

# Exploitation of Natural Resources and Mining Activities in Odisha: A case for Green Accounting



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## Abstract

In this paper an attempt has been done to highlight the significance of mineral resources in the development of Odisha GDP and to show the rate of exploitation of different minerals for industrialization in domestic territory and for exports in last decade. The forest area that has been diverted for non-forest use, particularly for mining purpose due to different projects has also been discussed. An account of deforestation having occurred in last decade due to exploitation of natural resources, particularly minerals is discussed and highlighted. The impact of overutilization of mineral resources and diversion of forest land for non-forest use on environment and the life of tribal in terms of livelihood loss and displacement needs crucial attention. There has been significant economic and non-economic costs borne by the marginalized tribal having been displaced which needs to be taken into account while reflecting the real growth of Odisha economy. The concept of green GDP i.e. measuring the growth of the economy compared to the environmental damage and costs to the ecosystem and depletion of natural resources should be accepted as measure of development instead of conventional measure of development i.e., Real GDP. Data have been collected form Odisha Economic Survey, 2016-17 and PCCF office, Bhubaneswar and Directorate of Mines and Directorate of Geology. The data for showing the significance of mining sector and rate of exploitation of minerals spans for a period of 2001- 2016. Simple statistical tool as compound growth rate using semi-log model and percentages are used to analyze the data.

**Keywords:** System of Environmental Economic Accounting (SEEC), Green Gross Domestic Product (GGDP).

## Introduction

Economies have been trying hard to achieve high economic growth. Unsustainable paths have been followed in order to achieve targeted high economic growth, straining economy's natural resources. Simon Kuznets (1934) who developed national income accounts for USA later stressed the need for distinguishing between the quality and quantity of growth, cost and returns of growth in the short-run and long-run of national income statistics. Hicks(1946) defined national income as the maximum amount that a country can consume without running down its wealth. However, national income accounting in most countries tend to define wealth and capital stock in a way that is favorable for growth statistics rather than concern for natural wealth. The known and the neglected truth is that the present high GDP growth neither takes into account the benefits of environment nor the costs to the environment. The costs to the depletion of natural resources, environment has been highlighted recently by economists, policy makers and institutions in last five decades.

In recent years, not only India but also Odisha has achieved spectacular economic growth at 6% to 8% since post-liberalization period. But, high growth rate has been achieved at the cost of haphazard exploitation of natural resources, leading to deforestation, deterioration of bio-diversity. GDP does not account for depletion or degradation in quality of natural resources or in other words the depreciation of natural capital as opposed to manmade capital. The objectives of this paper is to examine the trend of economic growth in Odisha and the share of mining & Quarrying in Odisha,s GDP at current prices. In this context, the total reserves, exploitation and rate of exploitation of important minerals during 2011-2015 has been highlighted. The third objective is to highlight the

significance of green accounting which would promote adoption of green growth development strategy that is sustainable, economically, environmentally and socially. While using mineral resources for development of industries in the state, the other consequences of mining sector should be taken into account for developmental decision-making. The economy based on nineteenth –century-type natural resource exploitation cannot sustain economic development and any resource-rich economy is bound to stagnate in poverty without major efforts to improve natural resource conservation and utilization efficiencies.

#### **Review of Literature**

In this work, an humble attempt has been made to review some of the literature based on various dimensions of mining sector and natural resource exploitation. Contribution of mining to the economy in terms of positive and negative aspects , particularly to the economy's growth in GSDP, employment and revenue on the positive side while negatively it impacts the environment, forest resource depletion, life of tribals in terms of displacement and rehabilitation and deteriorating quality of soil etc.

