

A Case Study on Sustainable Development in Coal India Limited

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Abstract: The case on sustainable development in Coal India Limited attempts to analyse the policies and practices of sustainability in Coal India in terms of social, environmental and economic dimensions. The study also throws light on some of the challenges and solutions for CIL towards sustainability development.

Key words: Sustainable development, Coal India Limited, social, environment, economic.

Introduction

Coal is fossil fuel formed by vegetation buried between the rocks. The high temperature and pressure results in formation of coal seam which is combustible organic rock composed of carbon, hydrogen and oxygen. Since the early civilization, it has been source of energy and is the main reason for industries to flourish and develop in today's modern world. Extraction of coal is called coal mining. Coal mining is done mainly in two ways: Surface or 'Opencast' mining and Underground or 'Deep' mining and it has many social, economic and environmental impact. As per the Green Gas Emission report (2010) of Ministry of Environment and Forest (MoEF), Government of India (GoI), India consumed 503 MTs of coal, generating 580 ktons of particulates, 2100 tons of sulphur dioxide, 2000 ktons of nitrogen oxide, 1100 ktons of carbon monoxide, 100 ktons of volatile organic compounds and 665 million tons of carbon dioxide, resulting in 80,000–1,15,000 premature deaths and more than 20.0 million asthma cases.

Coal combustion accounts more than 65% of total emission and is a major contributor of GHG emission

in India and coal is an inevitable source of energy for Indian economy. Table 1 indicates that out of total power generation thermal power accounts nearly 66%. It is a known fact that coal extraction has harmful impact on environment and society; however complete ban on coal extraction is not possible as the whole economy is highly dependent on coal powered thermal stations.

Table 1: Present energy mix in electricity generation in India, 2003

Source	Percentage
Coal	66
Hydropower	19
Oil and gas	10
Wind and solar	6
Nuclear	3

Source: Planning Commission, 2007.

The need of the hour for Indian economy is to produce coal in a sustainable way, which yields more caloric value and releases less polluting gases. As Coal India Limited (CIL) is a sole supplier of coal to

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62 of 64 thermal plants, it is the market leader in coal production holding more than 80% of market share. It has a significant role to play to reduce Greenhouse Gas (GHG) emissions and other harmful impacts of coal extraction by adopting sustainability. Therefore, current case tries to understand the sustainable development in Coal India.

Background of CIL

During the oil crisis of 1970's Government of India identified coal as a primary source of energy and started nationalizing coal mines. The process of nationalization took place in two phases. In the first phase, 226 cooking coal mines except that of ISSCO, TISCO and DVC were nationalized by enacting Cooking Coal Mines (Energy provision) Act 1971 leading to formation of Bharat Cooking Coal Limited on 1st May, 1972. In the second phase, around 711 non-cooking coal mines were nationalized by Coal Mines (taking on management) Ordinance to form Coal Mines Authority Limited on 1st May, 1973. Formally Coal India Limited was established in the year 1975 with a production capacity of 79 million tonnes by merging both the companies. Currently CIL holds 81% of total production with largest reserves in the world and market share of 74%; it is the 3rd largest coal producer in the world. With eight subsidiaries and one planning and consultant company it is one of the largest PSUs conferred with status of 'Maharatna'.

Before starting mining of coal at any location, CIL conducts Environmental Impact Assessment (EIA) and prepares a report along with Environmental Action Plan (EAP). The former illustrates the impact of its operations on social, economical and environment aspects and later i.e. EAP enlists the measures to combat the impact of mining to promote sustainable development. This report is submitted to Ministry of Environment and Forest (MoEF) to get environmental clearance to start the mining operations at site. And to sustain the changing business demands Coal India is involved in assessing and drafting policies before and after mining operations—some of which are resettlement and rehabilitation policy for the land losers, mine closure policy, safety rules, environmental policy, training policy, etc. which are revised time to time. Coal mining starts with the following steps:

- Mine creation
- Extraction or mining

- Processing
- Loading and transportation
- Mine closing

Mine Creation

The very first step to produce coal is mine creation wherein the place for mining is located and method to extract the coal is determined. It requires expertise from geologists, geotechnical engineers, mining engineers and surveyors. The work involves determining the size of coal deposits and the quality of coal. And accordingly they will decide to apply open cast or underground method of extraction.

Extraction or Mining

Coal can be mined or extracted by using open cast or underground method. Open cast involves removal of topsoil by use of dozers, from end loaders and trucks. Cap rock or laterite is disintegrated by dozers or by blasting which is used for road surface later. Overburdens are created by drilling blast hole and use of explosive called ammonium nitrate and fuel oil. This overburden are loaded in trucks or by using hydraulic excavator or front end loader and overburden dumps are created which are away from pit to extract coal (backfilling). When coal seam is free from overburden, the roof of seam is cleaned by using bulldozer after which coal is extracted using drill or by blasting. Underground mining happens either by room and pillar method or by long wall method.

