Diagnostic Study of Iron Ore Cluster in Keonjhar, District of Odisha

Submitted to: The DC (MSME), Ministry of MSME (Government of India)

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MICRO, SMALL & MEDIUM ENTERPRISES
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सत्यमेव जयते

Acknowledgement

We are very thankful to the DC, MSME for undertaking a project of such vital importance as the diagnostic study of the Keonjhar iron ore cluster. We sincerely thank all iron processing unit owners, managers and employees who have made this study possible by heartily participating in surveys and the stakeholder consultation workshop. We thank the District Collector, General Manager, DIC, Assistant General Manager, DIC and the Industry Promotion Officer for their kind cooperation.

We appreciate the hard work of our field coordinators Mr. Anant Panda and Mr. Raghunath Barik who braved all odds to complete this study in time. Surveying the units in a highly polluted environment coupled with tremendous difficulties in transportation is a truly commendable job.

We thank all of you without whose cooperation; the study could not have seen its fructification.

Cluster Team, CSREM

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Executive Summary

Prime Minister Dr. Manmohan Singh said in his key note address at India Steel Summit 2007, “In the last five years, the production and consumption of steel has grown at rates exceeding 9% per annum. The pace of growth has further accelerated in the current year to over 10%." That speaks volumes about the importance of iron ore in the Indian economy, which is the primary ingredient for steel. Keonjhar iron ore cluster in Orissa contributes around 3/4th of the total iron ore production of Orissa, which in turn, holds 32.9% of the total iron ore reserves in the country. Acknowledging its importance, a diagnostic study has been commissioned by the DC, MSME to study the problems and prospects of the cluster. As the Keonjhar iron ore cluster is not facing a crunch situation for the business unlike normal underperforming clusters, which become subjects of diagnostic studies, the study uses the SWOT analysis as the main tool besides a questionnaire survey.

The survey reveals that every two in five units have 20-25 employees, nine in ten units have invested up to three crores initially, four in five units are less than 10 years old and nine in ten units produce up to 3 lakh tonnes annually. Every one in two units admitted to have got financial assistance recieved up to Rs. 50 lakhs of term loan. Every two in five such units have also taken up to Rs. 50 lakhs of cash credit. The units make around 10%-15% of profits and are happy about the state of business as such but terribly dissatisfied about the state of basic infrastructure in the region. Nonexistent roads, unreliable medical facilities, little option in education and almost lack of social support remain their major concerns.

The SWOT analysis identifies huge reserves of good quality hematite, sound financial condition of the units, cost effective railway connectivity, export potential, skilled labor and a functional business association as the major strengths of the cluster. Lack of modern technology, scarce water resources, nonexistent roads, severe pollution and lack of social support are the major weaknesses, while the opportunities lie in technological innovations, networking, single window governance and growing markets. The cluster is threatened by unsustainable rates of mining, depletion of forest resources and dissatisfied local communities.

The action plan suggests increasing social capital as the major tool to utilize the strengths for capitalizing on opportunities. Need for an Environment Management Plan and rehabilitation and resettlement policy is also emphasized along with development of a web-based interenterprise information system.

INTRODUCTION

India is the 4th largest producer of iron ore in the world with around 131 years of reserves at the present rate of extraction. Iron is the world's most commonly used metal. It is used primarily in structural engineering applications, general industry applications, automobiles and maritime processes. Iron-rich rocks are common worldwide but mining is largely constrained by the proximity to market, cost/presence of rail infrastructure and the cost of energy to support such activity. The production of raw iron ore averages above 1 billion tonne worldwide with the global scene being dominated by giants like Brazilian mining corporation CVRD, Australian major BHP Billiton and Anglo-Australian major Rio Tinto. China is the largest consumer of iron ore followed by Japan. India, USA, European Union and Korea are other major players in this market. Magnetite (Fe_3O_4) and Hematite (Fe_2O_3) are the most common ores for iron. The total recoverable reserve in India is around 9600 million tonnes of hematite. Orissa holds 32.9% of the total estimated iron reserves of India and nearly 3/4th of that comes from Keonjhar district alone. Growing importance of iron ore in the Indian economy is reflected in the National Steel Policy, which has set the production target for 2020 at 110 million tonnes of steel. It intends to double the production capacity from 40 million tonnes to 80 million tonnes by 2012. The per capita steel consumption in India is 28 – 30 kg as against 350 – 400 kg in developed countries. That leaves a tremendous scope for India to grow in steel consumption and consequently that of iron ore.

Minerals are an important source of revenue for Orissa. Mineral royalty constitute a major portion of non-tax revenue of the state. It has increased from 52.58% of the total non-tax revenue in 2000-01 to 65.17% in 2004-05 as per the Orissa Economic Survey, 2005-06.

Table 1: Share of mining sector in the total non-tax revenue of Orissa

Year	Total revenue from Minerals	Total non-tax revenue	% of non-tax revenue
2000-01	360.32	685.50	52.58%
2001-02	376.45	691.80	54.42%
2002-03	443.53	961.20	46.14%
2003-04	550.77	1094.50	50.32%
2004-05	670.51	1028.90	65.17%

Source: Govt. of Orissa, Economic Survey, 2005-06 (Bhubaneswar: Govt. of Orissa, 2006).

Iron ore is the major mineral for the state of Orissa. Orissa is has rich reserves of hematite ore, which primarily comes from Keonjhar district.

Table 2: District-wise extraction and value of iron ore in Orissa during 2004-05

Sl_No.	District	Iron Ore	
		Quantity (In lakh tones)	Value (Rs. in crores)
1	Keonjhar	367.93	1548.68
2	Sundergarh	78.07	328.67
3	Jajpur	11.01	30.83
4	Mayurbhanj	3.62	15.25
Total		460.63	1923.43

Source: Govt. of Orissa, Economic Survey, 2005-06 (Bhubaneswar : Govt.of Orissa, 2006)

The importance of Keonjhar in the state economy is self-evident. Apart from the captive mines of steel companies, there are 103 registered enterprises engaged in the business of iron ore processing. These business units constitute Keonjhar Iron Ore cluster, which is the subject of this diagnostic study.

DISTRICT PROFILE

As a sequel to the integration of the feudatory states with Orissa on 1st January, 1948, the erstwhile princely state of Keonjhar emerged as one of its districts with its head-quarters at Keonjhargarh and since then it has been continuing as such.

Keonjhar has the distinction of containing one of the oldest rocks of the world, approximately 38,000 million years old covering an area of 100 Sq. kms at Asanpat. It has also the oldest stone inscription of Orissa paleogeologically belonging to the Gupta period. In Sitabinj, one finds the fresco paintings in the cave shelter of Ravana Chhaya dating back to 5th Century A.D.

Anthropologically, its two main tribes, namely the Juangs and the Bhuyans carry a distinct and primitive past. The Juangs claim themselves to be the most ancient tribe of the world. In spite of their modern ways of living, many aboriginal practices are still prevalent among them.

The district of Keonjhar is highly rich in mineral resources and has vast deposits of Iron, Manganese and Chrome ores. About 30 percent of its total area is covered with tracts of dense forests. But the district, in spite of its immense mineral and forest wealth, still remaining economically backward.

