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Editorial

How Much Should One Consume?

Prof. Baidyanath Misra

One of the questions which bothers social scientists is environmental degradation. And the main reason for which such degradation has become common is the pattern of development that we pursue to satisfy our unlimited desires. We have almost reached a stage of crossing the limit of our natural resources. The guiding principle of resource utilisation is to maximise development by utilising such resources in an optimum manner and to see that the benefits accrue not only to the present generation but also to the future generation. As the World Commission on Environment and Development points out in 'Our Common Future', sustainable development is the development that meets the needs of the present without compromising the ability of the future generation to meet their own needs. We have not only forgotten the future but also the present. We have already sacrificed efficiency and equity, now we have started endangering ecology. Instead of developing modern technology in a benign direction, it bears the impress of capitalism - with "the capitalist's interest in quantity - his belief that there are no natural limits to acquisition" being "supplemented in technology by the notion that quantitative production had no natural limits either" (Lewis Mamford). We propose here to discuss the problem of ecology from the point of view of acquisition of different goods and its effect on social perspective.

Rama Chandra Guha whose book on 'India after Gandhi' has made a critical analysis of historical development of India, now provides a provocative comparative history of environmentalism in two large ecologically and culturally diverse democracies, India and the United States by writing an illuminating book on 'How Much Should A Person Consume'? All those who have read Galbraith's path breaking book, 'The Affluent Society' know it very well that most of the developed countries are preoccupied with productivity and production. The population in these societies had for the most part been adequately housed, clothed and fed; now they express a desire for "more elegant cars, more exotic food, more erotic clothing, more elaborate entertainment". According to Galbraith, these are indeed for the entire modern range of sensuous and lethal desires.

Guha has shown that the USA consumes, per capita as well as in the aggregate, a far greater proportion of the World's resources as shown in the following table.

Material	World Production	USA Consumption	3 as % of 2
1	2	3	4
Minerals	7,641	2,410	31.54
Wood Products	724	170	23.48
Metals	1,196	132	11.03
Synthetics	252	131	51.98
All Materials	9,813	2,843	28.97

The USA's Share of World Consumption of Key Materials, 1995 (Figures in Million Tons)

The table shows that the American society has placed heavy burden on natural resources. It is estimated that the atmosphere and the oceans can absorb about 13 billion tons of carbon dioxide annually. This absorptive capacity, if distributed fairly amongst all the people of the world, would allow each human being to have the right to emit about 2.3 tons of carbon dioxide per year. At present, an American discharges in excess of 20 tons annually, a German 12 tons, a Japanese 9 tons, an Indian a little over 1 ton. We can, therefore, say that the industrialized countries led by the USA are principally responsible for the building up green house gases over the past 150 years.

The over-emphasis on consumption is identified mainly due to the worship of the Great God Growth. It is assumed that economic growth would cause more goods available for most of people and an increased availability of more goods to a person must cause an increase in his welfare i.e. it would thus enrich his life. But as Thomas Piketty in his monumental book "Capital in the 21st Century" has shown, in spite of tremendous growth in the USA, there is a great deal of inequality in the country. Just to give one example in 2012, the top one per cent of households in the USA took 22.5 per cent of total income, the highest figure since 1928. On the other hand, the share of income going to wages and other forms of labour compensation dropped from 68 per cent in 1970 to 62 per cent in 2010 – a decline of close to a trillion dollars. Piketty observes that a small group of wealthy rentiers lives lavishly on the fruits of inherited wealth, and the rest struggle to keep their livelihood. It is therefore, said that world's sole super power suffers from ecological imperialism. One philosopher aptly remarks that 'the present way for life of the most industrially advanced nations stands in a global and antagonistic contradiction to the natural conditions of human existence. They are eating up what other nations and future generations need to live on'. The industrialized countries which consume three fourths of world's energy and resources, and who contribute the lion's share of "climate - threatening gaseus emissions", must curb their voracious appetite while allowing poor nations to grow out of poverty.