Processing

It involves mainly two processes namely crushing and beneficiation. Crushing process reduces the big lumps of coal into small size and later the coal undergoes beneficiation in which impurities like ash and sulphur are removed or reduced by washing. Not all mines of CIL does washing of coal; for example at WCL washing is carried out by third party contractors.

Loading and Transportation

Soon after the processing the coal is loaded in trucks and transported mainly by trains to the end user or to the market.

Mine Closing

When the mines get exhausted of coal, the mines are closed with the landfills and steps to restore the natural vegetation are undertaken.

Technology

The operations of mining use high quality calibre heavy machines like dragline, shovels, trucks and front load excavator. Conveyors are used as inputs which are procured from internationally certified suppliers. As coal mining do not require any raw material storage and transportation, there is hardly any inbound logistics involved. Only the equipments like draglines, front load excavators, trucks etc. run from one mining area to another. Transportation of coal from exaction site to the vendor is the major function involved in mining of coal. At CIL this work is done with the help of trucks and railways. The process of transportation of coal causes dispersion of coal dust in the concerned areas which is handled by use of water sprinklers across the roads of transportation. Other methods include wet/mist conveyors, plantation (mainly bamboo). Coal dump yards are where extracted coal is stored and it does not require any storage facility as such. But these dump yards are prone to theft. Illegal mining is another issue which needs to be addressed more stringently. Figures 1 and 2 depict the dragline used for coal mining at one of the coal mining sites of Coal India.

Coal India is involved in producing different types of products like cooking coal, semi cooking coal, CIL coal, non-cooking coal etc. apart from coal washing units, milds, rejects which are used for different purposes. The details of the products and services of CIL are explained below:

Cooking coal: Coal when heated in absence of air forms coherent beads called coke having properties to be used for cooking purpose.

Semi cooking coal: This coal has less cooking properties. It is used in steel making, coke manufacturing and metallurgical industry.

NLW cooking coal: It has high content of ash and used in metallurgical and power utilities.

Non-cooking coal: Mainly used in thermal plants, cement, fertilizers, glass, ceramic and brick manufacturing.

Washed and beneficiated coal: This coal is processed of coal washing or beneficiation resulting in lower ash content.

Middlings: These are the by-products of coal washing, which are used as feed for power generation, domestic use, cement and brick manufacturing.

Rejects: These are product of coal beneficiation which are used as fluidized bed combustion, boilers for power generation.

CIL coke/LTE coke: It is a smokeless, environment friendly product produced by low temperature carbonization mainly at Dankuni Coal Complex.

Coal fines: These are the fraction of feed raw coal and LTC coal/CIL coke respectively.

Tar/Heavy oils/light oils/soft pitch: These are the products from Dankuni Coal Complex using low temperature carbonization of non-cooking coal.

All these products have their own advantages and disadvantages with certain usage characteristics which meet the demands of different industries dependent on them. But there are other clean technologies like Carbon Capture and Storage (CCS), Coal to Liquid fuel (CTL) and Underground Coal Gasification (UCG), which can make CIL to be more sustainable and responsible company and help it to retain its position in the market in future.

Impact of Coal Mining

Extraction of coal has many social and environmental effects apart from economical gains. As most of the coal reserves fall under the forest area, these areas are susceptible of being wiped out which may create an ecological imbalance and other problem of deforestation and pollution. The explorations create dumps containing high concentrated toxic minerals like arsenic, lead, etc. which when in contact with biological means will effect the food chain.

Exploration of mines leads to loss of land by indigenous people who own the land and creates mine drainage.

Beneficiation pollutes water with sulphur and nitrogen traces present in coal, which converts water into nitric acid and sulphuric acid creating acid mine drainage which are also formed during heavy downpour especially during the monsoon. Blasting of coal mines releases carbon dioxide, nitrogen dioxide and methane directly into the atmosphere which results in acid rain and it also pollutes air.

These gases are also one of the causes for ozone depletion. Noise pollution is another effect due to blasting of coal mines. It also causes dispersion of dust particles to nearby areas, which affects the health of aboriginals. Exposure to coal mining leads to various health hazards like skin allergies, cancer, nervous

system damage and diseases related to respiratory organs like asthma, bronchitis and lung cancer. It is found that infant mortality, under-five mortality and premature deaths are high in and around the coal mines due to increased pollution levels and exposure to harmful gases and minerals.

CIL addresses all these issues with its well defined plans, policies and practices. Some of them are illustrated below.

