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State of the Environment - Iron Ore Mining

Orissa's iron ore occurs mainly in high grade deposits (haematite). It is, accordingly, used in steel production. Seventy three mines were operating in Orissa and produced 16 million tons of iron ore. In 2003, due to better domestic and international market prospects and the high quality of Orissa's iron ore reserves, new plants came up and 10-12 new companies have expressed interest to invest in Orissa. As a result iron ore production increased by 35 %. Apart from relief & rehabilitation issues, Biodiversity, air & noise pollution are causes of concern in the years to come. The low mining exposure once have higher floral diversity as compared to high exposure area. Higher total Dissolved solids, slight increase in iron content and in some cases hardness of water has been recorded in high exposure are of the state. The most tolerant species like "Sal" in mining condition are being affected due to iron oremines.

The total iron ore reserve of the worlds has been estimated at 229,000 million tones. India's percentage share in the total reserve of the world is 5.46. The country has one of the highest Iron content of 63 percent (average) in its iron ore. The state of Orissa

had a total reserve of 4177 million tones of haematite ore as on 1-4-2000 with a share of 34 percent in India's total reserve of haematite ore - the highest in the country. The latest estimate (as on 31-3-2006) says the iron ore reserve is 5428 million tons

History of Iron Ore Mining

India is one of the earliest manufacturers and users of iron and steel in the world. This is indicated from a number of references available in the annals of metallurgical history. A survey of literature reveals many documentary evidences, such as making of various surgical instruments in the 3 rd / 4 th century B.C. by Sushrut, presentation of a gift of 30 lb of Indian iron by King Porus to Alexander the Great on the bank of Jhelum (around 326 B.C.) and the use of different weapons in various shapes and sizes in the ancient times.

The first signs of use of iron come from the Sumerians and the Egyptians, where around 4000 BC, a few items, such as the tips of spears, daggers and ornaments, were being fashioned from iron recovered from meteorites. Because meteorites fall from the sky some linguists have conjectured that the English word iron (OE isem), which has cognates in many northern and western European languages, derives from the Etruscan aisar which means "the gods".

Break up of the total iron ore reserve in Orissa

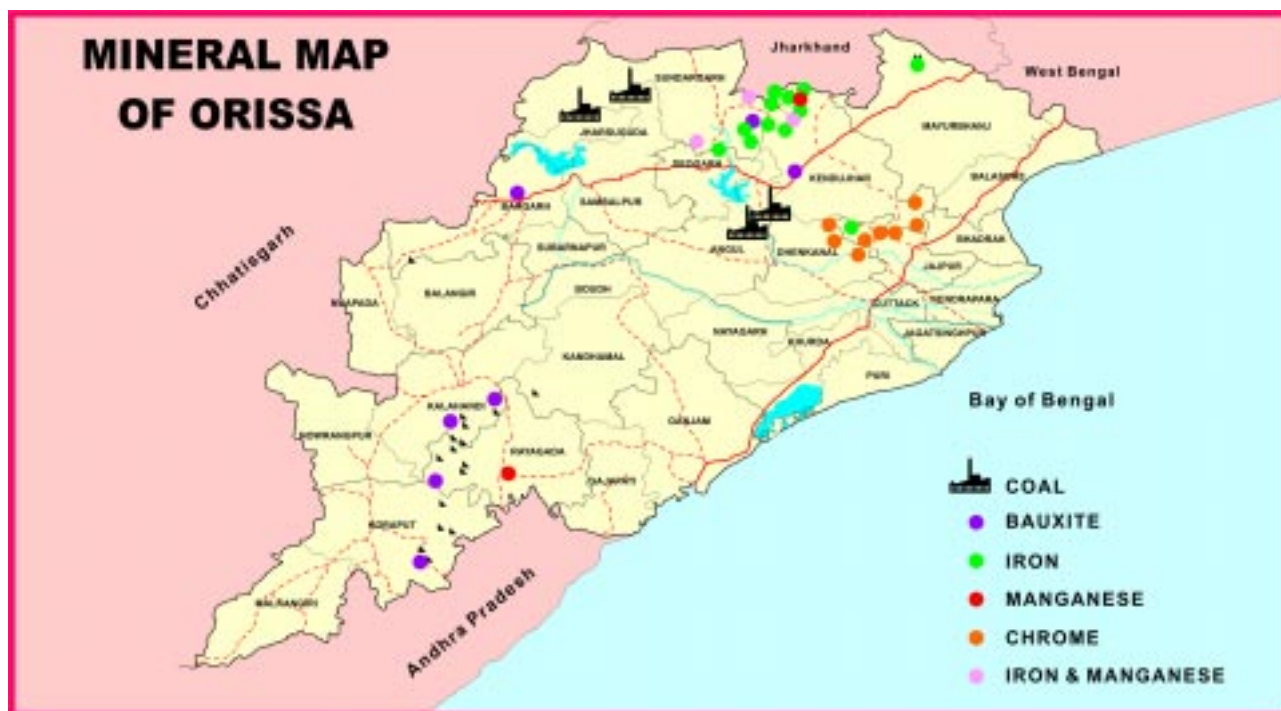
Category of reserves	Leasehold & freeholds	Leasehold area	Freehold area
In situ reserves in million tons			
Proved	1824	1778	46
Probable	763	403	360
Possible	1590	775	815
Total	4177	2956	1221
Recoverable reserves in million tons			
Proved	1528	1503	26
Probable	518	313	198
Possible	1158	604	553
Total	4177	2956	1221