Luthfi Fatah (2008) has analyzed the impact of coal mining industry on the economy in terms of both positive and negative externalities. Positive externalities are reflected through employment generation, generation of value and also improvement in the foreign investment in the country or region. But the negative externalities pointed by the author are the environmental deterioration for the public at the cost of managers' benefit. His research has used Social Accounting Matrix (SAM) to analyze the impact of coal mining industry on the economy of South Kalimantan Province, Indonesia. Simulation method has been used to find alternative policies on the coal industry that are suitable for economic improvement and environment sustainability. The author has suggested to impose taxes on coal mining to slow down mining activities and to use the tax revenue as transfer payments such as subsidies and direct transfers "in kind" such as rice and farming equipment to support the needs of lower income households. Hilson Gavil (2002) examines both positive and negative socio-economic impacts of small-scale mining in developing countries and points out some key measures for improving sustainability in the sector.

Galina Ivanova, John Rolfe, Stewart Lockie and Vanessa Timmer (2007) have discussed the key contribution of coal mining industry to the Queensland economy as an underlying driver of employment and economic conditions in many local and regional communities. This article aims to focus on how the social and economic impacts of mining should be assessed and negotiated with local and regional communities. Multi assessment tools such as extended stakeholder analysis of key community representatives, economic modeling of changes in the level of mining activity and a random survey method have been used to study the social impact. The results showed that impact assessment should be addressed using different economic and social

science tools to ensure regulatory approval as well as community acceptance. The article suggests alternative social and economic impact assessment mechanisms that can be applied to any industry and any situation (e.g. growth, decline, new development, simultaneous changes).

Large-scale mining activities involve risks related to environment. Nowadays, there exists an emerging literature on climate change impacts in mining operations. Not surprisingly, a large body of this literature refers to Canadian mining sector given that it has already been affected by climate-related hazards (e.g. Ford et al. 2010 and 2011; Pearce et al. 2011). Challenges include a shorter ice road season that induced, in 2006, an extra transportation cost of \$11.25 million to Diavik mine, changes in permafrost that could affect open pit design, tailings management and reclamation practices (e.g. Etkin 1998; Neale et al. 2007; Stratos 2009; Pearce et al. 2009 and 2011), etc. The impacts of climate change on mining industry, both direct and indirect effects in the Mediterranean Region, and Greece in particular has been discussed by Damigos. More specifically, the analysis aims at investigating how climate change will affect mining installations operating in Greek domain, and assesses, for the first time, the potential impacts and economic effects of climate change-related risks on the mining industry using a 'top-down' approach (Damigos, D, 2012) NevesaAna Carolina de Oliveira Nevesa (2016) undertook a study on the Brazil and watched one of the worst environmental disasters in its history unfold. The study has been conducted at Bento Rodrigues, a village in the municipality of Mariana, located in the Espinhaç, and data has been collected both the primary and secondary which points out the conflicts between mining and ecosystem services and goods and reducing society's consumption levels. Wang Jiali ( 2017) conducted on the basis of their study that proposed a reclamation strategy that incorporated land suitability analysis and ecosystem service evaluation for a mining site in Liaoning Province, China ,secondary data has been collected on this study and proposed a simple yet straightforward strategy for post-mining reclamation and applied it to an iron mining site located in the central part of Liaoning Province, China provided useful information for selecting optimal land uses alternatives for different parts of the mining site. This reclamation planning method can not only provide theoretical guidance for ecological restoration of post-mining areas, but also be used to restore other wastelands with similar contexts. Ali Yelapaala, Kaakpemaand S. H.(2005) attempted to examines large and small-scale mining in Ghana's largest diamond mining town, Akwatia, and their relative impact on environmental degradation, health, and the livelihood of artisanal miners. Data for this paper was collected via a combination of bibliographic research in the United States and Ghana, and field research in the case-study town, Akwatia. Qualitative and research techniques were employed to collect primary data on the mining industry in Ghana, mining practices in Akwatia, mining-related sickness, and information from the major diamond mining company

in Akwatia. Due to the unpredictability in diamond revenue earned by artisanal miners, miners who do not earn enough revenue may resort to illegal mining activities outside of areas set aside for artisanal miners to compensate. This implies that both the government and the mining company will need to be partners in enforcing the regulation of illicit mining activities to reduce the environmental burden of mining outside of set aside areas. Appropriate environmental planning, social safety nets for managing the economics and further allowing the communities to make a transition to other sectors after resource depletion are the solutions to prevent conflict which can lead to sustainable livelihoods for these communities.