- As per the CIL policy, one member of any displaced family is provided with job guarantee and they are rehabilitated at different locations as a means of sustainable livelihood. A resettlement and rehabilitation policy is in place and reviewed every two years.
- Safety of employees is the prime concern in the mining industry. CIL trains its non-executive employee's safety standards to be followed during the mining operations and health hazards associated with it. Safety standards are implemented strictly as per mines safety rule of 1955. ISO 24000 (EMS) is being implemented in mining areas in phased manner and are not compromised at any cost which are covered in formal agreement in National Coal Wage Agreement IX and CIL was rated 'AAA' and 'A+' by CRISIL for implementing highest safety standards on two occasions. CIL has safety committees constituted at national, head quarter, subsidiary level, area level and mine level as per the Mines Rule 1955. It has a policy not to indulge in forced labour, child labour (The Mines Act, 1952) or discrimination in terms of gender and religion. Non-executive employees are enrolled to participate in collective bargaining with five active central trade unions to facilitate freedom of association.
- CIL has constructed 85 hospitals with capacity of 5806 beds, 411 dispensaries, 1277 specialist doctors to serve employees, their family members and local communities. It owns 664 ambulances and provides facilities like mobile dispensaries, wellness centres, tele-medicine at central hospitals to promote health and safety culture among the employees. CIL was rated 'A+' and 'AAA' by CRISIL for its highest safety standards in the mining industry.
- CIL is producing CIL coke/LTE coke which is a smokeless, environment friendly product by low temperature carbonization mainly at Dankuni Coal Complex. This coal has high caloric value and produces less pollution. The products generated during process—heavy liquid oils, low liquid oils,

tar and soft pitch—are used as fuel. CIL coke/LTE coke should be promoted to become more responsible and sustainable source of coal which in turn will contribute to produce cleaner source of energy.

- Process of extraction is made more socially and environmentally responsible by adopting the following practices:
 - Rail and conveyors are being used to reduce the pollution due to transportation of coal to thermal power stations. Surface mining and continuous mining are being implemented on large scale to reduce the air pollution.
 - Manual mines are replaced by semi-mechanized bored and pillar mining with Load Haul Dumpers and Side Discharge Loader.
 - Power support long-wall and universal drilling machines are being used to reduce the waste and increase the productivity.
 - Residential consumption of coal by employees is being replaced by free LPG connections.
 - Street lights in colonies as well as non-residential areas are switched to automated timer based operations and CFL bulbs are being used and according to feasibility photovoltaic cells are used to promote renewable energy.
- Table 2 depicts the energy consumption per tonne of coal by subsidiaries of CIL for the last two years, which indicates that except for CCL and WCL all other subsidiaries are steadily decreasing their energy consumption. The other sustainable practices adopted by CIL to reduce the energy consumption are:
 - Residential and non-residential areas' street lights are connected to auto timer to operate.
 - To reduce the power consumption, mercury/sodium vapour lamps are replaced by CFL.
 - To prevent hooking CIL has installed low voltage distribution line with insulated wire.
 - Solar energy is being used as alternate source of energy on roof tops of its establishments, residential buildings, non-residential buildings including hospitals and dispensaries.
- Sustainable culture is inculcated to employees from first day of their employment; as a part of induction, employees are exposed to sustainable policy and practices. Training is imparted both in-house and out-bound training centres for executive and non-executive cadre at 27 training institutes, 107 vocational training centres and at Indian Institute of Coal Management. IICM is especially

for executives training programmes which trains 20% of workforce engaged in safety training every year. But of the challenges Coal India faces is in implementing and monitoring the practices at non-executive level due to the complications involved.

Table 2: CIL's energy consumption (in MJ/Tonne)

<i>Subsidiary</i>	<i>2011-12</i>	<i>2012-13</i>
ECL	95.25	87.51
BCCL	113.11	109.04
CCL	51.66	54.14
NCL	23.22	21.38
MCL	10.72	10.26
SECL	32.61	31.89
WCL	51.19	52.27
NEC	92.19	94.14

Source: CIL annual report

- Vocational training is provided to local community people to empower them with employment. 'Mining with Human Face' is socially sustainable inclusive model to promote livelihood to people affected by mining projects of CIL. As per GRI's sustainable development guidelines, ILO and International Human Rights community development and welfare programmes fall under the human resource management (Social Performance).
- Some of the social development activities are providing various welfare amenities like schools, hospitals, community centres, sports complex, etc. to its employees and also to local communities in the areas of its operations. CIL supports 536 schools under which 55 are project schools, 284 are privately managed with grants, 72 are private committee managed educational institutes and 125 are occasional grant schools. Coal India Scholarships are given to 100 BPL students and 25 wards of land losers in government engineering and medical colleges. Initial medical examination and periodic medical examinations are conducted on regular basis. Potable water systems are installed in CIL's area of operation at a cost of 22.32 Cr. All these are focused on inclusive growth and sustainable development of local communities.
- As per the guidelines of pollution control board, the permissible levels of pollutants and harmful hazardous materials are controlled and every fortnight air, water, noise pollution levels are monitored regularly. This information is made

