

Coal Mining Induced Pollution: A Threat To Sustainable Livelihood In Odisha

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ABSTRACT

Coal serves as the only natural resources and fossil fuel available in abundance in India and Odisha. A stream of benefits generated from coal mining in Odisha in terms of revenue yield, export earnings, industrialisation and employment generation. The major environmental challenges encountering the coal industry in Odisha are mining induced pollution, displacement, illegal mining, natural resource depletion or degradation. It affects the sustainable livelihood of rural communities. The study intends to examine the benefit streams from coal mining in Odisha and problem of pollution due to coal mining activities on sustainable livelihood of local communities. Coal mining is beneficial to society at the same time it brings several disasters. It is necessary to maintain a balance between coal minerals development and the protection of the environment and sustainable livelihoods.

Key words: Coal mining, induced pollution, coal benefits, sustainable livelihood

1. Introduction

Economic prosperity is the cornerstone of public policy almost everywhere in the world. The unrestrained economic growth based on materialistic individualism has led human beings to use renewable and non renewable resources of the earth. Coal minerals are a typical good for which property rights are not defined and hence no market exists. These have implications for intergenerational equity. The coal minerals play an important role in industrialisation in many developing countries like India. Coal mining provides employment and infrastructural facilities to local area (Das & Mishra, 2015). And it also provides raw materials for industrial development and provides employment opportunities to local people. Further, it has spill-over benefits like schooling, hospitals, and transport and communication facilities in the mining areas. However the rising coal demand have many negative impacts such as ecological degradation, biodiversity losses, air, water, noise pollution and adverse activities on agricultural production (Mishra and Pujari 2008). The state of Odisha richly endowed with considerable coal reserve is not an exception to this. The state is endowed with rich mineral resources including coal. The exploitation of the vast coal reserves for a variety of applications and it is contributing significantly to the state's industrial development. The state has a major coal mineral belt which falls in three districts Angul, Jharsuguda and Sundergarh. The coal mining generates direct and indirect employment opportunities for people in general and local communities in particular tax revenue has been earned by the state government. Artisan small scale mining activities provides employment, help to reduce poverty and at the same time it adversely impact on small scale miners, farmers, forest and water resources. (Arthur, Duah, Gyasi, Yeboah & Otieku, 2016). There has been a range of negative / positive effects on local rural communities and their livelihoods, by degrading the natural vegetation and creating water and air pollution. Coal mining activities negatively impact on local environment (Mishra and Das, 2017).

The present study hovers around this problem. The study intends to examine the benefit streams from coal mining and problem of coal mining induced pollution on sustainable livelihood of local communities in Odisha. The study is based on secondary data collected from Directorate of Mining, government of Odisha. The paper is organised in six sections. First section deals with introduction. Second section is a narration on state of mineral resources in Odisha. Third section contains the flow of livelihood benefits for people in Odisha. The cost of coal mining or coal mining induced pollution is explained in the forth section. Fifth section explains the coping strategies towards sustainable livelihood. The section sixth concludes the study.

2. The State of Coal Resources in Odisha

Among difference countries of the world, India is endowed with significance mineral resources. From the day of Pre-Harappan to till today it is the leading producer and exporter of a range of minerals. Odisha has occupied unique position in the mineral map of India. The coal mining contributes significantly to the state GDP. The state has emphasized on coal mining and its use in power generation. Odisha is the main supplier of coal to the different thermal power stations in India. Odisha is richly endowed with large variety of minerals which includes chromites, Bauxites, Graphite, Iron Ore, Coal etc. “There are two major coal bearing areas in the state-Talcher and Ib valley. Angul (12 mining leases, 9,590 Ha of mining area) is the prime coal mining district followed by Jharsuguda (14 mining leases, 7,656,55 Ha of mining area), Sambalpur (1 mining lease, 170.305 Ha of mining area) and Sundargarh (1 mining lease occupying 140.84 Ha of mining area. Total reserve of coal in the 2013 is 73,710 million tonnes which constitutes 88% of total reserve. The rate of exploitation total reserve is around 0.15%” (Economic survey, GOO, 2014).