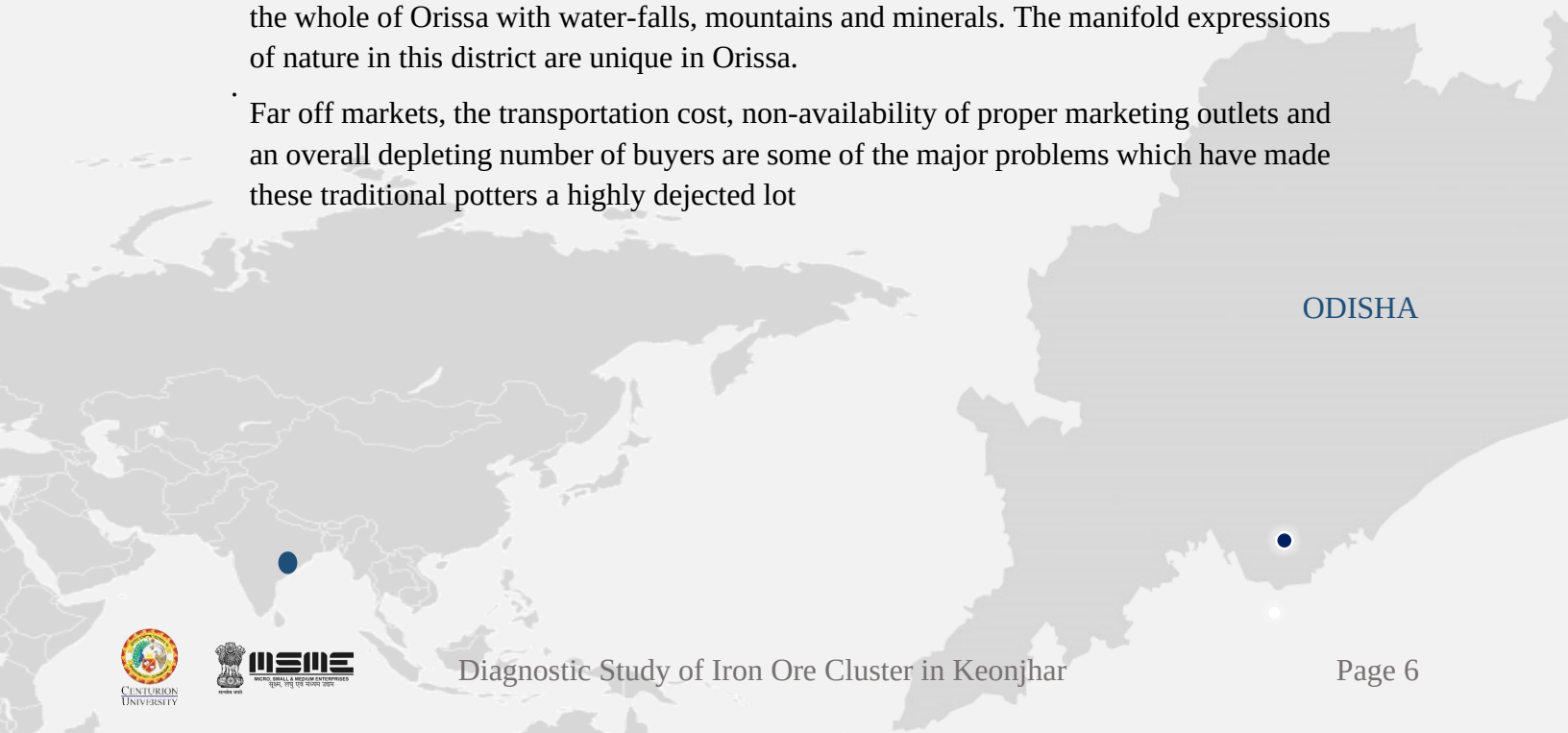
History

The whole district of Keonjhar was a princely state before its merger with Orissa. The early history of the State is not adequately known. It was most probably a part of the old Khijjinga territory with headquarters at Khijjinga Kota, identified with modern Khiching. It became a separate state with Jyoti Bhanja as its ruling chief sometime during the first half of the 12th century A.D. The then State of Keonjhar comprised only the northern half of the modern district for a long time prior to the installation of Jyoti Bhanja as king. During the latter part of the 15th century the southern half was occupied by King Govinda Bhanja under whose rule Keonjhar was extended from Singbhum in the north to Sukinda (a Zamindari in Cuttack district) in the South and from Mayurbhanj in the East to the borders of the States of Bonai, Pallahara and Anugul in the West. During the rule of Pratap Balabhadra Bhanja (1764-1792 A.D.) two small areas of Tillo and Jujhpada were purchased from the Zamindar of Kantajhari and were added to the State. These were recognised as parts of Keonjhar in the Sanad granted by the East India Company to Raja Janardan Bhanj in 1804. Since then there had been no territorial changes of the state till its merger with the province of Orissa. But after merger largely for the reasons of administrative expediency the areas of Tillo (7.51 sq.km) and Jujhpada (9.06sq.km.) were transferred to the districts of Baleshwar and Cuttack respectively, while a number of villages called Ambo group (14.84 sq.km.) of Balasore district were added to Keonjhar district.

Geography

The district of Keonjhar, lying between 21°1'N and 22°10'N latitude and 85°11' E to 86°22' E longitude presents a panorama of millennia, both from the geographical and anthropological point of view. Spread over an area of 8,240 Sq. kms, it is as varied as the whole of Orissa with water-falls, mountains and minerals. The manifold expressions of nature in this district are unique in Orissa.

Far off markets, the transportation cost, non-availability of proper marketing outlets and an overall depleting number of buyers are some of the major problems which have made these traditional potters a highly dejected lot



Climate

The climate of the district is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During the summer maximum temperature is 38.2^0 C. The weather becomes more pleasant with the advent of the monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. 11.7^0 C. Sometimes it even drops down to 7^0 C. The average annual rainfall is 1534.5 mms.

Population

Table 3: Population facts of Keonjhar district

Rural	13,48,967
Urban	2,13,023
Male	7,90,036

Source: Census of India, 2001

Table 4: Workers' profile in Keonjhar district

	Male	Female	Total
Total workers	4,04,691	2,16,535	6,21,226
Main workers	3,24,702	70,458	3,95,160
Marginal workers	79,989	1,46,077	2,26,066

Source: Census of India, 2001

Table 5: Blockwise Rural Population

Name of the block	Number of villages	Total population		
		Male	Female	Total
Anandpur	125	42,602	41,748	84,350
Banspal	163	35,196	35,451	70,647
Champua	148	39,776	40,329	80,105
Ghasipura	179	62,899	61,156	1,24,055

Ghatagaon	142	44,164	43,662	87,826
Harichandanpur	218	50,358	49,205	99,563
Hatadihi	212	62,076	60,358	1,22,434
Jhumpura	154	41,742	41,703	83,445
Joda	118	37,794	36,876	74,670
Keonjhar	225	58,732	57,992	1,16,724
Patna	153	40,239	40,982	81,221
Saharpada	139	34,950	35,952	70,902
Telkoi	149	37,601	36,609	74,210
Total	**2,125**	**5,88,129**	**5,82,023**	**11,70,152**

Source: Census of India, 2001

Table 6: Urban population of Keonjhar

Name of municipality /NAC /census town	Population		
	Male	Female	Total
Barbil (Municipality)	15,883	14,395	30,278
Joda N.A.C.	22,705	19,327	42,032
Keonjhar (Municipality)	16,280	14,789	31,069
Anandapur N.A.C.	22,742	19,203	41,945
Daitary(Census Town)	2,364	2,070	4,434
Champua(Census Town)	3,062	2,684	5,746
Bolani(Census Town)	6,315	5,055	11,370
Total	**89,351**	**77,523**	**1,66,874**

Source: Census of India, 2001

Tribes

The Scheduled Tribes of Keonjhar district which totaled 4, 99,657 in 1981 census increased to 5,95,184 in 1991 census, thus registering a growth of 11.90% in a decade (1981-1991). As per 1991 census there were 46 Scheduled Tribes in the district. Out of these the principal tribes were Bathudi, Bhuyan, Bhumij, Gond, HO, Juang, Kharwar, Kisan, Kolha, Kora, Munda, Oraon, Santal, Saora, Sabar and Sounti. These sixteen tribes constituted 96.12 % of the total tribal population of the district. The concentration of Scheduled Tribes is the highest in Keonjhar and lowest in the Anandapur Sub-Division.