available on public domain through sustainable annual reports which are assured by a third party as per the GRI guidelines on Sustainable Development. Waste released from coal mining sites are carbon dioxide, carbon monoxide, methane, sulphur oxide, nitrogen oxide and heavy metals like lead, arsenic, ash, etc. The gaseous waste are directly released into the air using exhausters but use of carbon capture technique helps to reduce the amount of carbon dioxide or carbon monoxide released into air which are the main elements causing global warming. Such element capturing techniques can be developed to absorb the other harmful elements like nitrogen and sulphur which cause acid rain. During the process of beneficiation or washing of coal, the heavy metals come in contact with water leading to its contamination or formation of acid mine drainage. CIL has established water treatment plants at locations of washeries to overcome these problems.

Coal India is one of the world's largest coal producer operating in eight provincial states of India and the single highest exchequer payer to the government of India. It started with mere production capacity of 75 MTs and now it is the world's third largest producer of coal with a capacity of 453 MTs. As per the MoU signed between CIL and Ministry of Mines, it has been rated 'Excellent' in achieving the targets set by Ministry in terms of financial and non-financial parameters including sustainability development aspect. About the market capitalization of CIL, it is one of the largest organizations with good growth with high returns in capital market. The economic performance parameters of CIL are depicted in Table 3, according to which the financial performance of CIL has been good and is in upward trend when compared to previous year in terms of total production, off take of coal, sales, gross profit, capital employed, net worth, profit before tax, profit after tax, earning per share, dividend per share and at the same time its expenses on Human Resource and their welfare is also increasing. Environmental care and social care investments are also increasing.

Conclusion

Coal India is taking various initiatives in terms of social, environmental and economic development through various policy and practices.

Some of the practices of social development include establishing schools, colleges, hospitals, skill development programmes, free supply of water, gas and

Table 3: Economic performance of CIL

<i>Parameter</i>	<i>2012-13</i>	<i>2011-12</i>
Production (MTs)	452.21	435.85
Off-take of coal (MTs)	465.18	433.08
Sales	88281.32 Cr.	78410.38 Cr.
Gross profit	25024.21 Cr.	21326.64 Cr.
Capital employed	75488.14 Cr.	66599.31 Cr.
Net worth	48471.99 Cr.	40453.02 Cr.
Profit before tax	24979.04 Cr.	21272.66 Cr.
Profit after tax	17356.36 Cr.	14788.20 Cr.
Gross profit/Capita employed (%)	33.15	32.02
Profit before tax/Net worth (%)	51.53	52.59
Profit after tax/Net worth	35.81	36.56
Earning per share (Consider face value of Rs.10/share)	27.63	23.47
Dividend per share (Considering face value of Rs. 10/share)	14.00	10.00
Coal stock (Net)	0.76	0.92
Sundry debtors	1.42	0.87
Payment made to Government exchequers	28923.97 Cr.	23978.20 Cr.
<i>Employee benefits</i>		
Salary, wages, allowances, bonus etc.	18930.24 Cr.	16571.73 Cr.
Ex-Gratia	1062.70 Cr.	858.68 Cr.
PRP	505.48 Cr.	382.33 Cr.
PF & Other funds	2291.46 Cr.	1778.31 Cr.
Gratuity	1456.83 Cr.	3944.09 Cr.
Leave encashment	833.21	804.67
VRS	18.04	13.78
Workmen compensation	27.02	10.49
Medical expenses	306.66	273.42
Grants to schools & institutes	96.01	81.29
Sports and recreational	8.06	7.75
Canteen and crèche	3.10	2.95
Power-township	713.82	629/32
Hire charges of bus, ambulance etc.	43.90	33.52
Other employee benefits	1024.25	995.09
Total	27320.78	26387.42
<i>Welfare expenses</i>		
Medical expenses for retired employees	285.22	29.08
CSR expenses	140.13	81.99
Sustainable development expenses	10.72	-
Environmental expenses	45.33	45.50
Tree plantation	16.58	19.31
Other expenses	130.60	119.59
Total	622.43	317.60

Source: CIL Annual report



Figure 1: Drag liner.



Figure 2: Coal mine site.

electricity, creating infrastructure, health, education and other community facilities.

Environment development initiatives include planting bamboo trees, afforestation at closed mines, establishing water treatment plant, septic plants, environmental management system, etc.

In terms of economic development CIL is the largest exchequer to the Government of India. It is giving economical support to more than three lakh employees and invested in many corporate social responsibility and sustainability development initiatives and is honoured with status of 'Maharatna'. From the case it can be stated that Coal India has embedded sustainability

development as its core corporate strategy in the form of vision, mission, policies and practices to become a sustainable organization.

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