Coal based resource use has several economic benefits relating to revenue yield, industrilisation, generation of employment and foreign exchange, earning through export. During a period of 2007-08 to 2013-14 the production of coal has increased from 8 crore tones to 10 crore tones. Annual growth of coal production seems to be highly fluctuating. Sometimes it was zero (2012-13) some other times it was highest 16.84 (2013-14). Still some other year witnesses a negative growth -5.37 (2011-12). But the value of coal resources has an uprising trend. During the period 2007-08 to 2013-14 the total value of coal production has increased three times (Table 1).

Table 1 Coal resources in Odisha: Production, value and growth rate

Sl. No	Year	Coal production (in lakh tonnes)	Coal value (in crores)	Growth rate of Coal production	All minerals (in lakh tonnes)	Value (in crores)
1	2008-09	771 (40.82)	8815	3.61	1890	15122
2	2009-10	796 (40.05)	7975	3.21	1989	15317

3	2010-11	728 (36.49)	17129	-8.62	1995	28217
4	2011-12	660 (35.68)	19105	-9.23	1852	30210
5	2012-13	666 (35.00)	19124	0.81	1903	34995
6	2013-14	7784 (38.29)	NA	16.84	2032	NA
7	Total	51473	77589	6.62	13450	134558

Source: Directorate of Mining, Government. Of Odisha, 2013-14

Note: Figures in parentheses reflects the % of total

3. Benefits

The economic benefits from coal mining can be distilled through looking into the revenue yield through taxation on coal, employment opportunities, export of minerals and industrialisation. The CSR activities by coal mining companies are provides opportunity for livelihood development and rehabilitation (Narula, Magray & Desore, 2017). Coal mining royalty is an important source of revenue for government. The royalty on mineral resources is paid to government by mining leaseholders. Mineral taxation revenue accounts for a sizeable share of total fiscal revenue in Odisha. Table 2 unfolds the benefits flows from coal mining in Odisha. In the year 2007-08, the revenue from coal was ₹ 637 crore which increased almost double in 2012-13. The growth rate is at its maximum, 23.67% (2008-09) and minimum 5.62 (2010-11). The state also earns Rs.2232 crore from the export of coal minerals in 2008-2009 (Table 2).

Table 2. Stream of Economic Benefits from Coal mining in Odisha

Sl No.	Type of Benefits	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Total
1	Revenue yield (In crore)	635	785	900	951	1038	1245	5553
2	Annual growth rate of revenue	-	23.67	14.69	5.62	9.13	20	73.11
3	Percent of total revenue	65.34	64.34	50.16	31.27	24.17	23.43	33.39
4	Labour employment in coal mines	12747	13467	13875	15389	16330	14320	86128

5	Annual growth rate of labour employment	-	5.64	3.02	10.91	6.11	-12.3	13.38
6	Percent of total labour	25.92	30.49	31.75	29.66	33.84	24.10	29.03
7	Export quantity (in lakhs tonnes)	1852	2232	-	-	-	-	-
8	Export value (Rs. In crore)	108	110	-	-	-	-	-

Source: Directorate of Mining, Govt. Of Odisha, 2014

The coal mining sector provides employment to peoples of Odisha. Nearly 1.63 lakh labourers were employed in the year 2011-12 as against 1.27 lakh in 2007-08. The growth rate in labour employment is highest in 2010-11 and lowest in 2012-13 (-12.3) (Table 2).

4. Social Cost of Coal Mining

The magnitude and extent of environmental cost caused by coal mining depends on the type of pollutants, their chemical properties and concentration in the air and water. All the pollutants have damaging effect on forest and biodiversity, vegetation, human health and cattle health (Berry & Hurton 1974). Several studies have found that diseases namely asthma, chronic bronchitis, respiratory trouble, blockage of psychomotor function, gastro-intestine diseases and so on can be attributed to the air and water pollution caused by coal mining (OSPCB, 1996; Hota and Behera, 2015). Sources of air pollution in coal mining areas generally include drilling, blasting, loading and unloading, and exposed pit faces etc. (CMRI, 1998). In the coal mine area of Angul-Talcher, one of the 22 pollution hotspots in India, the pollution is due to very high intensity of coal based pollution. The activities like drilling, blasting of coal, dump formation; transport activities reduce dust and noxious gases which degrades the air quality. The fly ash and pollutants when mixed with water bodies led to water pollution. The problem of mining induced pollution, displacement, resource loss and illegal mining poses major risks to livelihood sustainability.

