

Mining and human development in developing countries: a comparative analysis of mining and non-mining districts in India

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Abstract:

The contribution of mining operation to the development of the local region remains under serious controversy. The pro-mining block is of the view that mining represents the wealth of a region and opens up wide vistas for the latter's prosperity. There are equal concerns that mining cause's involuntary displacements of local people and that very often the displaced families are not adequately compensated for their direct and indirect, economic and social losses. People in the mining areas not only become victims of environmental degradation, but also go through changes in terms of over-all well-being. Nevertheless, mining projects are promoted by integrating them with the narratives of progress and development.

The present paper attempts to study the impact of mining on the well-being of people living in the mining areas in the Indian state of Odisha measured in terms of human development indicators. It highlights some interesting facts about the contribution of mining sector to Odisha's economy which destabilizes the conventional ideas about mining areas.

This present study is both diagnostic and exploratory. An attempt has been made here to throw light on various aspects of human development. For the purpose secondary data have been collected from materials like books, journals and other official documents and interpreted in a comparative framework to study human development parameters in mining and non-mining districts.

It is proposed that despite having a significantly lower health index and Human Development Index in mining districts is higher than the non-mining districts. This is due to significantly higher income index in mining districts than non-mining districts. It is also proposed that income generated from mining are not well distributed among inhabitants of mining region and are loaded in favor of the rich. Thus a compensation mechanism in mining policy, where mining has huge potential, can be designed taking environmental cost and health problem of community into account, in order to make mining industry a sustainable means of broad based and equitable growth.

Key words: *Mining, Income index, Human development index, Health index*

Introduction

Whether the benefits of mining led development have trickle down to the people in mining region? Minerals constitute an important source of raw materials for most of the basic industries necessitating their exploration from earth. They represent the wealth of a region where they exists and open up wide vistas for the prosperity of the region. A number of studies are there which substantiate the argument that mining is an important economic activity and provide a major structure upon which development of any economy gifted with rich natural resources rests (Ejdemoand soderholm, 2011; Ye,2008; Brunnschweiler,2006; mcmohan and remy,2001; Stilwell et al,2000; clements et al., 1996). The co-occurrence of poor economic performance and natural resource abundance is also an empirical regularity. The extensive literature(Yuxian and chen,2011;Torvik,2009) on this ‘resource curse’ phenomenon at the national level generally finds that economic dependence on point resources such as minerals is associated with lower levels of economic growth and human welfare. Various explanations have been offered for this association, many related to trade, rent-seeking, and national political institutions. Thus the relationship between mineral resources exploitation and national economic development is not very clear which require further exploration.

Odisha is a very rich mineral bearing state of India. Odisha is the leading producer of chromites, graphite, bauxite, manganese ore, iron ore, sillimanite, quartzite, pyroxenite and dolomite. The mining and quarrying sector has been contributing about 7.5 percent towards Odisha real GSDP at 2004-05 prices (Economic survey of Odisha, 2012-13). This is also a source of revenue to the state exchequer in terms of royalty collected from the lease holders. State government earns Rs 1029 million in 2010-11 as royalty collection in minerals. Exploration of mineral resources is an essential condition for successful economic development of an economy (Bogdetsky V,Ibraev K.,Abdyrakhmanova J,2005; Mensah E.A.O,2011).It generates employment opportunities to the people, income to state exchequer and foreign exchange to the mineral producing country (Akabzaa T and Darimani A,2001; Bogdetsky V,Ibraev K.,Abdyrakhmanova J,2005; Mensah E.A.O,2011).In terms of value of output of minerals, Odisha ranks highest enjoying 11.89 percentage share of total value of mineral output in India in 2010-11(Economic Survey of Odisha, 2012-13). Within the State, coal constitutes the lion’s share (87 percent) of all mineral deposits, followed by iron ore and bauxite. About 47 percent of coal is extracted from Angul district and the rest is from Jharsuguda, Sundargarh and Sambalpur districts. Iron ore extraction is mostly confined to Keonjhar district which accounts for 63.8 percent of total extraction, followed by Sundargarh

(34.3 percent). Most bauxite mining takes place in Koraput district. Iron ore is the most important mineral in the export basket of all minerals. Its share in total exports of minerals stood at 96.2 percent in 2011-12. In terms of employment, 48239 were engaged in mining sector in 2011-12.

Thus mining contribute significantly to the development of the mining region and the entire nation (Mensah E.A.O, 2011). So mineral rich backward region of the world should invest more in mining activities in order to break the chains of poverty as mining industries can generate wealth, create large scale employment, develop infrastructure, provide raw materials for most industries, contribute to production and trade and promote economic growth. Can mining serve as a pathway for economic development despite the environmental externalities? What is the impact of mining on well being of people living in mining area? Hence an attempt has been made to study the contribution of mining sector to the development of the Odisha economy. Further whether the people living in mining region are benefited from development generated due to mining has also been examined. Thus the importance of mining sector to Odisha economy is analyzed in next section.

Some facts about mining sector in Odisha economy

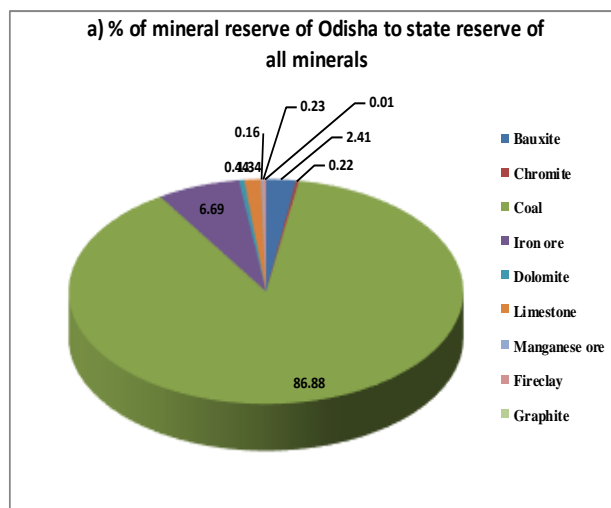
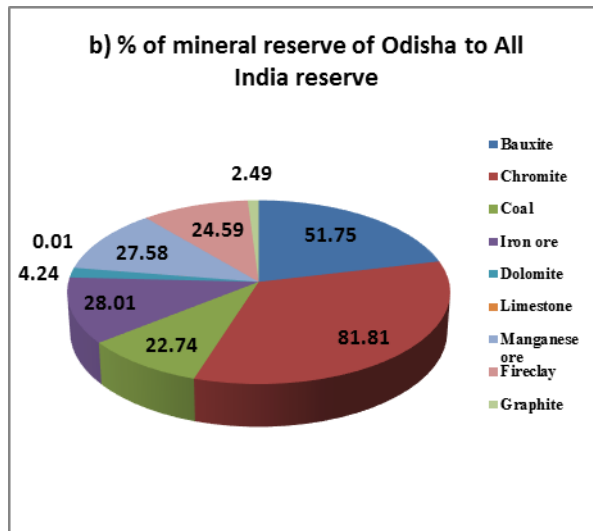
Odisha is one of the richest mineral resource abundant economies in the country. Its richness is depicted in table 1 and figure 1(a and b). The table and figure shows that coal, iron ore and bauxite together constitutes around 96 percent of total mineral resources in Odisha. Coal alone constitutes 65010.27 Million Tonnes (MT) of mineral reserve which is 86.88 percent of total mineral reserves in Odisha and 22.74 percent of total coal reserve in India. It is mostly found in Angul, Jharsuguda, Sundargarh, Sambalpur district of Odisha. Iron ore reserves of 5008.29 MT are located in Keonjhar, Mayurbhanj and Sundargarh district of Odisha. It is 6.69 percent of total mineral reserve in Odisha and 28 percent of the country's iron ore reserve. Bauxite being the third major mineral in state is mostly confined to Koraput district and is 2.41 percent of total mineral reserve in Odisha. Chromites though are 0.22 percent of mineral resource in state but are 81.81 percent to all India chromites reserves. It is mostly located in Jajpur and Dhenkanal district of Odisha. Other minerals like Dolomite, Limestone, Fireclay, Graphite are also found in Odisha but their share to total mineral reserve is very less.