There is now a trend in most of the developing economics to initiate the pattern of development as pursued in the USA. We can illustrate the example of one leading developing country like China where once communism was the basic structure of the economy. Consider the spread of personalized transport in China whereas once in America - the possession of car is the one time sign that a human being has become properly modern. As the Economist magazine approvingly reports, the car is seen by the middle class Chinese as the 'symbol of freedom and status'. As Prof. Guha reports, the demand for cars in 2002 increased by 56 per cent, in 2003 by 75 per cent. In 2004 the China state news agency Xinhua proclaimed that "China has begun to enter the age of mass car consumption. This is a great and historic advance." Shanghai has a Formula One racetrack now, costing \$320 million. The city will soon have a \$50 million car museum. One can give another example of misuse of forests in China. Thomas Friedman who has become famous by writing a wonderful book, 'World is Flat' reports that billion strong population of China uses 45 billion pairs chopsticks every year. These account for 25 million full grown trees. India's growth pattern is no way different from that of China. As a matter of fact, the industrialisation of India and China does pose special problems caused by the weight of sheer numbers. Gandhiji understood as early as 1928 that if the most populous nations sought to emulate the ecologically wasteful ways of most powerful, they put in peril the very conditions of human survival. So, by the time the Indians and Chinese reach American levels of consumption, will they have stripped the world bare, like locusts?

Galbraith aptly said, there is a vested interest in production. For businessmen production means prestige. For liberal politicians it helps public office. And in case of consumer, when physical needs are satisfied, then psychologically grounded desires take over. The concept of satiation has very limited standing in economics. It is neither useful nor scientific to speculate on the comparative cravings of the stomach and the mind. But no state should tolerate such ambitious cravings of businessmen, politicians or consumers and must try to enforce at least sustainable development. A minimum sustainable development must not, as pointed out by 'The World Commission on Environment and Development', endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and living beings. This implies that economic development should not cross the limits of the carrying capacity of our planet. In fact, sustainable development involves more than growth. It requires a change in the content of growth, to make it less material and energy intensive and more equitable in its impact. These changes are required in all countries as a package of measures to maintain the stock of ecological capital, to improve the distribution of income and to reduce the degree of vulnerability to economic crisis.

Poverty and Public Policy in India: Some Reflections¹

K. Sundaram²

I am grateful to the Orissa Economics Association and Professor Santosh Panda for inviting me to Inaugurate this 46th Annual Conference of the Orissa Economics Association and to share some thoughts on a subject that still has considerable relevance and traction in debates on public policy in India. As it happens, it is also a subject on which I have done some work.

In organizing my thoughts on the subject, I will draw upon some of the Terms of Reference (ToR) of the **Expert Technical Group to Revisit the Methodology for Estimation of Poverty and Identification of the Poor** set up by the Planning Commission in May 2012 under the Chairmanship of Dr. C. Rangarajan with myself as one of the members.

The First ToR requires the group to examine, inter-alia, "whether the poverty line should be fixed solely in terms of a consumption basket or whether other criteria are also relevant, and, if so, whether the two can be effectively combined to evolve a basis for estimation of poverty in rural and urban areas".

Before examining the question of setting poverty lines in terms of a consumption basket, let us briefly consider the issue of "other criteria".

The search for "other criteria" possibly stems from a view that some of the "capabilities" – or, rather, the lack thereof – underlying the notion of poverty, such as, for example, "escaping avoidable disease" or "to be (at least minimally) educated" may not be tightly linked to the privately purchased consumption basket in the current period in terms of which poverty lines are currently drawn. To illustrate, in the area of education, the observed outcome in terms of say, the proportion of illiterates in the adult population would primarily reflect **the cumulative impact of past** provisioning of public services and private decisions to avail of these services and to utilise a part of private purchasing power for the same and for essential complementary goods and services, with **Current expenditures** (both private and public) would, **primarily shaping future outcomes**.

Similarly, "escaping avoidable disease" and the health status indicators of morbidity and mortality may be expected to be more closely associated with availability and access to a range of public goods and services such as safe drinking water, sewage and sanitation facilities, vaccination services etc. rather than the money value of the privately purchased consumption basket.

^{1.} Inaugural Address delivered at the 46th Annual Conference of Orissa Economics Association

^{2.} Centre for Development Economics, Delhi School of Economics, Delhi University, Delhi

The elements of "other criteria", presumably, relate to an amalgam of some **outcome indicators in** the area of education and health and, **input indicators** in terms of a range of public goods and services. These are also listed as components of a so-called "Multi-dimensional" measure of poverty.

A few comments on these elements of "other criteria" are in order.