The majority of the Scheduled Tribes are in agricultural occupations or in mining, quarrying and other services. The literacy among the Scheduled Tribes was 15.25% in the 1981 census but it has increased to 24.89% in the 1991 census. This percentage is higher than the State average of 22.31%. The spread of education and communication facilities and the implementation of various development projects have helped the Scheduled Tribes a lot to change their manners and customs to some extent.

Industry

Keonjhar is one of the premier mineral producing districts in Orissa. The district occupies a prominent place in the mineral map of the country. Iron ore formations occupy most part of the district which can be traced from the Bihar boarder in the north to the Jajpur boarder in the South. Extensive deposits of manganese ore are found in Thakurani and Joda East hills of Barbil. Good deposits of chromite, an important and strategic mineral are found in Boula area near village Nuasahi of Anandapur sub-division. There are also some other mineral deposits in the district such as quartzite, bauxite, gold, pyrophillite and lime stone.

Engineering and metal-based industry: There are 53 small industries in the district employing 274 persons with an investment of 23.56 lakh producing automobiles spare parts, fabrication work (steel furniture), almirah, trunks, boxes, grills and steel metal products.

Chemical and allied industries: These 48 industries are mostly concentrated at Keonjhar, Barbil and Ghasipura. There are 268 persons working with capital investment of 30.79 lakh producing agarbati, candles, bore-metal, battery plates, lime powder, washing powder soap, spray paints and plastic products.

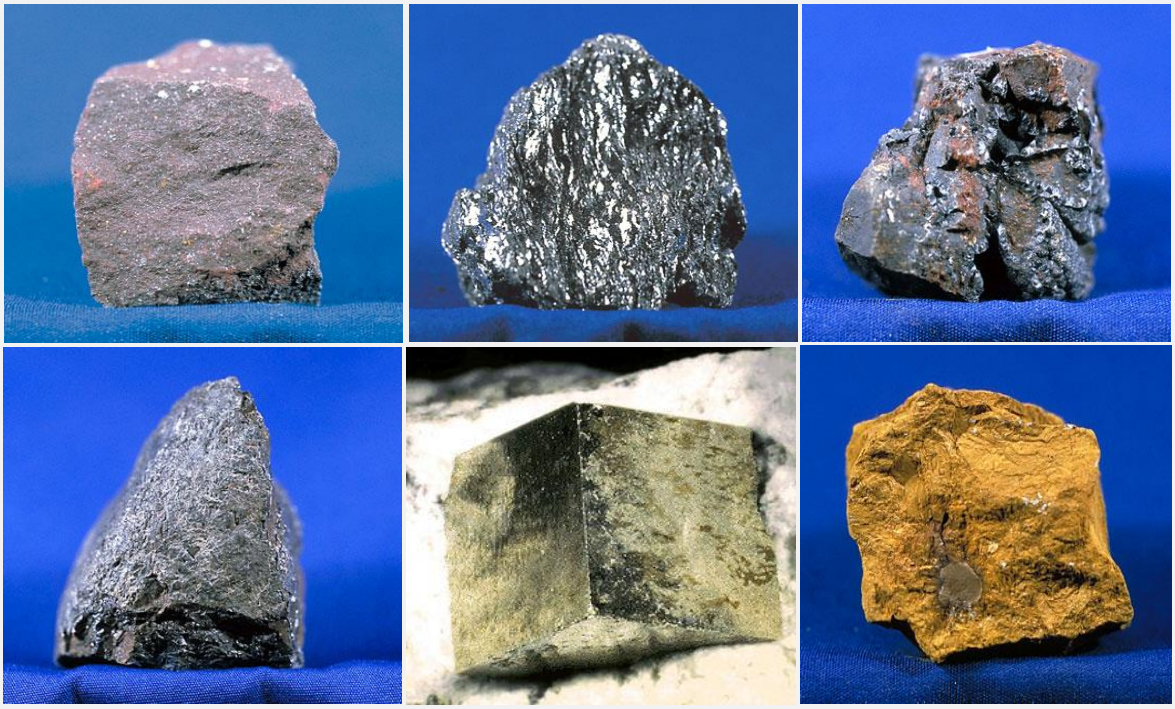
Agro- and marine-based industries: These are mainly situated at Keonjhar, Jhumpura, Tara, Erendei and Saraskolla. The 242 industries have given employment to 893 persons with an investment of 86.96 lakh processing paddy, wheat, oil seeds and bakery products.

Table 7: Other small industries in Keonjhar district

Name of the Industry with nos.	Location	Investment (Rs. in lakh)	Employment potential	Products
Textile based industries - 119	Keonjhar,Anandapur, Champua	47.22	494	Readymade garments, Tassar and cotton cloths.
Power loom - 01	Jagannathpur, Keonjhar	0.39	05	Goods worth 1.6 lakhs per annum
Wood and forest industries- 142	Keonjhar, Anandapur	38.91	607	Furniture
Bricks manufactures, stone crushing and other allied industries - 06	Keonjhar, Anandapur	2.51	117	Bricks, stone chips
Live stock leather industries - 16	Patna, Madhapur, Sananeuli, Chemana	4.01	77	Shoes, Chappals
Servicing and miscellaneous Industry - 246	Keonjhar, Anandapur, Joda-Barbil	39.35	749	Bidies, paperbag, body building of vehicles
Glass and ceramic based industry - 130	Keonjhar, Anandapur, Joda-Barbil	49.04	1861	Glass and ceramic products

IRON ORE: AN OVERVIEW

Iron ores are rocks and minerals from which metallic iron can be economically extracted. The ores are usually rich in iron oxides and vary in color from dark grey, bright yellow, deep purple, to rusty red. The iron itself is usually found in the form of magnetite (Fe_3O_4), hematite (Fe_2O_3), goethite, limonite or siderite. Hematite is also known as "natural ore". The name refers to the early years of mining, when certain hematite ores contained 66% iron and could be fed directly into iron making blast furnaces. Iron ore is the raw material used to make pig iron, which is one of the main raw materials to make steel. 98% of the mined iron ore is used to make steel.



As per the Mineral Information Institute (www.mii.org, Iron (Fe) is a metallic element composing about 5% of the Earth's crust. When pure it is a dark, silvery-gray metal. It is a very reactive element and oxidizes (rusts) very easily. The reds, oranges and yellows seen in some soils and on rocks are probably iron oxides. The inner core of the Earth is believed to be a solid iron-nickel alloy. Iron-nickel meteorites are believed to represent the earliest material formed at the beginning of the universe. Studies show that there is considerable iron in the stars and terrestrial planets: Mars, the "Red Planet," is red due to the iron oxides in its crust.

Iron is one of the three naturally magnetic elements; the others are cobalt and nickel. Iron is the most magnetic of the three. The mineral *magnetite* (Fe_3O_4) is a naturally occurring metallic mineral that is occasionally found in sufficient quantities to be an ore of iron.