Table 1: mineral reserves in Odisha and in India (in million ton as on 2010-11)

minerals	Odisha	India	major districts
Bauxite	1800.85	3480	Koraput, Sundergarh
Chromite	166.08	203	Dhenkanal, Jajpur, Keonjhar
Coal	65010.27	285860	Angul, Jharsuguda, Sundergarh, Sambalpur

Iron ore	5008.29	17882	Keonjhar, Mayurbhanj, Sundergarh
Dolomite	328.12	7730	Keonjhar, Sundergarh
Limestone	1000.66	184935430	Koraput, Bargarh, Keonjhar, Sundargarh
Manganese ore	118.58	430	Bolagir, Rayagada, Keonjhar, Sundergarh
Fireclay	175.46	713.5	Jharsuguda, Cuttack, Angul, Bargarh
Graphite	4.36	174.85	Balangir, Bargarh, Kalahandi, Kandhamal, Nuapada, Rayagada

Source: Economic survey of Odisha, 2011-12 and Indian bureau of mines, 2012



Source: Compiled by author

Figure 1: Percentage of Mineral Reserve in Odisha and to all India reserves

The Mines and Minerals (Development and Regulation) Act, 1957 and rules framed there under were amended in 2000-2001, to make the statutory provisions on par with international best practices, and investor friendly. Since February 2000, Foreign Direct Investment up to 100 per cent was allowed in the mining and mineral sector through the automatic route. With an objective to give momentum for mineral exploration on regional level and to identify the mineral potential areas in the country, the concept of Reconnaissance Permit was introduced in Indian mineral sector in January 2000. More powers were also delegates to the State Governments like declaring 29 non metallic and industrial minerals for which powers of approving mining plan (for open cast mines) have been given to State Governments. Thus to have a better analysis of the performance of mining sector in Odisha in consequences to these changes, entire time period from 1990-91 to 2011-12 has been divided into 1990-91 to 1999-2000 and 2000-01 to 2011-12. Endowed with vast mineral deposits, Odisha occupies a prominent place in the minerals map of the country. So the contribution of mining sector to Odisha economy over a period of time in terms of production, value, export of minerals and revenue from mining is discussed in subsequent sub sections.

Contribution to state exchequer

Mining Royalties and other revenues from minerals and cess on mining royalties together form revenue receipts from mining. Mining revenue has formed an important source of the total revenue of the state. Table 2 shows increasing trend of total revenue, Non tax revenue and mining revenue during 1995-96 to 2009-10. It can well be seen from table 3 that average total revenue has increased three fold to Rs 14880.37 crore (cr) during 2000-11 from 1995-2000. This may be because of substantial increase in average non tax revenue from Rs 584.98 cr in 1995-00 to 1794.04 cr in 2000-10. This increase in non tax revenue is much contributed by mining revenue which has increased fourfold during same period. Though share of mining revenue to total revenue and non tax revenue has declined but it stills remained high with 5.9 percent to total revenue and 48.6 percent to non tax revenue. This clearly testifies that expanding mining sector in terms of revenue collection from minerals has resulted in perpetuating total revenue receipts and total own non-tax revenue in Odisha entitling the state government with a sustained financial inflow.

Table 2: mining revenue, total revenue and nontax revenue of Odisha, 1995-96 to 2009-10

year	mining revenue (Rs in cr)	total revenue(Rs in cr)	non tax revenue(Rs in cr)
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1995-96	256.31	3890.71	628.23
1996-97	273.59	4286.76	481.78
1997-98	320.34	4632.03	540.93
1998-99	315.96	4554.4	557.49
1999-2000	320.46	5884.63	716.48
2000-01	360.41	6902.02	685.47
2001-02	376.45	7047.98	691.75
2002-03	443.53	8438.76	961.17
2003-04	550.77	9440.24	1094.55
2004-05	670.51	11850.19	1345.52
2005-06	805	14084.71	1531.9
2006-07	936.55	18032.62	2588.12
2007-08	1,126.09	21967.19	2653.58
2008-09	1,380.59	24610	3176.15
2009-10	2020.71	26430	3212.2

Source: 1.Economic survey of Odisha, 2011-12

2. http://www.orissaminerals.gov.in/Mines/Revenue_Royalty.aspx?GL=revenue&PL=1 as assessed on 25/2/2013

Table 3: share of mining revenue to total state revenue and non tax revenue in Odisha

	1995-96 to 2000	1999-2000-01 to 2009-10	1996-97 to 2009-10
average total revenue	4649.7	14880.37	11,470.14
average Non tax revenue	584.98	1794.04	1391.02
average mining revenue	297.33	867.06	677.15
percentage of average mining revenue to total average revenue	6.39	5.83	5.90
percentage of average mining revenue to average non Tax revenue	50.83	48.33	48.68