In respect of indicators of health outcomes, mortality indicators pose a basic problem that they are not even defined at the level of an individual person or a household. This feature of mortality indicators (also true for morbidity indicators) that they are appropriately defined for population groups rather than for individuals/households would, automatically, rule them out as a component of any measure of poverty that is relevant for the design and implementation of policies and programmes targeted at individuals/households. As for morbidity measures, self-reported episodes of illness, captured in NSS morbidity Surveys, could be seriously misleading and out-of-alignment with mortality indicators for the same population group.

As for indicators of access to a range of public goods and services, deprivation of individual households in respect of their access to these goods and services is indeed measurable. The central issue here is one of **aggregating** these into one composite index of deprivation in terms of the "other criteria". There are several problems.

First, since these public goods and services are in the nature of inputs shaping outcomes in the area of health and malnutrition, they are not independent of one another and, therefore, **in principle**, they cannot be aggregated.

Secondly, even if the indicators are indeed independent, and hence can be aggregated into a composite indicator, there remains the problem of **analytically appropriate rules of aggregation**. Specifically, this requires that all the component indicators relate to the **same individual**. This, in turn, poses severe data constraints. For example, Decennial Censuses which provide valuable information on access of households to a range of sanitation and other housing amenities like water and electricity cannot be combined with either the NSS Consumer Expenditure Surveys or other NSS surveys covering access to publicly provided goods and services.

Do these difficulties in aggregation of indicators of deprivation on different dimensions really matter from the perspective of design and implementation of policies and programmes? Not necessarily. In fact, I would argue that, in some cases, an inability to aggregate can be positively beneficial. For, aggregation – in effect some form of averaging – results in loss of information about the individual components. For example, the design of policies targeting illiteracy, on the one hand, and inadequate access to toilets on the other, is not helped by composite measure of the two deprivations. More generally, the target groups for these programmes would need to be programme-specific and not by reference to any "one-size-fits all" measure of poverty.

Equally important, if not more so, is the fact that **in respect of all public goods and** services the poverty – status of the beneficiaries (in terms of their consumption expenditure) should not matter : their provisioning must be on a universal basis.

Further, all **rights-based entitlements/programmes** – Employment Guarantee Programmes or those delivering "right-to-education" – must be universal in character. Indeed they are. Even the Food Security Act is designed not to exclude anyone who wishes to avail of its benefits. The provision under this Act to cater to up to 75 percent of the rural population rather than limit the same to the state-level Head-Count-Ratio must be seen in this perspective.

On the Issue of Poverty line, per se, there is general consensus in India that it should be specified by reference to Consumption Expenditure rather than Income. One reason for this preference is the recognition that collection of data based on household surveys is far more difficult in respect of income. The difficulties are particularly significant in respect of the sizeable segment of self-employed workers. Even when income data is more easily collectible, as in the case of wage employees, there is the problem of sizeable variability in their incomes even within a year, especially for the casual labourers among them. In contrast consumption expenditures are expected to be less volatile.

The choice of Consumption Expenditure, also settles the data – base question in favour of the nation-wide consumer expenditure surveys of the National Sample Survey Organisation (NSSO). And, the growing demand for estimates for smaller administrative units leads one to prefer the quinquennial surveys with a population frame and much larger sample-size (relative to the annual surveys of consumer expenditure surveys).

This choice of data-base also restricts the domain to **private** consumer expenditure leaving open the question of how one takes on board the sizeable and growing role of expenditure for/on behalf of households-not only by the Government but also by the so-called non-profit institutions serving private households. This is particularly important in the area of education and health. Apart from direct transfers e.g. stipends and scholarships-public expenditures can and do impact the reported private consumption expenditure by making available many of the publicly provided goods and services either free or at heavily subsidized prices. In this context, the provision of food grains at highly subsidized prices under the PDS system or, now under the Food Security Act, would require us to interpret carefully the reported private expenditure on food: **the same quantity of grains** would now **cost substantially less.** Inter-temporal comparisons basesd on a base – year poverty-line adjusted for prices of the base-year basket would also be affected if, over time, the households increase the share of the lower-priced PDS-grain and/or the prices of PDS-grains themselves are reduced.

