage canals all around; because of the pressure of work and lack of adequate sanitation facilities, the miners do not keep proper personal hygiene.

The social structure and economic life of people are closely related, and when the economic structure changes it is expected to bring about a change in the social organization among those people. Sachchidnanda (1984) observed some changes in Hazaribagh and Dhanbad coal mine tribal areas of Bihar which are attributed to the intensive mining industry. The changes summarized by him are as follows: displacement from hearth and home; disorganization of village life; process of detribalization; introduction of money economy; shift from egalitarian to class society; changes from communal goals to personal achievement; growth of criminality; ineffectiveness of traditional leaders in social control; more anxiety in people leading to alcoholism, petty quarrels, etc.; preference for conjugal family; indebtedness; changes in food habits; free mixing between tribals and non-tribals including marriage and illegitimate sexual relationship; contact of new diseases; change in language, dress, religious ceremonies, etc.

The present study relates to a situation similar to what Sachchidnanda had observed, however, the area of the present study falls within sixth schedule of the Indian Constitution and hence many of the social and economic forces are partially regulated in this context. The Jaintia have been traditionally dependent on cultivation, especially paddy, and the economy of people was by and large on the subsistence level and lined with the traditional pattern of social life of the people. The people represent the matrilineal pattern of inheritance and matrilocal residence. With the introduction of coal mining in the 1970's series of change are evident in the social (as well as economic) life of the people in the area of study. During the course of present study it is noted that there has been overall decline in agricultural activity. Some paddy fields are abandoned.

Anybody could claim community land for Jhum cultivation in the past. But now people are claiming this for mining coal. Therefore, at present, most of the community land has gone to individual families. The coal mining activity has brought about diversification of occupation. One of the important daily markets is established at Lad Rymbai near Bapung. Construction of shops, residential and other buildings in and around the mining area is taking place at a fast pace. The number of marriages with non-tribals is increasing. On the whole, it may be said that the egalitarian Jaintia society is becoming stratified on the basis of economic status.

References

- Brown, C. J. and Dey, A. K. (1975), *The Mineral and Nuclear Fuels of the India Subcontinent and Burma*. Oxford University Press. Delhi. Pp. 1-170.
- CIL. (1997), *Report of the Department of coal*. Coal India Limited.
- Directorate of Mineral Resources (1992), Cottage Coal Mining in the State of Meghalaya and its Impact on the Environment. In Gupta, A. and Dhar, D. C. (eds.), *Environment Conservation and Waste Land Development in Meghalaya*. Meghalaya Science Society. Shillong, India.
- Das, A. (1988), Dust Hazards in Coal Mines-An Overview. In Joshi, S. C. and Bhattacharaya, G. (eds.), *Mining and Environment in India*. Himalayan Research Group, India.
- Guha Roy, P. K. (1991), Coal Mining in Meghalaya and its Impact on Environment. *Exposure*. 4:31-33.
- Khosho, T. N. (1984), *27th Holland memorial lecture*. Mining, Geological and Metallurgical Institute of India. Calcutta.
- Roy, D. (1985), *Pnar Economy and Society-Changing Frontiers of a Tribal Village in Meghalaya*. Doctoral Thesis. N.E.H.U. Shillong.
- Sachchidananda (1984), *Industrialization and Social Disorganization*. Concept Publishing House, New Delhi.
- Tiwari, B. K. (1996), Impact of Coal Mining on Ecosystem Health in Jaintia Hills, Meghalaya. In Ramakrishnan, P.S., Purohit, A.N., Saxena, K.G., Rao, K.S. and Maikhuri, R.K. (eds.), *Conservation and Management of biological resources in Himalaya*. G.B. Pant Institute of Himalayan Environment and Development, Almora. Oxford IBH Co. New Delhi. Pp. 466-475.
- UNESCO (1985), *Living in the Environment*. UNESCO/UNEP.