Source: Compiled by author

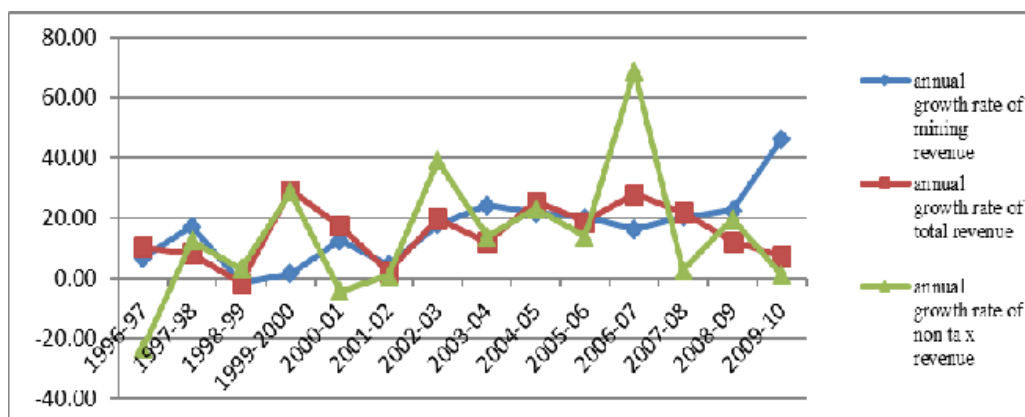
Table 4 shows the annual average rate of mining revenue was only 5.97 percent during 1996-2000 and mounted to 20.63 percent during 2000-10. This huge jump of mining revenue growth rate may be possible due to expansion in mining sector in Odisha. Not only the total revenue receipts but also the total own non-tax revenue of the state has increased vastly between 1996 and 2010.

It is noticeable that the average growth rate of total own non-tax revenue was 5.14 percent during 1996-2000 and increased by more than three times and reached 17.85 percent during the period 2000-10. Annual growth rate of mining revenue, non-tax revenue and total revenue from 1995-2010 can be seen in figure 2 where mining revenue shows an increasing trend in the given period whereas non tax revenue and total revenue is little fluctuating. It is indicative of the growing importance of the mining sector in the economy of Odisha.

Table 4: Average annual growth rate of mining revenue, total revenue and non tax revenue in Odisha

	1996-97 to 1999-2000	2000-01 to 2010-11	1996-97 to 2010-11
Average annual growth rate of total revenue (%)	11.44	16.47	15.03
Average annual growth rate of Non tax revenue (%)	5.14	17.85	14.22
Average annual growth rate of mining revenue (%)	5.97	20.63	16.44

Source: Compiled by author



Source: Compiled by author

Figure 2: Annual Growth rate of total state revenue, Non tax revenue and mining revenue of Odisha, 1990-91 to 2009-10

Contribution of mining sector to gross state domestic product (gdp) of Odisha

Mining sector has contributed significantly to GSDP of Odisha as evident from table 5. Further it can be seen from table 6 that though average GSDP has doubled from Rs 4787601 lakh in 1990-2000 to Rs 9455876 lakh in 2000-13,

contribution of mining and Quarrying sector to GSDP has increased three fold from Rs 207881 lakh to Rs 669361 in the same period. While annual average growth rate of GSDP of Odisha is 6.2 percent in 1990-2013, annual average growth rate of contribution of mining and quarrying sector to GSDP has registered to 9.5 percent in the given period. During entire decade from 1990-13, mining and quarrying sector has contributed on an average of 5.8 percent to Gross state domestic product with an increasing trend till 2005-06 though some decline is noticed in recent years as shown in figure 2. This shows that the economy of Odisha has been expanding with a vibrantly booming mining and quarrying sector.

Table 5: Contribution of Mining and Quarrying sector to Gross State Domestic Product (GSDP) at 2004-05 prices

Year	GSDP at 2004-05 prices(in Rs lakh)	contribution of Mining & Quarrying to GSDP at 2004-05 prices (in Rs lakh)
1990-91	3,883,162	121,831
1991-92	4,263,824	116,479
1992-93	4,188,390	144,643
1993-94	4,496,557	166,426
1994-95	4,728,488	191,499
1995-96	4,923,531	229,312
1996-97	4,684,672	243,634
1997-98	5,311,965	273,232
1998-99	5,462,975	289,483
1999-00	5,932,446	302,271
2000-01	5,830,376	324,897
2001-02	6,110,766	329,758
2002-03	6,105,838	420,585
2003-04	6,889,860	497,396
2004-05	7,772,943	586,186
2005-06	8,214,472	637,080
2006-07	9,270,083	764,315
2007-08	10,284,562	794,420
2008-09	11,081,178	865,484
2009-10	11,585,113	912,994
2010-11	12,453,658	889,553
2011-12	13,066,866	839,438
2012-13	14,260,674	839,586

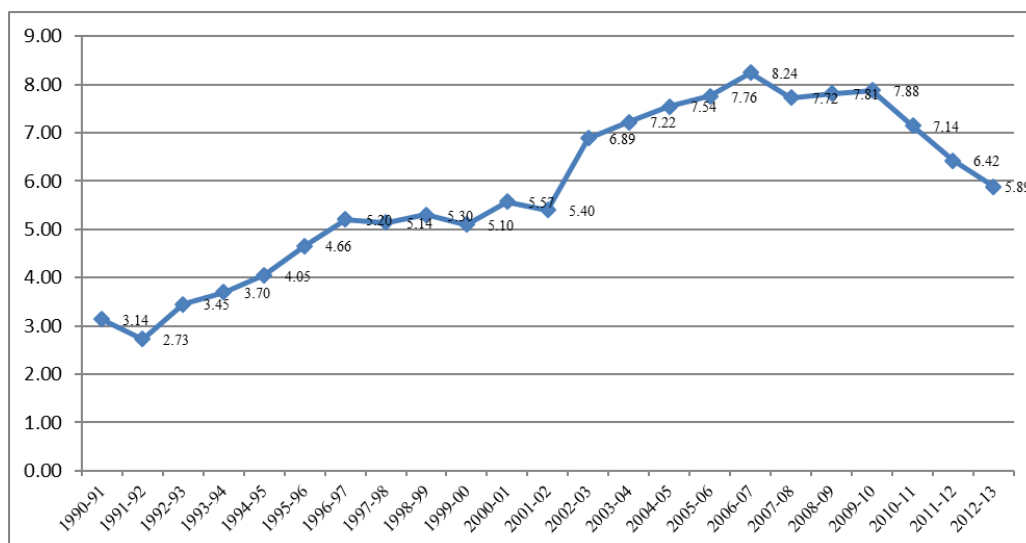
Source: .Economic survey of Odisha 2012-13

Table 6: Average value and Annual average growth rate of GSDP and contribution of mining sector to GSDP during 1990-2013.

1990-91	to	2000-01	to	1990-91	to
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	1999-2000	2012-13	2012-13
GSDP (Average in Rs lakh at 2004-05 prices)	4787601	9455876	7426191
Annual average growth rate of GSDP (%)	5%	7.1%	6.2%
contribution of Mining and Quarrying to GSDP (Average in Rs lakh at 2004-05 prices)	207881	669361	468717
Annual average growth rate of contribution of mining and Quarrying sector to GSDP	10.9 %	8.6%	9.5 %
Contribution of Mining and Quarrying to GSDP as percentage to total GSDP (%)	4.2 %	7 %	5.8 %

Source: Compiled by author



Source: compiled by author

Figure 3: Contribution of Mining and Quarrying to GSDP as % to total GSDP (%)

Production and value of minerals in Odisha

Production of minerals and its value during two decades can be seen in table 7. Production of mineral has registered a growth of six times from 310.7 lakh tons in 1990-91 to 1852.2 lakh ton in 2011-12. In case of value of mineral a considerable growth of forty eight times from Rs 629 cr in 1990-91 to Rs 30204.38 cr has been realized.