The iron ore deposits of the state occur in five distinct geographic zones namely Bonai-Keonjhar, Gandhamardhan, Tomka-Daitary, Gorumahisani-Badampahar and Hirapur. Out of these zones the main iron ore deposits of the state are found along the classic Bonai-Keonjhar horse-shoe shaped iron ore synclinorium in which the tops of iron contain high grade deposits. Keonjhar district alone contributes 75 % reserve of the State. Next to this is Sundergarh district with about 22 % reserves of the State.

Orissa produced about 46 Mt of iron ore in 2004-05 with a share of 35% of India's total production of haematite plus magnetite ore. Orissa's haematite ore

production recorded a growth of about 82 percent between 2001-02 and 2003-04. In 2003-04, Orissa produced highest haematite ore in the country.

Production of iron ore in Orissa	
Year	Productin (million tonnes)
2000-01	14.35
2001-02	16.79
2002-03	22.26
2003-04	34.89
2004-05	46.07
Source : Directorate of Mines	



Government Policy:

According to a recent Govt. policy, companies who are willing to carry out iron ore mining in the state will have to buy land for installation of a steel making facility to make them eligible for mining in the state. They will be allowed to mine in Orissa after they spend 25 per cent of the project cost towards industrialization. The mining lease will be given only after they spend 50 percent of the project cost.

Future Scenario

Total reserves of in situ iron ore in India, including magnetite have been estimated at approximately 17 billion tons. Fortunately, ores are of a fairly good quality.

Export & Revenue	
Year	Export in million tonnes
2000-01	2.99
2001-02	3.55
2002-03	5.49
2003-04	9.04
2004-05	10.83

State revenue from Iron ore	
Year	Revenue in Rs. crores
2000-01	17.26
2001-02	31.05
2002-03	42.26
2003-04	59.32
2004-05	72.85

Source : Directorate of Mines



Import Policy

The general policy procedure for importing iron and steel, ferro-alloys and ferrous scraps is decided by the Ministry of Commerce as in the case of other non-ferrous items. A close watch is maintained on import and domestic availability to ensure that the industrial requirements are met to the maximum extent possible and industrial activities are not adversely affected due to non-availability of iron and steel.