4.1 Mining Induced Pollution

Table 3 through 4 and 5 make an attempt to analyse the fly ash utilization by various thermal plants. NTPC and RSP have highest utilization of fly ash by adopting

the wet disposal method. The Ib thermal has lowest percentage of ash utilization through dry and wet disposal methods (Table 3). Further, it can be inferred that in TTPS, SPM and RSPM concentration in air is moderate (looking into EF value) and SO₂ and NO_x concentration is at low level (Table 4). Massive deforestation i.e., 27.26% of reserve forest area (496.8) hector is already lost. Owing to coal mining, the vision document (2020) has reported about critical situation of Angul-Talcher coal field. The pollution scenario in Rourkela is totally different. In case of both air and water quality it seems to be high. The water quality is not conformed for drinking (Table 5).

Table 3. Coal consumption and Ash generation by Thermal plants

SL. No.	Power plants	Capacity(MW)	Coal Consumption(TDP)	Ash generation (TDP)
1	TTPC, NTPC Talcher	460	7000 (9.77%)	2940 (9.77%)
2	NTPC, Kaniha	3000	36000 (50.27%)	15120 (50.27%)
3	NALCO, CCP, Angul	960	14000 (19.55%)	5880 (19.55%)
4	IB thermal plants	420	6500 (9.07%)	2730 (9.07%)
5	Hirakud plant	167	2000 (2.71%)	840 (2.79%)
6	NSPCL, CPP & RSP	195	4000 (5.58%)	1680 (5.58%)
7	Total	531000	71600	30072

Source: State Environment Report, Various issues Govt. of Odisha

Table 4 Fly Ash utilisation by thermal power plants of Odisha

Sl. No	1	2	3	4	5
Plant Name	NALCO CPP Angul	IB thermal plant Jharsuguda	NTPC Kaniha	Talcher Thermal	RSP, Rourkela

Disposal Method	Hydro slucing Ash disposal system	Wet & dry disposal	Wet disposal	Wet disposal	Wet disposal
Bricks making MT	-	233	16085	-	-
Supplied to Industry other agency MT	-	-	24	98	9200
Land filling	5000	-	65379	-	15600
Embankment Dyke	20000	18907	78190	166000	34300
Other purposes	600 agl. And other	-	14222 Ash products	1889 Ash products	-
Total utilisation	205 600	19140	172 109	175 812	59100
% of utilisation	14.4	2.15	10.61	26.02	39.4

Source: State Environment Report, Various issues Government of Odisha

Table 5 Air & water quality status of the power stations

Loca tion	Year	Air Quality, annual average (in MPCM)					Water Quality, annual average (in MPCM)				
		SPM	RSPM	So ₂	NO _x	Remarks	Plt	D O mg	BO D Mg/ l	TC MPN/ 10 0ml	Remarks
TTP S, Talc her	2005- 06	140 (41- 258)	68 (19- 126)	6 (BD L- 13)	19 (11- 23)	Mod erate pollu tion	7.6	7.6	1.3	2223	---
	2007- 08	163 (45- 219)	74 (23- 132)	17.6 (11.4 - 23.2)	9 (BD L- 12)	Mod erate pollu tion	7.8 7.5 - 8.0	7.8 7.5 - 8.3	1.3 1.1- 1.8	1975 1700- 2400	Class C

Rourkela DIs	2005-06	167 (36-252)	82 (26-148)	11 (4-16)	11 (9-16)	High pollution	7.5 6.7 - 8.4	7.4 6.1 - 9.3	2.7 1.6-4.8	9682 1500-3500 0	Not conform to class C
	2007-08	188 (129-239)	107 (65-137)	5 BOL -5.9	10 BDL -11	High pollution	7.7 7.1 - 8.3	7.6 6.6 - 8.3	2.3 0.8-3.4	1526 7 3300-3500 0	Not conform to class C

Source: Odisha state pollution control Board (OSPCB), Annual Report, Various issues

4.2 Coal Mining Induced Displacement

Coal mining, despite the very substantial benefits they bestow on Odishan economy, stir strong emotions. A great social challenge for coal mining is sustainable livelihood and local community’s acceptance of its role in society. This problem poses major risk to societal sustainability. It raises increasing risk of landlessness by removing the basis upon which productive systems, commercial activities, and livelihoods are articulated. Further post displacement or underemployment is often acute following the dismantling of the local income generating resource base. In case of the IB Valley of Odisha coal mining started years ago. The villagers acknowledge that Mahanadi coal field limited is providing employment at wage higher than agriculture. They have received compensation for their displaced lands. The villagers also want MCL to hire them as casual labour instead of taking labours through contractors (Mishra, 2009).