Table 7: Mineral production and its value in Odisha

Year	Production(in lakh tons)	Value (Rs In crore)
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1990-91	310.7	629.01
1991-92	372	812.39
1992-93	398.2	1033.71
1993-94	405.8	1166.84
1994-95	438.6	1300.7
1995-96	511.2	1634.03
1996-97	568.9	1791.33
1997-98	628.1	2148.96
1998-99	634.3	2365.56
1999-00	644.8	2605.05
2000-01	689.24	2776.15
2001-02	749.81	2910.47
2002-03	873.62	3694.17
2003-04	1080	3877.75
2004-05	1270.48	6130.93
2005-06	1396.78	6604.41
2006-07	1614.45	7629.63
2007-08	1784.23	10627.05
2008-09	1889.55	15122.9
2009-10	1988.4	15317.1
2010-11	1995.46	28287.13
2011-12(P)	1852.2	30204.38

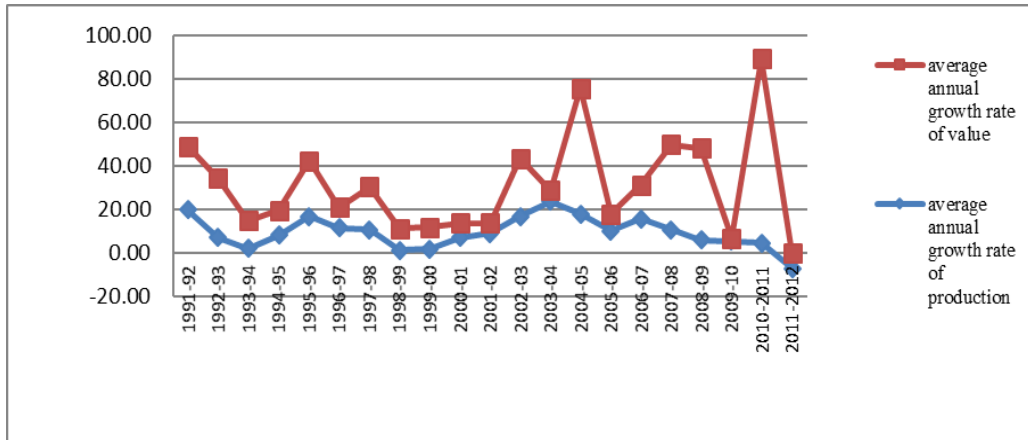
Source: various issues of Economic survey of Odisha; P: provisional

The production and value of minerals in the state has increased at an annual average growth rate of 9.93 percent and 21.67 percent during the last two decade 1990-2011. Average annual growth rate of production and value has increased during 2000-2011 in comparison to previous decade as depicted in table 8. Figure 4 indicates highly fluctuating average annual growth rate of value of minerals in comparison to production all throughout the two decades. Value of mineral has recorded its highest growth of 84.67 percent in 2010-11.

Table 8: Average annual production and value and Average annual growth rate of production and value of minerals in Odisha

	1990-91 to 1999-00	2000-01 to 2011-12	1990-91 to 2011-12
Average annual production of minerals (in lakh tons)	491.26	1432.01	1004.40
Average annual growth rate of production (%)	8.63	9.48	9.93
average annual value(Rs in cr)	1548.75	11098.5	6757.71
Average annual growth rate of value (%)	17.35	24.92	21.67

Source: compiled by author



Source: compiled by author

Figure 4: Annual growth rate of production and value of minerals in Odisha from 1990-91 to 2011-12

Export performance of mining sector in Odisha

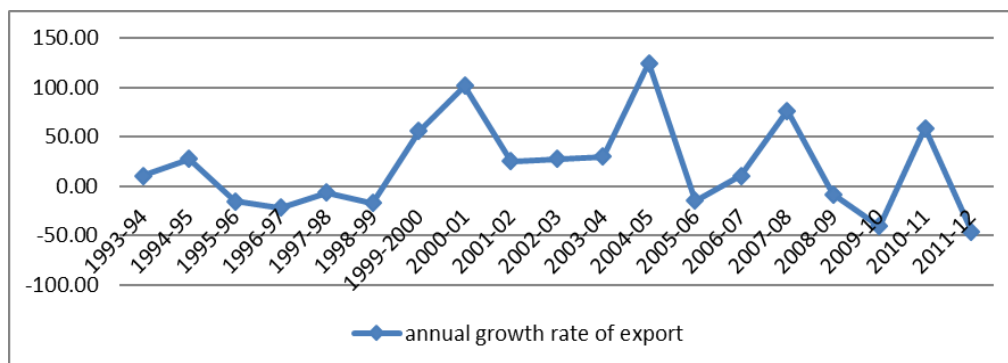
A country rich in mineral resources has got an enviable status. If it can effectively harness export-oriented mineral resources, it can dictate to the international market and earn huge amount of foreign exchange. Export performance of mineral and ores in Odisha can be judged from table 9 where both total export and value of export has been consistently increasing from 1992 to 2011. This shows that mining sector is doing well with regard to export of minerals and also helping the state in earning foreign exchange as value of mineral exported is showing an upward trend. But when annual average growth rate of exports of minerals is taken into consideration, we could see a fluctuating figure during last two decades (figure 5). Year 2004-05 marks the highest growth rate of 125 percent in exports of mineral from Odisha. This growth performance of exports has been an outcome of a conscious and concerted effort on the part of the Government to bring down transaction costs and facilitate trade. The vision and the roadmap provided by the Foreign Trade Policy (2004-09) for a five year period with clearly enunciated objectives, strategies and policy initiatives has been instrumental in putting exports on a higher growth trajectory. The export growth in India is partly on account of a favorable international environment resulting from a sustained world GDP growth at around 5 per cent since 2003. This has led to booming trade volumes and rising commodity prices in the world market. Exports from India also responded to numerous reform measures and policy initiatives. For the first time in the history of planning doubling of export activity within five years was set as a concrete target of the Foreign Trade Policy of the Government. Value of

exports of minerals has recorded a compound growth rate of 30 percent during 1992-2010.