Export Policy

Iron and steel, industry has been completely exempted from the provisions of compulsory licensing. According to the New Industrial Policy, automatic approval will be given for investments up to 51 % foreign equity to cover the foreign exchange requirement for imports of capital goods. These include industries producing iron ore pellets, sponge iron, pig iron, ferro-alloys and steel of all categories.

Environmental Concern

a) Iron ore crushers: At present most of the miners are establishing iron ore crushers. The major pollutant from the crusher points is dust which affects the nearby locality.

b) Bio-diversity : The low mining exposure areas have high floral diversity as compared to the high exposure areas. The biomass intensity is also found to be very low in case of areas with high exposure to mines. The key dominant plant species is Sal (*Shorea robusta*). Due to establishment of new mines or in case of expansion of mining in forest area this species suffers much. Water quality reports of those areas show high total dissolved solid, slight increase in iron content and in some cases hardness is found to have increased.

Environment in the mining area is being affected mainly due to deforestation, land loss due to lease area and

pollutants discharged from mines to the nearby agricultural land and forests.

In most cases, sal forests are being affected due to mining. Forest areas are being degraded due to construction of roads, settlements and mines expansion. If this process continues, a large amount of land resources will be lost. In manual mining method, the mining area is generally extended to avoid deep mining. This causes more environmental degradation. People who work in the mines also do some felling for their settlement. So much pressure is being created on the forest produce.

The mines waste are being dumped in the surrounding area of the mines, which gradually becomes hard and in several areas plantation becomes impossible. There is a

Land use change in Joda Block		
Landuse	Area during 1989 in ha	Area during 2004 in ha
Habitat	1466.27	1644.45
Agriculture	22128.61	21520.57
Forest	36191.82	24501.17
Waste Land	8294.82	18540.86
Mining	1646.41	2807.11
Land use change in Keonjhar Sadar Block		
Landuse	Area during 1989 in ha	Area during 2004 in ha
Habitat	2822.02	3642.86
Agriculture	36282.00	35452.14
Forest	12837.99	7576.63
Waste Land	4177.00	6280.43
Mining	755.54	777.76
Water Body	1089.64	1054.10
Source : Growth & Environment Studies, World Bank (2006)		

chance of land slide if waste management is not properly done. Air pollution is a major problem in iron ore mining area. It is higher in winter season. The main constituent of air pollutants is suspended particulate matter.

Total iron mining lease area - 36947.303 ha
Forest area - 21647.396 ha
No. of Iron & associated minerals - 135
Source: Directorate of Mines

Persistent Organic Pollutants (POPs) in Orissa

POPs are a class of synthetic toxic chemicals that cause severe and long term effects on wildlife, ecosystems and human health. Some of the POPs have been implicated in the increase in incidence of certain cancers (e.g. breast, prostate, endometriosis etc.), reproductive problems such as infertility, sex-linked disorders and declining sperm counts, foetal malformations, neurobehavioral impairments and immune system dysfunction. Because of such evidence of major threats to human health, the UNEP has short-listed twelve substances for elimination, which include organochlorine pesticides, (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, Mirex, Toxaphene) industrial chemicals like polychlorinated biphenyls (PCBs) and dioxins and furans.

POPs when released to the environment can be transported by air & water to places far and wide. The journey through the environment (typically) consists of three stages: evaporation, transport in the atmosphere and condensation at lower temperature. This is known as the "grasshopper effect".

Agriculture is the mainstay of Orissa's economy and sustenance of life of the people. Agriculture and Animal Husbandry contribute 25.7% of the net domestic product of the state. With 69.65 M.T. of total food grains being produced per year on the average, and 61403.97 X 000 M.T. of fruits and 7719000 M.T. productions of vegetables, the state is all set to increase its food security through modernization and improved farming in the years to come. This may led to more pest control mechanisms and increased load of pesticides to the environment. Though integrated pest management has been made a thrust area and all of the pesticidal POPs have been banned in the

state, there are all possibilities of use of these pesticides in unorganized sectors.