Recent experiments with the choice of reference period to be used to capture private household consumer expenditure have also led to a consensus that a mix of itemgroup specific reference periods (ranging from 7days for relatively high-frequency purchases like vegetables, eggs, meat & fish, and edible oils, to a 365-days reference period for durables and low-frequency expenditure like in-patient medical care, with a 30day reference period for all other item groups) best captures private consumer expenditure. Estimates on this full mix of reference periods are referred to as modified mixed reference period (MMRP) – estimates, while those with a mix of a 365-day reference period for durables etc. and 30-days for all others are called MRP estimates.

The most difficult question of all, namely, where or rather how to draw a poverty line in terms of reported private consumer expenditure on say, MMRP, is left to the last precisely because there are no easy answers.

Consider, for example, linking the poverty line to calorie norms. There are, firstly, problems at the level of specifying the Calorie norm. Recent work by Meenakshi and Vishwanathan shows that these are sensitive to assumptions about the age-structure of the population, the cut-off level of BMI chosen, the heights of the reference Male/Female in rural and urban India, and, the level of physical activity (heavy/moderate/sedantry). And, depending on the choice of assumptions, this could vary all the way from 1880 to 2135 calories in rural India – significantly lower than the widely used norm of 2400 calories per capita per day.

The more significant problem is the **absence of strong support, either analytical** or empirical, linking the calorie-content of the privately purchased food basket in the current period to either nutrition-status outcomes or health-status outcomes.

A related problem in drawing a poverty line in terms of total monthly per capita private consumer expenditure (MPCE) linked to a calorie-norm is the very limited variation in observed calorie-content of the food basket over a sizeable-range of MPCE.

As Professor Tendulkar and I had noted over two decades ago, given problems of norm-specification in respect of other basic needs as well (and other problems), we can not treat the poverty line cut-off as the total cost of purchasing goods and services needed to fulfill them.

In short "there is an inherent and irreducible element of arbitrariness in the specification of the absolute poverty line" and there is no alternative but to treat is as "low-enough but reasonable" minimum living standard.

It is important to underline the idea of "low-enough" in specifying the absolute poverty line. Specifying a poverty line such that, say, two-thirds (or, more) of the all – India population are deemed to be poor would imply that in poorer regions or among poorer segments of population almost the entire population would be below the poverty line. To illustrate, with a poverty line set at the median – MPCE of the all-India rural population (on MRP) will imply a poverty ratio of over 85 percent of the Scheduled Tribe population in rural Odisha and of over 92 percent for Casual Labour in Agriculture in rural Chattisgarh.

In assessing the Recommendations on the all-India poverty line by this or any other Expert Committee, this perspective must be firmly in place.

How is Odisha Doing ? A critical assessment of economic performance of the State in the last two decades'

Santosh Chandra Panda²

At the outset, I would like to thank the members of Odisha Economic Association to elect me as President for the year 2013-14. I stand here today to deliver the Presidential address. Before I move on to the subject matter of my talk, I would like to thank formally, Professor K. Sundaram, our Chief Guest today, who has already delivered an excellent inaugural address. I would also like to thank our invited speakers, Prof. Pulin Nayak and Prof. Arup Mitra who would be speaking later during the conference. I would take this opportunity to thank all our sponsors and the Principal and Staff of Rimuli College without whose support, this conference would not have been possible I hope, all of you will enjoy these two days at a remote location of the state.

The title of my talk today is "How is Odisha Doing" with a question mark in which, as an economist, I am going to assess the economic performance of the State in the last two decades. Let me confess that the title is more or less a borrowed title from Amartya Sen who in 1982 published an article in New York Review of Books titled "How is India Doing" which became an eye opener to the outside world about India. In that paper Sen spoke about economy, society and politics of the country. In my talk, however, I am going to cover only the economic aspects in which I will address the following questions:

- 1. How has the State performed on the economic growth front and which are the sectors contributing to this growth process?
- 2. How has economic growth in the State impacted poverty and inequality during the period?
- 3. How has the State performed in the social sector, in the last two decades? In particular, we will assess how the State has performed in Education and Health.

I must admit that in preparing this lecture I have borrowed liberally from my own work done earlier and also from our edited volume "Essays on Economy of Odisha" jointly

^{1.} Presidential Address delivered in the 46th Annual Conference of Orissa Economics Association on 15 Feb. 2014

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edited by me, Pulin Nayak and Prasanta Pattanaik, which should be published very soon. A lecture of this nature has to rely on data. I use data from various sources including NSS and Odisha Economic Survey. I have used data sketchily to present the main theme in my story. Tables and diagrams have been presented in the appendix. So much for the introduction. Now let us turn to the main questions I want to address.