Table 9: Total Exports and value of exports of Minerals & Ores from 1992-93 to 2011-12

Year	total exports(in lakh tons)	value of export(Rs in crore)
1992-93	16.01	140.36
1993-94	17.71	148.84
1994-95	22.63	178.43
1995-96	19.13	209.48
1996-97	15.01	233.95
1997-98	14.08	224.09
1998-99	11.65	258.58
1999-2000	18.14	387.48
2000-01	36.63	453.8
2001-02	46	538.8
2002-03	58.7	642.2
2003-04	76.4	1186.5
2004-05	171.7	NA
2005-06	146.3	9161.2
2006-07	162	10761.2
2007-08	286.17	8333
2008-09	262.84	7814.64
2009-10	155.89	4760.43
2010-11	247.64	15894.29
2011-12	134.73	4231.79

Source: Various issues of Economic survey of Odisha



Source: compiled by author

Figure 5: Annual growth rate of export of minerals in Odisha from 1990-91 to 2011-12

Exports from Odisha composed of Metallurgical Products, Engineering, Chemical and allied Products, Mineral Product, Agriculture and Forest Products, Marine Product, Handloom and Textile Product, Handicraft Product, Electronics and Other(Computer Software and Pharmaceutical).Table 10 shows that Share of mineral product to total product remained around 20 percent till 2002-03 but thereafter it increases more than 20 percent and after 2004-05 it shares increases to half of total export of Odisha and now it is having a lion share of more than 50 percent of total export .This shows that mining is helping the state in making its financial position strong by way of earnings of foreign exchange through exports of minerals products.

Table 10: share of mineral product to total export of Odisha (%) from 1990-91 to 2011-12

year	total exports (Rs in cr)	mineral products (Rs in cr)	Share of mineral product to total export (%)
1990-91	530.59	101.01	19.04
1991-92	797.21	154.16	19.34
1992-93	1068.45	114.19	10.69
1993-94	1117.06	157.6	14.11
1994-95	1334.91	226.86	16.99
1995-96	1740.93	292.02	16.77
1996-97	1760.44	336.9	19.14
1997-98	1885.28	280.89	14.90
1998-99	1892.86	311.35	16.45
1999-2000	2203.38	281.99	12.80
2000-01	2386.09	202.3	8.48
2001-02	2109.52	366.3	17.36
2002-03	2916.18	495.72	17.00
2003-04	NA	NA	NA
2004-05	5391	1266	23.48
2005-06	10743.97	5392.74	50.19
2006-07	12837.32	6085.42	47.40
2007-08	13808.63	7088.06	51.33
2008-09	14644.33	6900.06	47.12
2009-10	12696.43	5740.14	45.21
2010-11	17054.83	9836.84	57.68
2011-12(P)	16139.2	9257.42	57.36

Source: various issues of Economic survey of Odisha; P: provisional

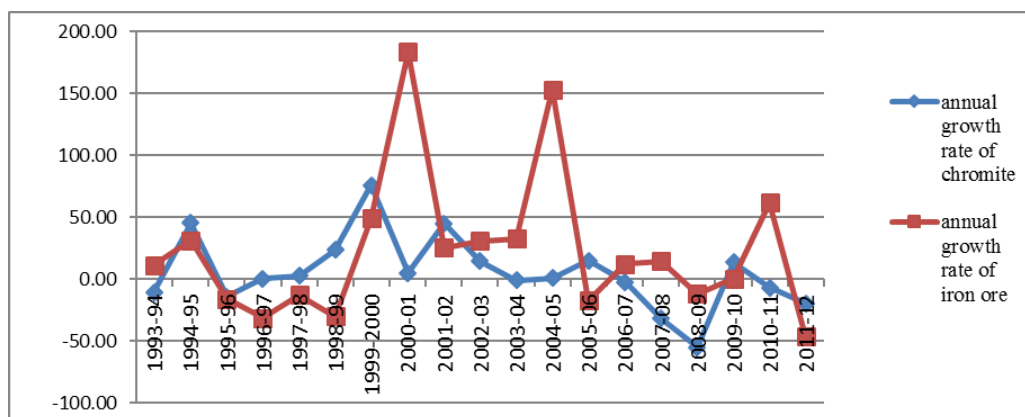
Segregation of export of minerals will highlight more information about export scenario in Odisha and importance of different minerals in Odisha. Exports of minerals has largely occurred in case of iron ore, chromites, manganese ore and mineral sand as is evident from table 11. Iron ore and chromites are two important mineral that are exported substantially from Odisha. Exports have also taken place in case of manganese ore and mineral sand though in small amounts. From figure 6 we could see that export of Iron ore was marked highest in 2000-01 with an annual growth rate of 183.85 percent. This may be due to surge in crude steel production with an annual growth rate of 7.5 percent followed by rise in international steel prices in 2000. As iron ore is used for making steel so there has been a substantial growth rate in its exports. We could again see a considerable increase in growth of exports of iron ore in 2004-05. In this year alone annual growth rate of export of iron ore was 153 percent. But again a slowdown in the export growth for iron ore was observed in 2005-06 with negative growth rate of -17.22 percent. Thereafter in 2006-07 and 2007-08, a positive growth rate though was registered but it was less than 20 percent. The reason for decrease and slow growth in exports of this commodity during these years was mainly due to a slowdown in the demand from China. Main markets of Odisha for iron ores are china, Japan, South Korea, Poland, Singapore, and Malaysia.

Table 11: Export of mineral /ores from Odisha (Quantity in lakh tonne)

Year	chromites	iron ore	mineral sand and zinc	manganese	others(thermal coal,hardcoal and ferrochrome)	Illmenite
1991-92						
1992-93	2.65	12.86	-	-	-	0.5
1993-94	2.38	14.31	-	0.21	-	0.81
1994-95	3.46	18.81	-	-	-	0.36
1995-96	2.98	15.82	-	-	-	0.33
1996-97	3	10.91	-	-	-	1.1
1997-98	3.09	9.54	-	-	-	1.45
1998-99	3.83	6.68	-	-	-	1.14
1999-2000	6.74	9.97	-	-	-	1.54
2000-01	7.1	28.3	1.3	-	-	-
2001-02	10.3	35.5	0.3	-	-	-
2002-03	11.8	46.6	0.3	-	-	-
2003-04	11.7	61.9	2.8	-	-	-
2004-05	11.8	156.8	3.1	0.1	-	-

2005-06	13.6	129.8	2.3	0.6	-	-
2006-07	13.3	145.7	2.7	0.3	-	-
2007-08	9.07	167	2	0.1	108	-
2008-09	4.09	147.53	1.08	0.07	110.07	-
2009-10	4.66	148.68	2.55	-	-	-
2010-11	4.34	241.02	2.25	0.03	-	-
2011-12	3.5	129.67	1.56	-	-	-

Source: various issues of Economic survey of Odisha



Source: compiled by author

Figure 6: Annual growth rate of iron ore and chromites from Odisha, 1993-94 to 2011-12

This section shows that Odisha enjoys comparative advantage of abundance of rich mineral resources. Its contribution to Gross State Domestic Product, production and value of minerals has been substantial. Mining revenue receipts has been steadily increasing contributing fairly to the state exchequer over last one and half decade. The contribution of mining revenue to own non tax revenue has been around 45 -50 percent during 1995-96 to 2011-12. Thus mining revenue has resulted in perpetuating revenue receipts in state exchequer. The state has also emerged as a major exporter of mineral products. This shows that mining sector has definitely contributed to the economic development of state. But now the Question arises that whether the benefits of mining has trickle down to the people in mining districts? How mining districts have fared in terms of human development indicators? Thus this requires a detailed understanding of the impact of mining on human well being and the next section is an attempt in this direction.