### **Mining Sector & Odisha Economy**

Mishra (2010) has analyzed both analytically and empirically the path taken by the three important sectors of the state: agriculture, industry, and mining. Based on an inter-district and inter-state panel analysis, the paper highlights the serious decline in the Orissa's agricultural sector despite being the most significant determinant of per capita income in the state. In contrast, the mining sector has flourished in production and exports. How the socio-economic conditions of primitive tribals such as Juanga and Paudihuyian living around the Suakati Mines of Keonjhar are discussed by Patra(2015). Pradhan P and S.Patra ( 2014), conducted the study to analyse the health status of mining people in Keonjhar district of Odisha. The study is based on primary data collected from mines worker in Banspal block of Keonjhar district of Odisha, Increasing mining activities have increased the incidence of waterborne diseases like typhoid and fever through changes in water quality and acute respiratory infections are caused due to working in dusty conditions with no protection. Thus, a compensation mechanism should be designed in order to achieve a sustainable development in Odisha

Mohapatra Dharmabrata (2013) has compared human development parameters in mining and non-mining districts of Odisha, highlighting the lower health and human development index in mining districts vis a vis non-mining districts. A compensation mechanism can and should be designed to ensure that the mining industry in Odisha become a sustainable engine of broad-based and equitable growth and not another example of the resource curse. The environmental degradation consequences in the Raniganj and Jharia coalfield have been discussed by Goswami (2013).Goswami(2015) has expressed his view that the need for industrialization and its expansion is inevitable but should not be at the cost of agriculture. Agriculture and coal mining should go together so that we can meet the present need sufficiently without compromising the availability of resources for future generation. .

Panda Gitanjali (2014,) shows the economic significance of mining sector in the context of Orissa Economy in terms of value of total extractions, total employment generation and contribution of mining sector to State Gross Domestic Product and total revenue. She has discussed the

various forms of corruption as pointed out by Saha Commission relating to violation of environmental rules and regulations and other rules of state and central government

Behera P.K. (2015) attempts to explain the significance of industrialization on and its impact on the local economic development through a case study in three peripheral villages of NALCO industrial area. In view of the specificity of the topic and primary data has been collected. The relevant information have been elicited from 100 residents of three surrounding villages of NALCO namely Kapsiput, Analabadi and Goudaguda through a special questionnaire. The findings showed both positive and negative effects of mining, refinery, aluminium smelter and industrial effluents of NALCO on human and ecological health, pattern of livelihood, income, education and settlement of local population etc. and finally it suggest alternatives and improvements to prevent environmental and health degradation and, to actively promote education, health and economic development around industrial sites.

### **Research gap and Significance of The Study**

So far nobody has studied the trend and contribution of mining sector to the state Gross Domestic Product and the rate of exploitation of natural resources in an analytical manner. As Odisha economy is rich in minerals, the future development of the economy depends on the economic utilization of the minerals in domestic industry so that more employment can be generated. The present study has given the empirical evidence of continuous deforestation for different development projects in general and for mining in particular to signify the natural resource exploitation .It has discussed the importance of green accounting as an indispensable tool to be used to judge the real economic growth.