The amount of hematite needed in any deposit to make it profitable to mine must be in the tens of millions of tons. Hematite deposits are mostly sedimentary in origin, such as the banded iron formations (BIFs). BIFs consist of alternating layers of chert (a variety of the mineral quartz), hematite and magnetite. They are found throughout the world and are the most important iron ore in the world today. Their formation is not fully understood, though it is known that they formed by the chemical precipitation of iron from shallow seas about 1.8-1.6 billion years ago, during the Proterozoic Eon.

Taconite is a silica-rich iron ore that is considered to be a low-grade deposit. However, the iron-rich components of such deposits can be processed to produce a concentrate that is about 65% iron, which means that some of the most important iron ore deposits around the world were derived from taconite. Taconite is mined in the United States, Canada, and China.

Iron ore consists of oxygen and iron atoms bonded together into molecules. To convert it to metallic iron it must be smelted or sent through a direct reduction process to remove the oxygen. Oxygen-iron bonds are strong, and to remove the iron from the oxygen, a stronger elemental bond must be presented to attach to the oxygen. Carbon is used because the strength of a carbon-oxygen bond is greater than that of the iron-oxygen bond, at high temperatures. Thus, the iron ore must be powdered and mixed with coke, to be burnt in the smelting process.

However, it is not entirely as simple as that; carbon monoxide is the primary ingredient of chemically stripping oxygen from iron. Thus, the iron and carbon smelting must be kept at an oxygen deficient reduced state to promote burning of carbon to produce CO not CO2.

Air blast and charcoal (coke): $2C + O2 \longrightarrow 2CO$.

Carbon monoxide (CO) is the principal reduction agent.

Stage One: $3Fe2\ O3 + CO \longrightarrow 2Fe3\ O4 + CO2$

Stage Two: $Fe3\ O4 + CO \longrightarrow 3Fe\ O + CO2$

Stage Three: $FeO + CO \longrightarrow Fe + CO2$

Limestone fluxing chemistry: $CaCO3 \longrightarrow CaO + CO2$

The name *iron* is from an Old English word *isaern* which itself can be traced back to a Celtic word, *isarnon*. In time, the "s" was dropped from usage. Iron is essential to animal life and necessary for the health of plants. The human body is 0.006% iron, the majority of which is in the blood. Blood cells rich in iron carry oxygen from the lungs to all parts of the body. Lack of iron also lowers a person’s resistance to infection.

It is estimated that worldwide there are 800 billion tons of iron ore resources, containing more than 230 billion tons of iron. It is estimated that the United States has 110 billion tons of iron ore representing 27 billion tons of iron. Among the largest iron ore producing nations are Russia, Brazil, China, Australia, India and the USA. In the United States, great deposits are found in the Lake Superior region. Worldwide, 50 countries produce iron ore, but 96% of this ore is produced by only 15 of those countries. Iron ore reserves at present seem quite vast, but some are starting to suggest that the maths of continual exponential increase in consumption can even make this resource seem quite finite. For instance, The Worldwatch Institute has suggested iron ore could run out within 64 years based on an extremely conservative extrapolation of 2% growth per year.

Raw iron by itself is not as strong and hard as needed for construction and other purposes. So, the raw iron is alloyed with a variety of elements (such as tungsten, manganese, nickel, vanadium, chromium) to strengthen and harden it, making useful steel for construction, automobiles, and other forms of transportation such as trucks, trains and train tracks.

While the other uses for iron ore and iron are only a very small amount of the consumption, they provide excellent examples of the ingenuity and the multitude of uses that man can create from our natural resources.

Powdered iron: Used in metallurgy products, magnets, high-frequency cores, auto parts, catalyst.

Radioactive iron (iron 59): In medicine, tracer element in biochemical and metallurgical research.

Iron blue: In paints, printing inks, plastics, cosmetics (eye shadow), artist colors, laundry blue, paper dyeing, fertilizer ingredient, baked enamel finishes for autos and appliances, industrial finishes.

Black iron oxide: As pigment, in polishing compounds, metallurgy, medicine, magnetic inks, in ferrites for electronics industry.

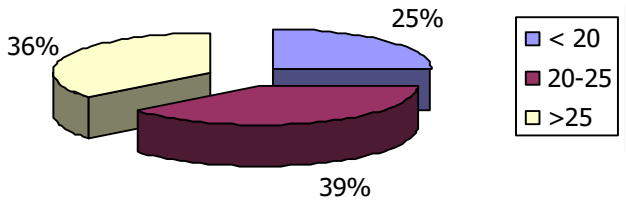
Though there is no substitute for iron, iron ores are not the only materials from which iron and steel products are made. Very little scrap iron is recycled, but large quantities of scrap steel are recycled. Steel's overall recycling rate of more than 67% is far higher than that of any other recycled material, capturing more than 1-1/4 times as much tonnage as all other materials combined.

Some steel is produced from the recycling of scrap iron, though the total amount is considered to be insignificant now. If the economy of steel production and consumption changes, it may become more cost-effective to recycle iron than to produce new from raw ore.

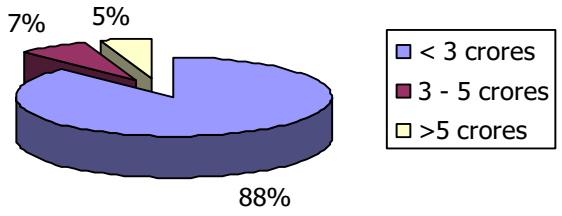
Iron and steel face continual competition with lighter materials in the motor vehicle industry; from aluminum, concrete, and wood in construction uses; and from aluminum, glass, paper, and plastics for containers.

CLUSTER PROFILE

No of Employees



Total Investment



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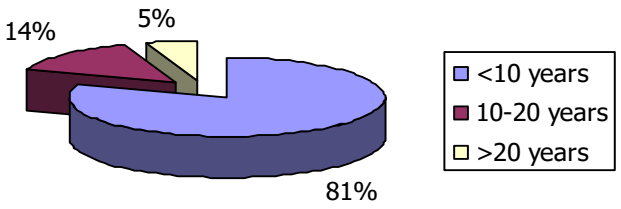
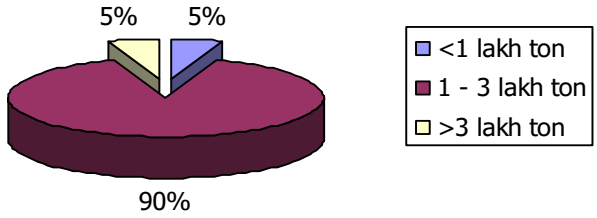
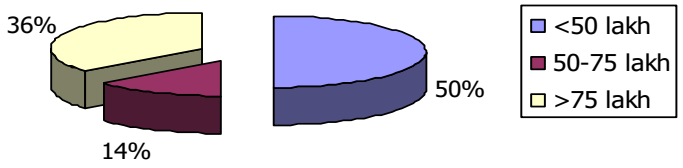


Annual Production

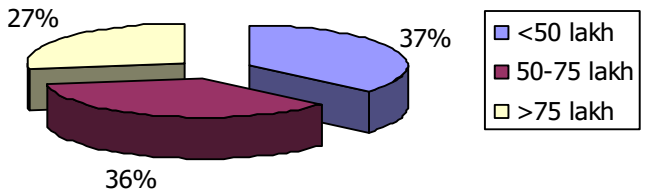


Apart from extraction, the units are also engaged in sales, marketing and transportation of the iron ore. They also invest in skill development of their employees as well as the labor welfare. Development of peripheral areas is yet another area of activity, where the units invest. They do not use any channel to market their product. Normally all units make around 10%-15% profits over the whole transaction. 32.14% of the units surveyed accepted taking financial assistance from banks.