Impact of mining on well being of people in mining districts

Mining and employment:

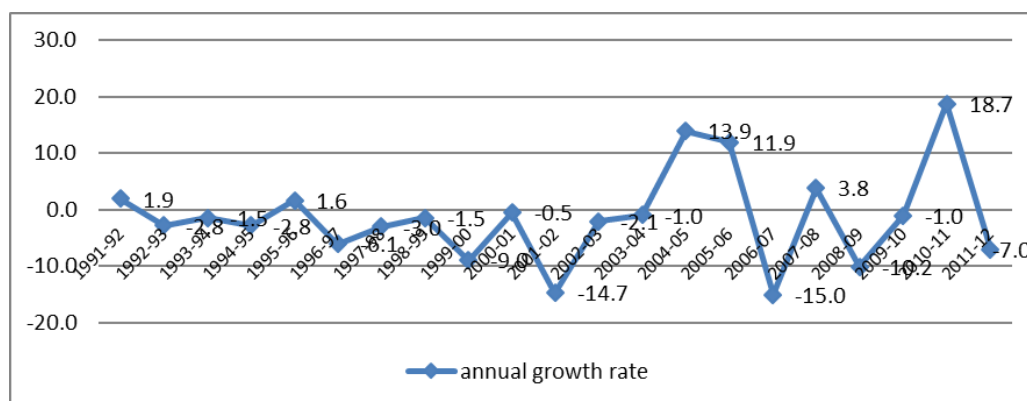
The level of employment is an important measure of economic development of a nation. The efficiency of a particular sector in an economy is assessed, besides other things, on the basis of its employment generating capacity. The mineral sector in Odisha provides employment to a large number of skilled and unskilled people. Table 12 shows number of workers directly employed in major mineral activities. It can be seen that it is not much employment generating as number of people employed in mining declines from 67596 in 1990-91 to 48239 in 2011-12. The average growth rate in employment during 1990-91 to 1999-00 has been negative. Ironically this decline in employment has happened when average growth rate in production has been positive during the same period. Even Employment was negative with average growth rate of -0.28 percent during 2000-01 to 2011-12. Overall during the last two decades though average growth rate in production has increase by 10.14 percent. But people has not been benefited in terms of employment as average growth rate in employment has been negative i.e. -1.26 percent during two decades which table 13 shows. Production of mineral and people directly employed in major mineral activities are significantly negatively correlated. The correlation coefficient between production and employment in mineral activities is -0.73. Annual growth rate of people employed in mining has been more or less remain negative up to 2003-04 but suddenly there has been increase in employment in 2004-05 and further thereafter it is again declines in 2006-07 and again suddenly increased in 2010-11 and again decline next year. Thus it shows a fluctuating tendency (figure 7).

Table 12: Number of workers directly employed in major mineral activities, 1990-91 to 2011-12

Year	Number of workers directly employed
1990-91	67596
1991-92	68886
1992-93	66927
1993-94	65951
1994-95	64094
1995-96	65147
1996-97	61192
1997-98	59326
1998-99	58448
1999-00	53209
2000-01	52937
2001-02	45135
2002-03	44167

2003-04	43743
2004-05	49837
2005-06	55764
2006-07	47376
2007-08	49176
2008-09	44167
2009-10	43705
2010-11	51877
2011-12	48239

Source: various issue of Economic survey of India



Source: compiled by author

Figure 7: Annual Growth Rate of number of workers directly employed in major mineral activities, 1990-91 to 2011-12

Table 13: Annual average growth rate of employment v/s Production growth rate

	1990-91 to 1999-00	2000-01 to 2011-12	1990-91 to 2011-12
Average annual growth rate of production (%)	8.63	11.37	10.14
Average annual growth rate of employment (%)	-2.57	-0.28	-1.26

Source: compiled by author

Thus level of employment in mining sector during two decades shows a dismal state of affairs. Mining has not benefited much in terms of employment generation. This comes as shock when we find that production has shown a positive and upward trend. Mining sector has been increasingly employing labor saving and capital-intensive production techniques and technology over the years. So mechanization, induction of higher technology and automation of

mineral activities in Odisha could be the reason for poor figure of employment of direct labor in this sector.

Human Development in mining district and non mining district

It has been seen that mining districts has contributed a lot to the state in terms of production, export earning, and revenue and has resulted in development of the state. But now the question arises that whether the people living in mining region has benefitted from this development? Did the benefits from mining percolates down to the people in mining districts? This can be assessed by comparing human development indicators that is infant mortality rate, literacy rate, gross enrolment ratio, District domestic product per capita of mining district with non mining district. So districts in Odisha have been categorized under mining and non mining.

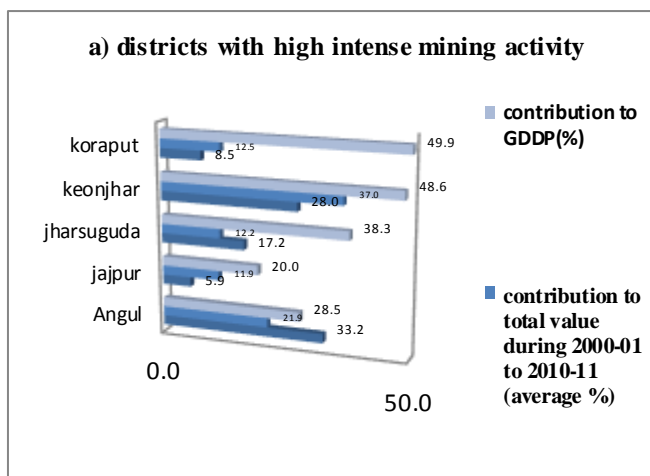
Table 14: Average Production, Average Value and contribution to Gross District Domestic Product (GDDP) of mining district of Odisha