DDT is used in the health Sector

Neem based pesticides and biological controls have been under trial through integrated pest management control in Orissa. Some 200 MT of Neem based pesticides, 2126 lakhs of parasites and 120 MT of Biocides have been consumed in the state.

Current status of POPs in Orissa			
Sl. No.	Name of chemical	Category	Situation in Orissa
1.	Aldrin	Pesticide	Banned Pesticides from 20th September 1996
2.	Chlordane	Pesticide	Banned Pesticides from 20th September 1996
3.	DDT	Pesticide	Restricted pesticides and banned for agriculture (used in health sector for control of Malaria) from 26th May 1989
4.	Dieldrin	Pesticide	Restricted pesticides banned for agriculture from July 2001
5.	Endrin	Pesticide	Restricted pesticides banned for agriculture from July 2001
6.	Heptachlor	Pesticide	Restricted pesticides banned for agriculture from July 2001
7.	Hexachlorobenzene	Pesticide/Industrial	Not registered for use
8.	Mirex	Pesticide	Not registered for use
9.	Toxaphene	Pesticide	Not registered for use
10.	PCBs	Industrial	Never manufactured
11.	Dioxins	By-product	Unintentional byproduct
12.	Furans	By-product	Unintentional byproduct

Some potential sources of POPs other than the organized sector			
Sl. No.	Chemical	Activity	Uses
1.	Chlordane	Use	Insecticides, termiticide in roads and buildings
2.	Heptachlor	Use	Termiticide, wood treatment

Know the Rules

The Mines Act, 1952

The Mines Act 1952 regulates the mining operations and also deals with the management of mines. Apart from this it also contains beneficial provisions for the mine workers, Chapter V of the Act provides certain standards for the health and safety of the mine workers; safe drinking water for all of them, sufficient and hygienic facilities for both i.e. male and female workers, and proper medicinal facilities. Chapter IV of the Act provides for weekly day of rest, and compensatory rest. The act also regulates night shifts and working hours in underground mines. Employment of women in underground mines is strictly prohibited. The amendment made to the Mines Act in 1983 prohibits employment of persons below the age of 18 years.

The Factories Act, 1948

The Factories Act, 1948 was passed to provide for safety, welfare and health of the labour engaged in factories. This Act is a social legislation with the aim to achieve social reforms for factory workers. Chapter III of the Act contains provisions for keeping the factory clean and ventilated. Several duties are imposed on the owner of the factory relating to the treatment of wastes and effluents, the maintenance of an optimum temperature so that the workers can work properly without any injury to their health and prevention of overcrowding in a room in a factory where workers are doing their jobs. The owner is also responsible for making proper arrangements in the

factory, providing lighting arrangements in the factory, providing safe drinking water, and making adequate and sufficient arrangements for toilets and spittoons. Chapter IV of the Act imposes a duty for proper fencing of the machinery to avoid any accidents. It strictly prohibits the employment of young persons on complex machines and the presence of women and children near cotton-openers. It is the duty of the owner of the factory to give information to the workers regarding the handling of hazardous substances and processes in the factory. It is also the duty of the factory owner to maintain an up-to-date health record of the workers who are working with such hazardous substances and processes. Chapter V of the Act deals with the welfare provisions regarding workers, such as, washing facilities, first aid appliances, canteens, rest rooms, lunch rooms and crèches. Chapter X makes provisions for the punishment and penalties if the owner of the factory violates any provision of the Act.