Term Loan Received



Cash Credit Received



All units are financially sound in general and have capacity expansion plans. The units normally purchase their machines from UK, Ireland, Japan and India. Average age of machines is 10 years. All units maintain a record of maintenance over the years.

Cluster profile in a nutshell

- Units are mechanized or semi-mechanized opencast hematite ore mines
- All units are sole proprietor form of business
- Every seventeen in twenty units have no other businesses
- Every two in five units have up to 25 employees
- Every nine in ten units have invested up to 3 crores initially
- Every four in five units are less than 10 years old
- Every nine in ten units produce up to 3 lakh tonnes of iron ore annually
- Units rely on direct marketing and do not use any channel
- Every one in three units admit taking financial assistance from banks
    - Every one in two units got up to Rs. 50 lakhs of term loan
    - Every two in five units got up to Rs. 50 lakhs of cash credits
- Units on an average make 10% - 15% profits in their business
- Units get their machines and spare parts both from India and abroad
- All units face problems related to electricity, water, transport, fuel, effluent treatment and waste disposal

PRODUCTION PROCESS

The government of India divides the iron ore reserves into three grades as per their iron content: -

- High-grade: Over 65% iron content
- Mid-grade: 62% - 65% iron content
- Low-grade: Less than 62% iron content

The cluster has predominantly high- and mid-grade hematite ores, which can be further divided into lump ore (+ 12.5 mm to – 150 mm) and fines (-12.5 mm). The beneficiation process involves washing, jigging and classification. Washing removes up to 35% of alumina from the ore as well as imparting better handling properties to it. The slimes (-21 mm) generated during the process are discarded into tailing ponds. Slimes go waste with the existing technology despite containing 48%-62% of iron. About 60% of the production comes in the form of fines (including concentrates) during the course of mining operations itself. Further, around 10% of lumps become fines while handling, loading / unloading and converting them into calibrated iron ore (CLO). Lumps can be directly utilized by the steel industry but fines need sintering or pelletisation before use. Fines are a major source of environmental hazards in these areas. Recovery rate of lumps is almost twice that of fines creating a forked technological challenge: -

- Utilizing slimes, reducing the tailing impoundment and air pollution
- Beneficiating the powder obtained from lump ore production to reduce metallic impurities like silicon and alumina, reduce gangue volume and improve the quality

A lot can be learned in this regard from China, which is braving this challenge with relative success.

The units primarily size their products into 5 mm and 60 mm with the later being consumed by the domestic markets, while the former being primarily consumed by the international markets.

KEY MINING POLICIES IN INDIA

The Constitution of India mandates that both the Central and the state governments would be responsible for management of mineral resources in India. The Mines and Minerals (Development and Regulation Act, 1957, the Mines Act, 1952 and the Mineral Conservation and Development Rules, 1988 govern mining in India. All mining activities have to comply with the environmental legislation of India. The relevant acts are Environment Protection Forest (Conservation) Act, 1980 (amended in May 1992) and Environment Protection Act and Rules, 1986. The Environmental Impact Assessment Notification, 1994 also applies for all mining projects.

SWOT ANALYSIS

The Keonjhar iron ore cluster has its own set of problems and prospects. In the stakeholder consultation workshop organised in Joda, we conducted the SWOT analysis of the cluster in a participatory manner. Participants have given their valuable opinion about what they perceive as the major strengths, weaknesses, opportunities and threats of the cluster.

Keonjhar Iron Ore Cluster: Strengths

- Iron ore reserves: Orissa holds 32.9% of the total iron ore reserves of India which translates into 5428 million tonnes. Nearly 60% of the total reserves are leased out to the private companies, which is primarily located in Keonjhar district. Keonjhar holds 79.88% of the total iron ore reserves of the state in the form of good quality hematite, which is its biggest strength.

- *Financial strength:* All mine owners are financially sound and they have access to required credit. All of them have started the units with self-financing and then got credits from financial institutions. Units are able to access working capital credits (93 lakh on an average) and term loans (55 lakh on an average). After meeting all other expenditure along with a 12.5% of service tax, they are comfortably able to get around 10% - 15% profit. Their financial strength augurs well for the cluster.
- *Railways connection:* World over iron ore mining is facilitated by access to market provided by railways. Keonjhar district already has rail connectivity, but the existing facility is not able to cater to enormous demand. With increased emphasis on freight in the rail budget 2008-09, especially for steel industry (Mission 200 MT) and Port traffic (300 MT), the prospects for railways are further strengthened in the cluster area.
- *Export potential:* The only significant steel plant in Orissa, the Rourkela Steel Plant of Steel Authority of India Limited, produces 1.671 million tonnes of saleable steel per annum. The state has already signed 43 MoUs with different companies to produce 70 million tonnes of steel per annum requiring around 114 million tonnes of iron ore; however, the actual production is at least a couple of years away. Hence apart from selling iron ores to other parts of India, export of iron ore becomes an attractive avenue. Exports also hedge against fluctuating domestic demand. There is a steel-hungry world out there with China leading the pack making iron ore exports a lucrative option. India has exported 89.2 million tonnes of iron ore in 2006 with a major share from Orissa. Iron ore sells at an average price of $55-$60 per tonne and hence remains a profitable proposition despite an export duty of Rs. 300 per tonne. According to the State Steel and Mines Department, 15.68 million tonnes of iron ore from Orissa was exported through Paradip, Haldia and Visakhapatnam ports during 2004-05 by 55 companies, including Tata Iron and Steel Company, Jindal Steel and Mines Ltd., and Essar Steel. The cluster gets immense strength from such huge export potential as it is at the heart of Orissa's iron ore production capacity.

Table 8: Export of iron ore from Orissa

Mineral	2000-01		2001-02		2002-03		2003-04		2004-05	
	Quantity (In lakh tonnes) / Value (Rs. In Crores)									
	Qty	Val	Qty	Val	Qty	Val	Qty	Val	Qty	Val
Iron ore	28.25	222.88	35.46	272.33	46.55	374.28	61.93	852.43	156.75	n.a.

Source: Govt. of Orissa, Economic Survey, 2005-06 (Bhubaneswar: Govt. of Orissa, 2006).

Table 9: India's iron ore export Lumps/Fines (Mt)

Year	Fines	Lumps	Total
2002-03	35.72 (74.39)	12.30 (25.61)	48.02
2003-04	49.12 (78.50)	13.45 (21.50)	62.57
2004-05	64.60 (82.67)	13.54 (17.33)	78.14
2005-06	77.60 (87.00)	11.61 (13.00)	89.28

Source: JPC Bulletin: June 2006 (Provisional)

Note: Figures in parentheses ( ) indicate percentage to the total export. Lumps include pellets and fines include concentrates.

- *Skilled labor:* The cluster gets enough skilled labor to keep on meeting the demands of growing production year after year.

Table 10: Number of workers directly employed in iron ore mining

Mineral	District	2000-01	2001-02	2002-03	2003-04	2004-05
Iron ore	Keonjhar, Jajpur	13255	11983	10523	11418	19592

Source: Govt. of Orissa, Economic Survey, 2005-06 (Bhubaneswar: Govt. of Orissa, 2006)

Growing mechanization in the industry is contributing towards a relatively steady labor force despite substantial increase in production.