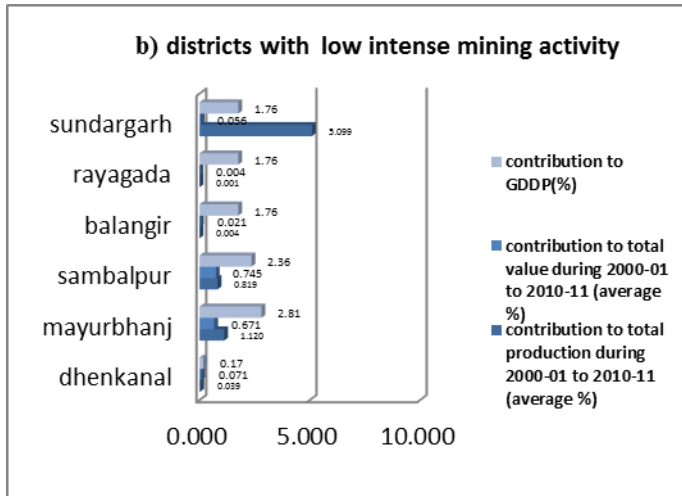
mining districts	average production (2000-01 to 2010-11)	% contribution to total average production of mining districts	average value (2000-01 to 2010-11)	% contribution to total average value of mining districts	value of minerals 2009-10 (in Rs crore)	Gross district domestic product in 2009-10 at current prices (in Rs cr)	Minerals contribution to GDDP (%)
Angul	459.3	33.162	1997.8	21.90	3094.00	10849.07	28.52
jajpur	81.18	5.861	1081.9	11.86	1300.00	6509.11	20
jharsuguda	238.2	17.199	1115.1	12.22	1801.00	4704.17	38.29
keonjhar	388.2	28.029	3379.7	37.04	5909.00	12150.1	48.63
koraput	117.3	8.469	1137.4	12.47	2636.00	5285.26	49.87
mayurbhanj	15.51	1.120	61.25	0.67	190.00	6753.35	2.81
sundargarh	70.62	5.099	273.74	3.00	30.00	14200.07	0.21
dhenkanal	0.53	0.038	6.51	0.07	7.00	4152.2	0.17
sambalpur	14.18	1.024	67.93	0.74	123.00	5214.2	2.36

balangir	0.06	0.004	1.94	0.02	3.21	5240.43	0.06
rayagada	0.01	0.001	0.39	0.00	0.46	3359.15	0.01

Source: various issue of Economic Survey of Odisha and compiled by author

Average Production, Average Value and contribution to Gross District Domestic Product (GDDP) of 11 mining district of Odisha are shown in table 14. Angul,Keonjhar,Jharsuguda,Koraput,Jajpur are the mining districts where it can be seen that contribution of mining to State District Domestic Product in terms of share of value of minerals to GDDP is 20 percent or more whereas in other district it is less than just 3 percent. In these five districts average production and average value to total are also very substantial that is more than 5%. Thus these districts can be considered as districts with high intense mining activity where as Sambalpur,Sundergarh,Bolangir,Mayurbhanj,Rayagada,Dhenkenal are considered as less intense mining activity districts which is shown in figure 8a) and b). Thus as the contribution of mining sector to GDDP in less intense mining activity districts is very less so these districts were considered in the category of non mining districts.





Source: compiled by author

Figure 8: performance of mining districts in Odisha in terms of its contribution to GDDP, total average value and total average production of minerals.

Above table 15 analyses Human Development indicators across thirty districts of Odisha which has been categories into mining and non mining districts. It is observed that some of the mining districts have performed poorly in terms of various indicators of human development vis a vis other districts of the state. Keonjhar, Koraput And Jajpur fair poorly in terms of health index than all Odisha aggregate. These three districts have also been poorly in terms of human development index at aggregate level. While Jajpur and Koraput were poor than Odisha aggregate in terms of income index, Keonjhar and Koraput perform poorly in terms of education index. A better picture of performance of mining districts in terms of various indicators can be framed when assessed Vis a Vis the performance of Non-mining districts.

Table 15: Human Development indicators of mining and non mining districts of Odisha

Districts of Odisha	HI	infant mortality rate	II	EI	HDI value	HDI rank
Mining districts						
Angul	0.481	95	0.748	0.76	0.663	6
jajpur	0.333	118	0.499	0.786	0.54	22
jharsuguda	0.635	71	0.757	0.773	0.722	2
keonjhar	0.34	117	0.547	0.704	0.53	24
koraput	0.218	136	0.539	0.535	0.431	27
Non mining districts						
mayurbhanj	0.782	48	0.489	0.647	0.639	9
sundargarh	0.692	62	0.618	0.74	0.683	4

dhenkanal	0.468	97	0.534	0.773	0.591	12
sambalpur	0.436	102	0.59	0.742	0.589	13
balangir	0.468	97	0.504	0.666	0.546	21
rayagada	0.25	131	0.547	0.531	0.443	25
Balasore	0.442	101	0.466	0.77	0.559	18
Bargarh	0.449	100	0.517	0.727	0.565	17
Bhadrak	0.673	65	0.463	0.803	0.646	8
Boudh	0.423	104	0.497	0.688	0.536	23
cuttack	0.686	63	0.587	0.813	0.695	3
Deogarh	0.776	49	0.532	0.698	0.669	5
Gajapati	0.173	143	0.558	0.561	0.431	28
Ganjam	0.404	107	0.532	0.718	0.551	20
Jagatsinghpur	0.288	125	0.549	0.833	0.557	19
Kalahandi	0.763	51	0.471	0.585	0.606	11
Kandhamal	0.006	169	0.516	0.645	0.389	29
Kendrapara	0.596	77	0.466	0.815	0.626	10
Khurda	0.724	57	0.639	0.845	0.736	1
Malkangiri	0.122	151	0.497	0.491	0.37	30
Nabarangpur	0.34	117	0.453	0.516	0.436	26
Nayagarh	0.462	98	0.485	0.766	0.571	15
Nuapada	0.692	62	0.47	0.582	0.581	14
Puri	0.622	73	0.527	0.823	0.657	7
Sonepur	0.474	96	0.492	0.731	0.566	16

Source:1. Economic Survey of Odisha of various years

2. Human Development Report 2004, Odisha

Note: HI – Health Index, II – Income Index, EI – Education Index, HDI – Human Development Index