### **Objectives of the Study**

1. To analyze the significance of Mining Sector in terms of production in tons and its contribution to State Gross Domestic Product
2. To highlight the rate of exploitation of different minerals in Odisha for the period 2011-12 till 2016-17
3. To analyse the trend of diversion of forest area to non-forest use for developmental projects in general and for mining projects in particular
4. To discuss the concept of green accounting and its relevance in calculating the State GSDP

### **Role of Mining and Querrying and State GSDP**

Odisha is one of the mineral rich states of the country having a special distinction in the country's overall mining sector. Bounded by latitudes 17 49-22 34 N and longitudes 81 23-87 29 E, having an area of 1, 55,707 sq.km. and a 477.6 km-long coastline the state has geological continuity with the bordering states of West Bengal, Jharkhand, Chhatisgarh and Andhra Pradesh which together account for some of the major rock groups of Indian stratigraphy. It has attracted large scale private investments to mining sector in last two decades. Most large-scale industries in Odisha are mineral-based. Presently in steel production, Odisha has 10 % of the total capacity of the nation, while it has 25 % of

total iron ore reserves . We will make an estimation of the stock, exploitation and status of rate of exploitation in Odisha in major mineral resources due to rapid increase in demand in steel internationally as well as increased demand of mineral-based industry. The impact of the degradation of minerals on livelihood and environment needs serious attention:

**Table1.1**

**Percentage Contribution of Mining and Quarrying to State GSDP and Growth of Production of Minerals in Odisha**

Year	Production in lakh tons	Percentage of contribution to GSDP
2001-02	749.81	5.35
2002-03	873.62	6.06
2003-04	1080	7.05
2004-05	1270.48	7.54
2005-06	1396.78	8.37
2006-07	1614.45	8.51
2007-08	1784.23	9.47
2008-09	1889.55	10.73
2009-10	1988.4	9.4
2010-11	1995.46	9.82
2011-12	1852.29	12.2
2012-13	1866.7	10.84
2013-14	2017.57	10.38
2014-15	1919.24	8.55
2015-16	2396.46	8
2016-17	2609.81	7.36
Compound Annual Growth Rate	6.98%	

Source: State Income Division, DE&S, Odisha & Directorate of Mines & Directorate of Geology, Odisha  
The table 1.1 shows the contribution of mining and Quarrying to State GDP which has shown an increasing trend since 2001 at 5.35% to 10.38 % in 2013-14. There has been little decline in the mining contribution in the last two years i.e., 8.55 and 8 % respectively, following the Saha Commission report on illegal mining and withdrawal of leasing licence. The growth of mineral outputs (in Lakh tons) taking all kinds of minerals together from 2001-2002 to 2016-17 has been quite high at 6.98%

**Table2.2**

**Value of Production in India as a Percentage of all India Production**

Year	Odisha	India	% of India
2008-09	17642.18	1545514.08	11.42
2009-10	17034.03	160649.56	10.6
2010-11	19488.58	163907.85	11.89
2011-12	28597.81	137346.78	20.52
2012-13	29450.81	144945.17	20.32
2013-14	54281.6	225659.68	24.04
2014-15	26470.1	211712.22	12.5
2015-16	29582.57	208488.13	14.16
2016-17	2997.44	216188.01	13.88

Source: IBM Govt of India

The above table 2.2 reflects the fact that the value of production of the minerals as a percentage of total value of all-India production have increased from 2008-09 till 2013-14. It was 11.42 % in 2008-09 which increased to 24.04% in 2013-14.