- *A functional business association:* Units show presence of social capital in the form of a functional association viz. Eastern Zone Mining Association (EZMA). EZMA undertakes a variety of activities such as arranging for training and skill upgradation of labor, medical tests of all workers, awareness campaigns and 'mine environmental mineral processing weeks'. Indian Institute of Material Science has conducted several training programs for skill upgradation of labor.

Keonjhar Iron Ore Cluster: Weaknesses

This iron ore cluster has its own share of weaknesses and they are major ones. Ignoring them would be fatal to the prospects of the cluster.

- *Lack of modern technology:* The cut-off grade for estimating hematite resources has been taken as 55% iron and above in the country. In Orissa, the minimum iron ore content that is being mined at present is 58%. If the cut-off grade is lowered by a few percentage points, iron ore resources will increase substantially. With the help of modern technology, it would be possible to utilize around 45% iron and above. The cluster lacks any such technology and the cut-off grade for some units remain as high as 60%, which is a gross underutilization of resources.

- *Scarce water resources:* Hematite ore is generally beneficiated by a wet process needing copious water supply. The Joda-Badbil area of Keonjhar, which is the heart of mining activity, lacks sufficient ground water to support it. Jindal Steel and Mines Limited is laying down a water pipeline to meet its production requirements but such contrivances are prohibitively expensive for smaller units constituting the cluster. Lack of water resources remains a major challenge for the cluster.
- *Nonexistent roads:* Despite presence of railways, the onus to transport iron ore from mines to ports lies primarily on roadways. Nearly 30,000 trucks carry the load from Keonjhar to Paradeep every day along a 350 km road. Such heavy traffic has taken its toll on the roads and now the road from Joda to Keonjhar hardly exists. The distance of around 60 km from Joda to Keonjhar becomes indeterminate in time. To ease the traffic, the movement of trucks has been restricted from 8 AM to 8 PM daily; however, it is not easing the burden on roads. Trucks stand making a beeline on both sides of the road and thereby effectively narrowing it. Movement of even smaller vehicles remains a problem. Atrocious roads make it extremely difficult for the units to meet their delivery commitments to the market. Condition of roads remains a major weakness for this cluster.
- *Pollution:* This cluster remains one of the most polluted regions in the world. A survey conducted in the region reveled that the level of suspended particulate matter in the air remains a whooping 2500 microgram per cubic meter. The level of dust in the mining areas is unbearable. Noise pollution adds further insult to the injury. Such high pollution levels lead to many diseases among the inhabitants putting their life at risk. The units have problems related to waste disposal and effluent treatment also.
- *Lack of enabling social support:* The area is primarily focusing on mining where money remains the prime motivation behind any social structure. A cluster cannot develop in absence of enabling social structures. Basic health facilities are conspicuous by their absence in these areas. Most of the primary health centers in these areas have no doctors. People have hardly any choice but to visit Keonjhar town to avail themselves of decent medical facilities. The problem becomes serious considering the prevailing diseases like cerebral malaria, typhoid and jaundice. Very high levels of pollution put entire population at risk. The pathetic condition of roads further compounds the problem leaving the rich and the poor alike at the mercy of chance as far as survival is concerned. Majority of villages in these regions have no electricity and roads. Many schools in these regions manage without required number of teachers. People do not feel that the standard of education in the private schools is also good enough. People hardly have a choice and hence they continue with whatever educational facilities they have. Indeed, it is a catch-22 situation where the quality social infrastructure is required to get quality people who would develop quality social infrastructure. Unless the basic amenities are insured in these areas, sustainability of the cluster would remain under question. This sentiment was echoed by all participants in the stakeholder consultation workshop in unison.

Keonjhar Iron Ore Cluster: Opportunities

The very nature of the cluster makes it a fertile ground for opportunities that can shape it in future.

- *Technological innovations:* Pattanaik Minerals, one of the units operating in the cluster, is attempting to use magnetic separation of hematite so that the dependency on water supply can be reduced. Usually such processes are in vogue for magnetite but their use for hematite is not well established. Pattanaik Minerals is attempting a magnetic beneficiation process with hematite in a laboratory production capacity of 500 kg per hour. If the experiment succeeds, then it can be scaled up. That would solve the scarcity of water as a problem for the beneficiation of hematite.
- *Networking:* The region is blessed with two premier institutions of national repute viz. Indian Institute of Technology, Kharagpur and Indian School of Mines, Dhanbad. Unfortunately, there is no attempt as of now to involve these institutions for the betterment of the cluster. Involvement of these institutions for technological solutions and training for skill upgradation can significantly contribute to the betterment of the cluster. Moreover, these institutions can help in developing solutions for the environmental problems caused by mining, which is crucial for the sustainability of the cluster.
- *Single window system for governance:* As of now, the units have to deal with 17 government departments individually, all with procedures and systems of their own. This increases their difficulties in complying with legal and regulatory requirements. A single window system will make the system more cohesive and make monitoring legal and regulatory compliance easier. It may become a major step in curbing illegal mining activities for which this region is often blamed. The DIC has started thinking in this direction and it has trained its people for single widow governance at Xavier Institute of Management, Bhubaneswar.
- *Global presence of Indian companies in the steel sector:* LNM's acquisition of Arcelor and Tata Steel's acquisition of Corus has set the stage for global presence of Indian steel companies. That would automatically translate into an increased domestic and global demand of iron ore. That augurs well for the future of this cluster.

Keonjhar Iron Ore Cluster: Threats

Keonjhar iron ore cluster is facing threats that would seriously undermine its profitability as well as sustainability.

- *Unsustainable rate of mining:* The cluster is mining its iron ore reserves at a rate that would call into question its sustainability. Illegal mining further aggravates the problem and unless it is checked, the reserves would deplete in a decade or two. Mining schemes and actual production seldom tally and the race to make money translates into exceeding sustainable limits.

- Captive mining can be a solution for this problem in the short run but the issue can only be tackled by a sustained and coherent effort on various fronts such as law and regulation, governance, creating awareness among units, developing environmental consciousness and last but not the least making the place worth living for generations. If the place offers hope for a socially enabled life, probably people would take interest in preserving it.
- *Depletion of forest resources:* Keonjhar is endowed with beautiful forests full of priceless wildlife such as elephants, tigers and leopard. Indiscriminate mining is posing a huge threat to the entire ecosystem of the region. Cooking gas being a scarce commodity in the region, laborers are forced to use forest resources for fuel. This had led to further deterioration of the environment. The deforestation caused by mining has already taken its toll on the elephant corridors; thereby, increasing human-elephant conflicts in the region. The district has seen 61 elephant deaths in the past three years. Furthermore, the opencast mining would lead to the disappearance of the streams and pollute the major drinking water sources for the tribal people.
- *Lack of a comprehensive rehabilitation and resettlement policy:* In spite of the large scale displacement of tribal and local people due to mining related activities, Orissa is yet to enforce a comprehensive rehabilitation and resettlement policy. This had led to tribals perceiving increased mining as a serious threat to their culture and their future. The state has already seen major protests from people against the steel majors like Posco. This threat needs serious deliberation as the development and the destruction of socio-cultural and physical environment need not go together.

Summary of SWOT analysis

Strengths	Opportunities
• Huge good quality hematite reserves • Financially sound businesses • Cost effective railway connectivity • Tremendous export potential • Availability of skilled labor • Functional business association (EZMA)	• Technological innovations • Networking potential • Single window system for governance • Global presence of Indian companies in the steel sector
Weaknesses	**Threats**
• Lack of modern technology • Scarce water resources • Nonexistent roads • Severe environmental pollution • Lack of enabling social support	• Unsustainable rate of mining • Depletion of forest resources • Lack of a comprehensive rehabilitation and resettlement policy

IMPLICATIONS FOR THE CLUSTER

The cluster will grow if it uses its strengths to capitalize on the opportunities that it is presented with. It must also take cognizance of its weaknesses and try to work on it while trying to minimize the threats. What follows is the discussion on the strategic choices that the SWOT analysis brings to the cluster.