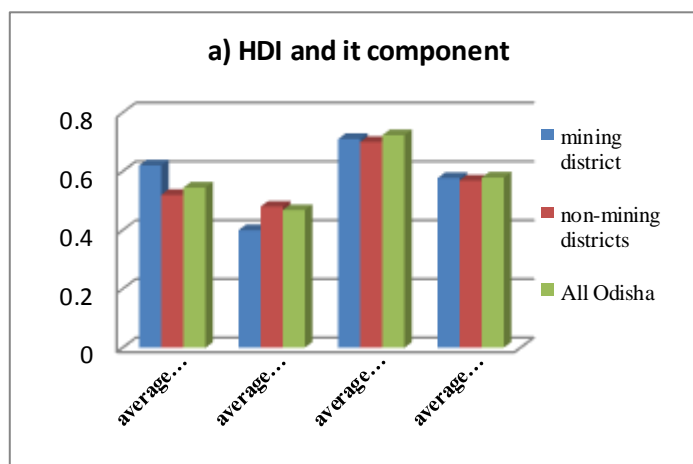
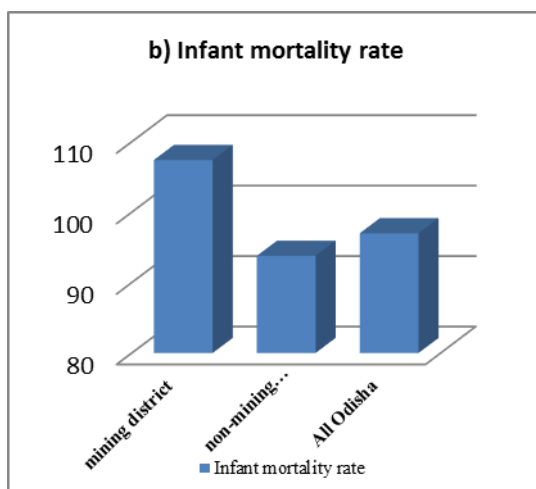
In table 16 Human Development Index and its indicators of mining districts has been compared with the non mining districts. HDI in mining districts is slightly higher than non mining district and the difference is also significant at 2 percent level of significance having t-statistic value of 2.40. Analyzing by its components, Income index in mining districts is significantly greater than non mining districts at 0.5 percent level of significance having t-statistic value of 3.04. But in case of Health index it has been lagging behind non-mining districts. Health index in mining district is significantly lower than non mining at 8 percent level of significance with t-statistic value of 1.8. Thus despite of having lower health index, due to higher income index HDI in mining districts is higher than non mining. It seems that Income distribution in mining districts

may be loaded in favor of rich people of the district (Figure 9a). Further Infant mortality rate in mining districts is not only very high than non mining districts but also is statistically significant at 1 percent level having value of 2.59 showing poor health conditions of people living in mining region (Figure 9b).

Table 16: Human Development Index in mining and non mining districts of Odisha

	average income index	average health index	Infant mortality rate	average education index	average HDI
mining district	0.62	0.4	107.4	0.71	0.577
non-mining districts	0.52	0.48	93.8	0.7	0.569
All Odisha	0.545	0.468	97	0.723	0.579

Source: compiled by author



Source: compiled by author

Figure 9: comparison of mining and non mining districts with respect to a) Human Development Index and its component b) Infant mortality rate

In spite of economic and other benefits that accrue due to mining there is almost a unanimous agreement that this activity is beset with a number of problems. The impacts of mining are felt at every stage of the mining cycle from exploration to mine disclosure. It is one such activity that has highly adverse consequences not only on natural ecosystem but also on the local communities dependent on them (Vagholikar N et al, 2003). The villages closest to mines appear to bear a greater environmental cost (Pattanayak S K et al, 2010). The adverse impact of mine on environment can be seen in form of pollution of air, water, land and noise. Further a study by Noronha and Nairy (2005) shows that though mining region has a lower Quality Of Life relative to the non-mining villages but people in the mining region reported lower satisfaction levels only in the environmental domain. This finding was evidenced by a study in Keonjhar district which shows villages closer to mines have poorer health, education and production assets (Pattanayak S K et al, 2010).

Mining has been most hazardous of occupation and hazards of working in mines vary greatly on such factors as the type of mineral being mined, related geological formation, mining techniques employed and general health of workers (Cho K.S and Lee S.H, 1978). The mining effect on health of residents in the communities is related to distance from the mines. That is, proximity to mine site is very crucial in determining the prevalence of mining related diseases such as malaria, respiratory infections and skin diseases (Yeboah J Y, 2008). Incidence of illness, expenditures on illness, and total cost of illness are all higher in mining region and negatively correlated with distance to mines. Households who live closer to mines do report significantly more days that household members are too ill to work (Pattanayak S K et al, 2010). Odisha is sharing second highest Infant Mortality Rate of 57 per thousand in 2010-11 out of 29 states in India. The health hazard and degeneration of health condition of women and children is one of the most serious impacts of mining. Hexavalent chromium is known to adversely affect women's health as it is teratogenic, causing birth defects in foetus, embryo toxic, causes still birth, reduces fertility. A study in manganese mine shows high infant mortality rate and suffering of newborn from neurological problems (Das M, 2013). The most common diseases suffered by people due to the dust from the coal mines are tuberculosis, cough and cold, malaria, skin diseases, diarrhea, staining of teeth, joints pain, arthritis, lethargy etc. Constant contact with dust and pollution and indirectly through contamination of water, air cause adverse impact on offspring of pregnant women in mining areas. They are exposed to various respiratory illnesses due to dust particles and become victim of skin diseases, experience

malfunction of various sensory organs, which have long term impact on reproductive health. These may be the reason for existence of high Infant mortality in mining districts.

Hence there is an increasing disparity between mining and non mining districts by means of percolation of development. Mining sector has not much benefited people in terms of direct employment provided as a negative annual average growth rate has been recorded in past two decades. Mining districts enjoy higher income index but suffer lower health index than non mining districts. It seems that income generated from mining is not well distributed among inhabitants of mining region that is why average Infant Mortality Rate is very high in mining districts than in non mining area.

Conclusion

Mining resources extraction in any economy plays a pivotal role in its development. The present study finds that a forceful performance of mining sector (in terms of production, export and value) and a widespread of mining activities in the state has substantially contributed to government exchequer in form of royalty, taxes etc. This has been also reflected in terms of performance of human development indicators of mining districts in relation to non-mining districts. But it has failed to improve the health conditions of people in the mining districts as mining districts have performed poorly. Mining districts like Keonjhar, Koraput, and Jajpur have HDI value very low though their income is more or less near to average value of Odisha. On an aggregate if we see, mining districts are lagging behind in health aspect where not only neglected trickle-down effect but also adverse environmental impact of mining on health of inhabitants could be reason. The negative impact of mining on health, land, water, air, plants and animals can be reduced by careful planning and implementation of mining activities. Provision of medical facilities to the people in the mining areas especially to those who have no employment link with mining companies should be the responsibility of government. Awareness campaign of the dangers to the health posed by mining activities can be effectively carried out through educational programmes. Abatement measures to control environmental pollution are a must in order to reduce the likelihood of sickness. Formation of village level committees, blending outside expertise grass root political leadership can go a long way in excising an effective check on environmental degradation. A compensation mechanism can and should be designed to ensure that the mining industry in Odisha becomes a sustainable engine of broad-based and equitable growth and not another example of the resource curse. Thus we could safely conclude that mining can be the driver of economic development of the region provided health aspect of inhabitants of mining region are duly taken care.

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