**Table2.3**

**Total Reserves for 2015-16 and Rate of Exploitation of Important Mineral during 2011-12 to 2015-16**

Minerals/Ores	Total reserves in 2015-16	Exploitation in million tones during					Rate of exploitation to total reserves (%)				
		2011-12	2012-13	2013-14	2014-15	2015-16	2011-12	2012-13	2013-14	2014-15	2015-16
Iron Ore	5692.83	81.15	62.93	77.784	53.33	80.87	1.63	1.27	1.36	0.93	1.42
Chromite	171.49	3.79	2.88	2.855	2.16	3.10	2.33	1.8	1.62	1.24	1.81
Coal	757860.53	105.12	109.68	108.175	122.76	138.55	0.15	0.15	0.14	0.02	0.02
Bauxite	1895.11	5.05	5.46	7.635	9.19	10.84	0.28	0.3	0.41	0.49	0.57
Lime Stone	1764.45	3.14	3.90	3.716	3.41	4.52	0.31	0.39	0.21	0.19	0.26
Dolomite	682.54	1.11	1.02	0.687	0.46	1.04	0.34	0.31	0.10	0.07	0.15
Fire Clay	170.08										
Quartz	134.26	0.07	0.03	0.04	0.03	0.05	0.10	0.04	0.04	0.02	0.04
Mineral Sands	266.38	0.24	0.23	0.179	0.24	0.226	0.11	0.1	0.07	0.09	0.08
Graphite	8.59	0.03	0.01	0.010	0.01	0.18	0.69	0.15	0.12	0.12	2.10
Manganese Ores	189.66	0.54	0.53	0.663	0.32	0.43	0.45	0.44	0.37	0.17	0.23

Source: Directorate of Mines, Odisha & Directorate of Geology

Odisha has been richly endowed with vast resources of a variety of minerals and occupies a prominent place in the country as a mineral rich state. Odisha has 5692.83 million tones of iron ore constituting 33% of iron ore deposits of India, 757860.5 million coals constituting 24% of India and 52% of Bauxite of India at 1895.11 million tones .The rate of exploitation has been highest among the chromite, iron ore and coal. Coal has been extracted in Angul District and the rest from Jharsguda,

Sundergarh and Sambalpur. Iron Ore extraction is confined to Keonjhar followed by Sundergarh. Most of the bauxite mining takes place in Koraput, followed by Rayagada. The rate of exploitation of has been the highest for chromite at 2.33% in 2011 followed by Iron and ore at 1.63%. There has been a little decline in the exploitation of iron ore from 2011-to 2014-15. But, the rate of exploitation has again increased in 2015-16 to 1.42.

**Size of Diversion of Forest Area for Mining Activities in Odisha**

By 2015-16, 433 diversion proposals covering an area of 46,708 hectares were diverted under the Forest Conservation Act, 1980 for different

developmental projects. Of which mining projects constitute 37.41%, demanding 21,256 hectares, constituting 45.51% of total diverted area for non-forest use. Total area diverted for mining is 22024.47 hectares since 1980.

**Forest Area Diverted to Non-forest Use (2004-05 to 2015-16)**

Year	Number of Developmental Projects	Area diverted for non-forest use (in hectares)	Cumulative area diverted for non-forest area
2004-2005	9	1274.39	
2005-2006	28	2207.23	3481.62
2006-2007	17	911.83	4393.45
2007-2008	20	1802.58	5305.28
2008-2009	14	723.74	7107.86
2009-2010	15	2310.16	9418.02
2010-2011	13	915.95	10333.97
2011-2012	13	831.18	11165.15
2012-2013	10	2813.74	13978.89
2013-2014	18	925.407	14904.3
2014-2015	21	2867.588	17771.89
2015-16	7	756.009	18527.89
2016-17	17	297.872	19283.9

Source: PCCF, Odisha

**Consequences of Rampant Mining Activities**

Mining in Orissa has generated controversy, which spans encroachment of forest areas, underpayment of government royalties, and conflict with tribals regarding land-rights. The spill-over of the effects of illegal mining into problems such as Naxalism and the distortion of Indian democracy by mixed political and mining interests, has gained international attention. Bauxite and coal mining by Vedanta Resources in tribal areas of Orissa have led to conflicts in land rights. Coal mining has run into trouble as well in Angul district over land issues. The livelihood of lakhs of tribals was affected due to closure of mines in both Sundergarh and Keonjhar districts.