I. The cluster can increase its hematite resources in two ways

   a. Exploring newer reserves, which may not be very rewarding considering its already exposed small geographical area

   b. Lowering cut-off grade by using modern technology needing no water, which would need active networking efforts on the part of EZMA with foreign countries and institutions like IIT, Kharagpur and ISM, Dhanbad.

II. The cluster can alleviate its transport related problems in two ways

   a. Advocating for increasing the carrying capacity of railways already existing in the region

   b. Advocating for sanctioning more freight trains for the region

Both of these can be undertaken by EZMA to reduce load on the overburdened roadways. That will create some breathing space for the roads to develop. In addition, it has three choices to make to bolster the road transport:-

   c. Advocating with the government to build roads of appreciable quality, a process that is likely to incur negligible cost to the units with high returns; however, the output may be critically delayed.

   d. Investing in developing roads, a proposition that will yield high returns but may take its toll on the working capital of the units

   e. Partnering with the government to jointly develop road infrastructure, a process that is likely to be relatively quicker than the first one with high returns; however, it may have its own teething issues of road building contracts and the collaboration of the contractors. It is clear that none of these are possible without EZMA playing an active role.

The last two options provide enough space for the big companies like Tata and Jindal to cooperate and share the initial investments. A well-coordinated effort can result in a win-win situation for all concerned. If the contract issues are handled well, the public-private partnership mode of road infrastructure development will be quick to fructify with relatively less liquidity pressures.

III. Market potential can be maximized in several ways, which are synergistic in nature

a. Units can experience the power of synergy over domestic and export markets should they come together to develop a common brand with standardized production processes and quality assurance

b. Units can go for ISO certifications for quality and environment friendly production processes. This will incur additional cost in documentation and process improvements but the returns will be highly rewarding. It will effectively tackle the issue of illegal mining as the entry barrier for the new entrant will be raised. It will also force the units to think about the environment; thereby, increasing the chances of sustainable business. Units may take an Environment Management Plan approach to fulfill their environmental obligations.

c. They need to clearly spell out their own rehabilitation and resettlement policy to tackle the issue of development induced displacement. Units need to invest in developing good relationships with the tribal and local community to improve the image of the business. They can do it by investing in the basic health care facilities and elementary education. Investing in education is important for the future of these businesses as 81% of the enterprises are less than 10 years old. That indicates relatively high proportion of employees with school-going age children. Better prospect for the employees and their families within the cluster itself would go a long way in ensuring sustainability and developing enabling social support systems. The cluster need not open and manage educational institutions itself; it can invite well known educational groups by offering them sufficient number of children and some land to operate. The cluster can network with health care institutions to open a quality hospital in Joda, which is at the heart of the mining area. Enabling social infrastructure would mean that the availability of skilled labor would sustain as new laborers would also look to have a future there.

IV. It can be seen that working on strengths like huge market potential itself is capable of taking care of many of the weaknesses of the cluster to a large extent. Corporate social responsibility like the green city drives, plantation drives and water conservation and harvesting measures can go a long way in developing a healthy environment. This clearly means that the units need to have a long term plan for their businesses and for the region. Single window system for governance can be further augmented by a single complete view of the units to the government. Again the role of EZMA becomes important. It can act like a single point contact for all practical purposes requiring a business-government contact. That would require the development of a web-based interenterprise information system to present a single and complete view of the company to the government and customers at every point of contact. The cluster has enough financial resources to develop and implement such a system. EZMA can take initiative to start developing such a system to facilitate business processes including compliance. It must be clearly understood that the booming iron ore market may continue to generate profit without any cluster development initiative; however, profits would sustain with such efforts.

ACTION PLAN

The strategic choices can be translated into concrete actions which are indicated below. It must be clearly understood that the Keonjhar iron ore cluster is not facing a crunch situation for the business unlike normal underperforming clusters, which become subjects of diagnostic studies. Hence the actions being suggested need not only focus on the business side; they can focus on the social side as well.

Assumption: The cluster is willing to make strategic choices as illustrated under I.b, II.a, II.b, II.e, III.a, III.b, III.c, and IV.

Proposed Action Plan

Activity/Project (Year 1)	Time frame (In Quarters)			
	Q1	Q2	Q3	Q4
Strengthening EZMA and expanding its mandate	■			
Negotiating standardized processes and quality parameters		■	■	■
Tie up with IIT & ISM for training & technology development		■	■	■
Procurement of low cut-off grade technology			■	■
Procurement of no water hematite beneficiation technology			■	■
Starting interenterprise system development process				■
Advocacy for enhanced railways		■	■	■
Forging public-private partnership for road development		■	■	■
Green city and plantation drives	■	■	■	■
Water conservation facility development		■	■	■
Developing effluent treatment facilities	■	■	■	■
Developing Environment Management Plan			■	■
Developing a knowledge-base on ISO certification		■	■	■

Identification of land for school				
Networking with educational institutions				
Development of basic health facilities in the region				
Networking with health care institutions				
Developing a monitoring plan for tracking progress				

Activity/Project (From Second Year Onwards)	Time frame (In Years)			
	Y2	Y3	Y4	Y5
Advocacy for enhanced railways*				
Implementing the web-based interenterprise information system				
Continuing with public-private partnership for road development				
Advocating for basic infrastructure development				
Standardizing processes and quality parameters*				
Implementing modern technology				
Making networks with IIT and ISM functional				
Development of a common brand				
Initiating ISO certification processes*				
Getting ISO certified on quality and environment sustainability				
Developing resettlement and rehabilitation polices				
Implementing resettlement and rehabilitation polices				
Establishing quality educational facilities in the region*				

Establishing quality health care facilities in the region*				
Green city and plantation drives				
Implementing water conservation and harvesting facilities				
Implementing effluent treatment procedures				
Implementing Environment Management Plan				
Advocating for single window governance*				
Implementing the monitoring plan				
Evaluating the cluster development efforts				

* Assumption is that it would materialize by that time.

Note: Budget estimates are not provided as it would take economic feasibility studies for the suggested activities and projects to estimate their cost, which is beyond the scope of this diagnostic study.

ROLE OF CLUSTER DEVELOPMENT AGENCY

A cluster development agency can at best be a facilitator for social capital development, training, advocacy, networking, monitoring and evaluation. A successful CDA would make itself irrelevant within 3 to 4 years as the cluster would develop internal capabilities to handle these areas.

CONCLUSION

Keonjhar iron ore cluster holds immense potential for Orissa. The state has already taken the first step by initiating a diagnostic study of the cluster, which will pave the way to a dynamic iron ore cluster in Keonjhar leading to the full utilization of the iron ore reserves in an environment friendly and sustainable way.