The Indian Forests Act, 1927

With the object of protecting forests the Indian Government enacted important forest legislations. First, it enacted the Indian Forest Act, 1927 which relates to the use of forests and then came the Forest (Conservation) Act, 1980, which deals with the conservation of forests. The Indian Forest Act, 1927, consolidates the law relating to forests the transit of forest produce and the duty leviable on timber and other forest produce. It establishes three classes of forests namely; reserved forests, village forests and protected forests. While interpreting the term 'forest land' under this Act the supreme Court has held that the term 'forest land' includes not only the area as provided in the Act but also any area recorded as forest in Government records irrespective of the ownership. Felling and burning of any tree, quarrying, pasturing of cattle, clearing land for cultivation in any protected forest are prohibited under the Act. It is the duty of every person exercising rights in

a reserved or protected forest to assist forest officers and police officers in the prevention of the commission of an offence under the forest law. The purpose of the Forest (Conservation) Act, 1980, is to slow down deforestation caused by the conversion of forestlands for non-forest purposes. The Act was passed to preserve the natural habitat of wild life. It restricts the use of forest for non-forest purposes and de-reservation of reserved forests. It restricts felling of trees and regulates diversion of forestlands by way of lease to private industries and individuals. It places restrictions on the power of the State Government concerning preservation of forests or use of forestland for non-forest purposes like clearing forest land for cultivation of tea, coffee, horticultural crops etc. It prohibits the State Government from clearing any forestland of trees, which have naturally grown in that land except for the purpose of reforestation.

The Biological Diversity Act, 2002

The Biological Diversity Act, 2002 was enacted to conserve and protect the rich biological diversity and the associated traditional and contemporary knowledge system. The Act makes provisions for the use of diversities within the

species or between species and the eco-systems in a manner which would meet the needs and aspirations of the present and future generations. It has a provision to set up three authorities under the act, namely; the National Bio-Diversity Authority, the State Bio-Diversity Board and the Bio-Diversity Management Committee. The function of these authorities is to regulate the biological resources occurring in India for research purposes, commercial utilization and bio-utilization of resources, such as, drugs, cosmetics, colours, food flavours, genes used for improving crops and livestock by genetic interventions.

What some dailies report:

1. Imports by the world's steel making countries grew by 10% in 2005 to reach 715 million tonnes compared to 2004's 650 million tonnes. The largest importing country was China. Imports into China from India, at 68.5 MT, were up by 18 MT on 2004 which means that imports from India have increased tenfold since 1998. The major exporters of iron ore in 2005 were Australia (239 million tonnes) and Brazil (224 million tonnes).

Source: Iron and Steel Statistics Bureau.



2. India is among countries with large deposits of iron ore, Brazil tops the list. However, the potential steel demand of India & Brazil over time was 300 million tonnes and 13-14 million tonnes respectively. At 300 MT of annual steel demand, Indian reserves would last only 40 years.

Source: *The Hindu Business Line*, 20th May 2005.

3. A technology called Self-Assembled Monolayers on Mesoporous Supports (SAMMS) has been developed at Pacific Northwest National Laboratory (PNNL) to capture and remove mercury and other toxic substances from industrial waste streams.

Source: *PNNL News*, 23rd May 2006.

4. The U.S. Environmental Protection Agency will begin oversight of a clean up in early June at four residential properties in Dewey-Humboldt, Ariz., where elevated levels of arsenic were detected in soil at homes near the Iron King Mine Site.

Under the settlement with Ironite Products, Inc., the company will excavate soils at each residence and replace it with clean soil.

Source: EPA News 15th May 2006.

5. Tata Steel has inaugurated India's first automated iron ore fine jigging plant at Noamundi Iron Mine of the company situated in West Singhbhum district at Jharkhand. This plant will help in effective use of iron ore fines, reducing coke consumption and increasing productivity of blast furnaces. The capacity of the plant is about 300 tonnes per hour or 1.6 MTPA throughputs. Further, the Hydro-cyclone Plant installed will help in recovering iron values from the slime being discharged from washing plant and reduce alumina level.

Source: *NewKerala.com*, May 9th May 2006.

6. The Government of Guyana and the Essar Group of India have signed a Memorandum of Understanding for manganese and iron exploration. Source: *Stebroek News*, 17th May, 2006.

Feedback

We would appreciate if you send us comments and suggestions.

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