There have been severe ecological changes due to illegal mining. Certain species of animals and medicinal plants disappear due to large-scale mining. It is reported that the area surrounding the mining area is denuded of greenery and agricultural activity gets affected in mineral-based districts. The forest land of Keonjhar constitutes one of the major parts of forest resource of Orissa. Apart from this, it is home to a sizeable tribal population; including some of the most primitive tribes, those who are totally dependent on forests and agriculture for their livelihoods and survival. The land use pattern surrounding the mines area are changing rapidly. The major sufferers of this change are forest, agricultural land. Apart from the above two, another important finding of the study is the sharp increase in wasteland which is putting negative implication on livelihood of tribal. Apart from environmental degradation, this resource extractive development process has put a negative impact on the tribal inhabiting surroundings of mining. The local economies that used to circle around agriculture, forest produces and traditional occupations (fishery, handicrafts) are on the verge of collapse (extinction). The study reveals that, areas in and around the mining area has mostly affected by the progressively

increasing in pollution generated due to mines & associated activities. Fugitive dust pollution is found to be a major problem throughout the year in these areas. Similarly the perennial streams passing through the mines area has become severely polluted. Some streams are found choked & some path has been diverted due to deposition of overburden in its path.

**Relevance of Green GDP**

Definitely Odisha's economic growth is expected to grow at 7.94% during 2016-17 which is more than national average of 7.1%. The important question is whether such satisfactory growth rate has been achieved at the cost of exploitation of natural resources, causing collateral damage to the environment. There has been a growing awareness about the necessity to promote growth and development without massive degradation of the natural resources and thereby adopt the principles of sustainable development. Green GDP is one way of achieving this. Conventional measures do not take into account environmental costs and social costs of development. Therefore, they may be misled in terms of forecasting long term growth.

GDP has become the default measure of economic progress. World Research Institute (1989) has estimated that nearly half the increase of gross national product of Indonesia during the period 1971-1984 was on account of unsustainable liquidation of natural resources. Hence the concept of green accounting has been accepted and promoted by International Organisation such as UN, developing a framework of System of Environmental Economic Accounting (SEEA). There is a need for land accounting, water accounting and forest accounting as part of GGDP. The costs of land degradation in terms of soil erosion, sedimentation and degradation Factors to compute GSDP accounting are value of stock depletion, value of loss of water quality, costs and gain associated with ground water depletion and

recharge, impact costs of wealth due to water pollution and land degradation due to water logging and salinity. There is a great deal of interaction between forests and the economy as forests are source of firewood, timber, tangible non timber forest produce (NTFP), non-timber forest amenities like biodiversity related benefits, environmental regulatory services like ground water recharge, carbon sequestration, Environmental protection services like disposal of pollutants, protection of soil erosion, environmental recreation services such as ecotourism.

### Conclusion

Thus, as we set our goals for quantitative economic growth to meet the aspirations of the people, it is vital to ensure that economic achievements are not at the cost of serious depletion of natural resources and unsustainable degradation of environment. Green GDP allows us to take into account such cost as stated above to better developmental decision –making. We have to subtract the costs of environmental and ecological damage done in a specific period of time from the GDP of the same period. Due to poor availability of information on various aspects of natural resources and problem of quantification of natural resources, it is not possible to fully assess the damage being done to natural resources. It is therefore necessary to develop a system of accounting of natural resources which is likely to provide ample support to design the economic system, in such a way that it is possible to attain economic growth without destroying natural resources.

In view of the significant importance of mining in the economic growth of an impoverished state like Odisha, it is not desirable to completely restrict mining. However it is extremely important to regulate mining and take all necessary steps to restrict illegal mining. To minimize the adverse impact on environment, concrete measures need to be undertaken for the rehabilitation of mined areas. Comprehensive plans should be prepared on priority in order to stabilize the overburden dumps, minimize the silt flowing into the water bodies, and undertaking planned afforestation activities. The local population and the people working in the mines suffer from various health hazards and need special medical care. Usually the roads and other infrastructure get adversely affected in the mining areas. All these adverse impacts need to be addressed to minimize the impacts of mining on the environment as well as the local population. Also there needs to be long term studies on socio economic and environmental impacts due to mining activities to generate reliable data for future planning.

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