Annexure – I
Cluster Diagnostic Questionnaire

1	Date of Visit				
2	Name of Enterprise				
3	Name and Position of the Respondent				
4	Location				
5	Main product(s) of the Enterprise				
6	How many people are employed (Including Owners)				
7	Estimated total investment (Excluding land/buildings rented by the enterprise)				
8	Form of the enterprise (Sole proprietorship, partnership, family business, company etc.)				
9	Date of establishment				
10	Any other business fully or partly owned by the owners				
11	Where are the products sold (Volumes are to be calculated annually)		Local Market	Other places in India	Export Markets
		Name of the market			
		Product 1 (Volume)			
		Product 2 (Volume)			

		Product 3 (Volume)			
		Product 4 (Volume)			
		Product 5 (Volume)			
		Others (Volume)			
12	How does the state of business of the enterprise differ from younger units				
13	How does the state of business of the enterprise differ from other units established in the same year of establishment				
14	What are the other business which have important business relations with the enterprise				
15	Marketing channels used by the enterprise				List the names of subsidiaries for the channel members, if applicable
		Dealers			
		Carrying and Forwarding agents			
		Wholesalers			

		Retailers		
		Direct Marketing		
16	Apart from orders, what are the other things provided by these channels	Market intelligence		
		Design support		
		Market requirements		
		Technical assistance		
		Credit in money or materials		
17	What are the main product features used to attract customers (quality, customizing to customers' needs, quick delivery, advertising, price etc.)			
18	Is the emphasis shifting from one product feature to the other? Describe.			
19	Does enterprise require any kind of aid to enhance its business? If yes, then had it received any such aid in past. (Note the names and addresses of the aid providers.)			
20	Was it required to pay to get any such aid			
21	What are the enterprise's main problems in marketing	Selection		
		Quality		
		Price		
		Design		

		Transport cost	
		Lack of credit	
		Lack of market information	
		Others	
22	Who are the enterprise's main competitors (Note their names and addresses)		
23	Developments in the last 3 years		
24	What are the enterprise's future plans of up gradation /diversification /expansion		
25	Is the enterprise situated in an industrial estate? If yes, then who is the developer (small industry agency, local authority, SSI association, private party etc.)		
26	What are the other services, if any, provided to the enterprise by the developer		
27	Is the premise temporary		
28	From where, the enterprise has purchased its machines		
29	What is the average age of machines		
30	Who advised it to buy these machines (Note the names and addresses of the advisors)		
31	Who provides parts, servicing and repair services? Are they general mechanics or specialists in these types of equipments?		

32	What are the main problems with these equipments	
33	What are the main problems with the production processes	
34	Does the enterprise maintain a record of upgrading/diversifying its products/processes	
35	Does the enterprise specialize in one or two stages of a production process? (If the specialization is significant, then note the names and addresses of customers, specialist suppliers and common service facilities)	
36	Does the enterprise rely on other SMEs for supplies	
37	Is the specialization helpful for its business?	
38	Where did the owners/suppliers receive their basic training (Note the names and addresses of the training organisations/people)	
39	Does the enterprise maintain a record of all the training programs that its employees attend	
40	Does the enterprise feel significant problems with the existing level of skills of its employees	

41	Is the enterprise using any other source to train its employees? (Note the names and addresses of the training providers)	
42	What are the principal sources of raw materials? Are they local?	
43	Can the raw material suppliers offer any advice on the choice/use of raw materials	
44	What kind of technical support is provided by the suppliers	
45	What are the problems that the enterprise is facing from suppliers' side	
46	Has the enterprise received any help to resolve any such issues? (Note the names and addresses of the help providers)	
47	How was the enterprise funded in the beginning?	
48	How is the enterprise funded now?	
49	What kinds of credits does the enterprise receive? (Note the names and addresses of the creditors)	
50	What was the size of the credits received	
51	What was the rate of interest	
52	What is the date of the most recent credit	
53	Has the enterprise used third party services for securing external credit (Note the names and addresses of the service providers)	

54	Is the enterprise generating profits after considering all business costs including the income of owners		
55	What is the rate of increase of profit over the years for the enterprise		
56	Where do owners invest their profits	What form of expansion	
		Which other sector	
		What type of investment	
		What are the reasons for such investments	
57	What are the enterprise's main problems with finance		
58	What are the main sources for the enterprise to get infrastructure support	Electricity	
		Phone/fax/Internet	
		Water	
		Transport	
		Waste disposal	

		Effluent treatment	
		Fuel	
59	Has the enterprise received any cooperation from other SMEs in getting infrastructure support (Note names and addresses of all such cooperating SMEs)		
60	What are the infrastructural problems that the enterprise is facing today		
61	Describe the most serious problem, if any, that the enterprise have with laws and regulations		
62	Who has advised the enterprise to solve problems related to laws and regulations (Note names and addresses of the advisors)		
63	Is the enterprise a member of any business association? Note the name and place of the association.		
64	How long the enterprise has been the member of the association		
65	What kinds of services the enterprise has received from the association		
66	How are the services offered by the association to the enterprise financed		
67	How useful are the services provided by the association		

68	What are the steps that can be taken to improve the services provided by the association	
To be filled by the Researcher		
Write three main problems faced by the cluster as observed by you. (Describe each problem in one sentence)		
Problem-1		
Problem-2		
Problem-3		
Summarize in three lines, the enterprise's core competitive strategy and strengths and its most valuable interactions with other parties		
Core Competitive Strategy		
Core Strength		
Most valuable interaction		

Annexure – II
List of the Participants

1	Pitamber Rout	Murgabedha Crusher Plant,Murgabedha,Joda ,Keonjhar
2	Bijayakumar Barik	Tarini Minerals (P) Ltd ,At-Jaribahal Jurudi, Joda
3	N P C Behera	Asst Manager DIC Keonjhar
4	S K Das	I.P.O Keonjhar
5	Rajkishore Sha	Pattanayak Minerals (P) Ltd Jaribahal ,Joda, Keonjhar
6	B Mohapatra	Pattanayak Minerals (P) Ltd Jaribahal ,Joda, Keonjhar
7	P K Das	Bansapani Iron Ltd Jaribahal ,Joda, Keonjhar
8	Ashok Kumar Pati	R.M Minerals, Joda ,Keonjhar
9	Rajkishore Parida	Shree Balaji Metals Inds Kasia ,Barbil,Keonjhar
10	Ashok Kumar Pati	Tarini Minerals (P) Ltd ,At-Jaribahal Jurudi, Joda
11	R S Thakur	M/S Pattanayak Steel & Alloys (P) Ltd At-Khajuridihi,Po,Dubuna,Keonjhar
12	P K Panda	M/S Jajanga Crusher Plant At-jajanga,Po-Jurudi Keonjhar
13	ParameswarMohanta	Murgabedha Crusher Plant,Murgabedha,Joda ,Keonjhar
14	Dillip Kumar Mohanta	Tarini Minerals (P) Ltd ,At-Jaribahal Jurudi, Joda
15	Kishore Kumar Barik	Maa Shakti Minerals At-Jurudi Po -Jajanga,Keonjhar
16	Arjun Kumar Behera	M/S Maa Engineering At-Kalimati Po-Joda, Keonjhar

17	Kshitish Jena	M/S Maa Engineering At-Kalimati Po-Joda, Keonjhar
18	S K Singh	M/S Sakti Minerals,At -Jurudi,Po-Jajanga Keonjhar
19	S Bhanja	D R Pattanayak Firm Joda
20	Ananta Charan Panda	CSREM Paralakhemundi
21	Raghunnath Barik	CSREM Paralakhemundi
22	Susanta Kumar Pattanayak	M/S Bimaldeep Minerals Pvt Ltd At-Bileipada ,Joda,Keonjhar
23	T.K.Pattanayak	M/S Ankita Crusher Pvt.LtdKalimati,Dubuna, Keonjhar
24	Sanatan Boitai	Deepak Minerals Inds (P) Ltd Jaribahal,Jajanga,Joda
25	Prasanta Sahoo	Balgopal Minerals(P) Ltd At_Jaribahal Joda,Keonjhar-