4.3 Illegal Mining

Odisha’s illegal mining fraud that came to lime light in 2009. Mining activities were going in large number of mines in Odisha without requisite approval under the forest conservation act 1980, environmental clearance, Air pollution and water pollution act. The state government at fault for allowing illegal mining forest land included in nine mining leases allowed to Mahanadi Coal Field (MCL). Over 200 coal mining licences deemed illegal by the MCL in Odisha. The Supreme Court declared coal licenses illegal. The commission of mining crimes is organised by smugglers and contractors in league with corrupt politicians and bureaucracy. The illegal mining damages the environment and threatens the livelihoods of local people. The mining activities also exceed the production limit. This may be due to a doomed extension of mining lease under Rule 224(6) of mineral concession Rule 1960. Illegal mining cases in Odisha have increased from 284

in 2006-07 to 758 in 2009-10. This illegal mining is equated with the high profile and high visibility environmental crimes of industrial entrepreneurs which may be called “luxury” environmental crimes.

4.4 Forest Loss

Another significant aspect of extraction of coal minerals needs further discussion from an ethical angle. The forest is a renewable resource and deforestation for development can be bridged up with keen afforestation programme. Tribals as well as poor people use the forest for their livelihood. The collection of firewood and forest product by tribals enables them to survive. This can be attributed to their utter poverty. Minerals resources are mostly located in the forest areas. Mining sector has suffered much due to delay in forest clearance. Mining always causes large scale loss of forest area (Table 6). Even though loss of forest cannot be altogether avoided while developing the mines, conservation of forest and development of green belt have to come.

Table 6 No of mining project diverted forest area (2009-13)

Sl. No	Year	Project type	No of project	
1	2009-10	Mining	9	960
2	2010-11	Mining	7	571
3	2011-12	Mining	6	542
4	2012-13	Mining	9	2064

Source: Economic survey, Government of Odisha, 2014

5. Coping strategies

Most often it has been said that sustainability is not with the extractive coal mining and therefore, it is not sustainable. Using coal minerals to sustain economic wellbeing is important for local communities particularly in coal mining area. Therefore while looking at the sustainability issues in the mineral sector, the option of completely banning mining is not a realistic or viable one. The challenge of sustainable development in coal mining is to ensure that mineral resources exploited in an efficient manner with least possible generation of wastes. The damage caused to the environment by coal mining is to offset by planet’s capacity for accommodating change. It is important to understand the environmental impacts of mining, processing and utilisation of coal. Choosing a mining method is determined by coal deposit. Underground mining accounts for about 60% of world coal production.

Opencast coal mining causes more air pollution in comparison to underground coal mining. In underground coal mining workers suffer from coal dust inside underground mine. But open cast mining creates much more air quality deterioration in respect of dust and gaseous pollutants. Coal mining causes air pollution not only within the mining premises but also in surrounding residential area deteriorating air quality. There is increase in respiratory diseases such as asthma cases and chronic bronchitis due to high level of suspended particulate matter in mining area. The gaseous emissions contribute towards global warming besides causing health hazards to the exposed population. The vehicular traffic on haul roads are known for fugitive dust emissions and can contribute maximum the dust emitted from an opencast coal mining.

6. Conclusions

Coal serves as the only natural resources and fossil fuel available in abundance in India and Odisha. A stream of benefits generated from coal mining in Odisha in terms of revenue yield, export earnings, industrialisation and employment generation. The major environmental disasters faced by the coal industry in Odisha are mining induced pollution, displacement, illegal mining, natural resource depletion or degradation. It affects the sustainable livelihood of rural communities. The negative impact of coal mining on health, land, water, air, plants and animals, and livelihoods of people can be handled by careful planning. Coal mining is beneficial to society at the same time it brings several disasters. It is necessary to maintain a balance between coal minerals development and the restoration of the environment as well as sustainable livelihoods of local people.

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