1. Odisha Growth Story:

When we examine the growth rate of Gross State Domestic Product we find that the last ten years have been an exciting phase for Odisha's economy. The average rate of growth of the economy till 2003, has been a meagre 3.4% but from 2003-04 onwards, the State has seen a significant upward shift in the rate of growth . The average rate of growth during the last ten years is around 8%. The rate of growth during 2003-2007 was in excess of 12%, and in 2012-13, it was 9.14%. Till 2003-04, growth rate was low and fluctuating widely; whereas from 2003-04 onwards it has been high and relatively stable.

There are several factors which might have contributed to this turn around in growth in 2003-04. The State government started implementing the liberalized policy of industrialization around this time. Several mine based industries in steel aluminium, ferromanganese got established during this period. Secondly, the State followed a path of fiscal discipline and became a surplus revenue state in 2003-04. This would have curtailed resources being used for debt financing and would have augmented growth. Thirdly, the disaster management policy adopted by the State after the super cyclone started showing results around this time and this would have mitigated the negative impact of natural disasters on economic growth.

Whether the turn-around in growth in 2003-04 was significant or not, we ran a statistical significance test using dummy variables. We found that the change in the rate of growth is statistically significant at 5% level of significance so that the upward shift in growth rate was not a random event.

Since economic growth have been significant after 2003-04, we examine what has happened to per capita income in the State since 2004-05. The per capita real income in the State has grown from Rs. 17650 in 2004-05 to Rs 25584 in 2012-13, whereas all India per capita real income has grown from Rs 24143 to Rs 39143 in 2012-13. The increase in per capita income in the State has lagged behind the national average and the gap has widened.

While talking about growth, it will be of interest to know the sectoral contribution to economic growth. Using the data from CSO on GSDP at factor cost we find that the Primary sector grew at an average rate of only 1% till 2002-03 but from 2003-04, it has grown

at a rate of 4.4. The change in the growth of Secondary sector has been very substantial: from 1.9% pre 2003 to 9.9% post 2003. Similarly, tertiary sector grew at an average rate of 6.1% before 2003. Since 2003-04, it has been growing a 9.9% on an average. Within Primary sector, growth of agriculture has been the main contributory factor. Within Secondary sector, growth of Manufacturing and Construction has been of prime importance. In Tertiary sector, two components have major contribution: namely, Trade, Hotels and Restaurants and Transport, Storage and Communication. If we look at contribution to growth, Primary sector contributes 15.9%, Secondary sector 30.6% and Tertiary sector 53.5%.

2. Inequality and Poverty:

Inequality in our society exists since time immemorial. Extreme inequalities in societies have led to social unrest and revolutions in the past and a glance through world history makes it clear that extreme form of inequality had undesirable consequences and hence should be avoidable. At the same time, noted economist Scitovsky (1963) observes in his classic paper "Equity" that as long as we get 'economic incentives' to produce the national product , inequality results since human abilities are unequal . Societies are more likely to tolerate inequalities if these are correlated with merit and if a person at the bottom feels that he has equal chance with others for reaching the top. Also, a society will easily tolerate inequalities if those at the bottom are provided with subsistence and necessities of life. In this sense, inequality is always linked to poverty and we are going to analyse both inequality and poverty here.

Following Sen, we could also ask "Inequality of What?" While it is interesting to consider inequality in income, inequality in wealth, inequality in nutrition or inequality in opportunities it is difficult to get an estimate of these attributes since data is difficult to obtain. NSS data gives us data on 'per capita consumption expenditure' and we use this data to measure inequality in the State.

To measure inequality, several alternative measures are available and we are not going to discuss the pros and cons of each of these measures. Gini Coefficient is the most popular measure to estimate inequality and we are going to use that. Using the thick rounds of NSS in 1993-94, 2004-05 and 2009-10 we calculate Gini Coefficient for Rural and Urban Odisha separately. The results on inequality in rural Odisha are something to cheer about. We see that inequality in rural Odisha increased between 1993-94 and 2004-05 but it shows a decline between 2004-05 and 2009-10. It is to be noted that this has been a period of high growth. Contrary to the popular belief that high growth is always associated with higher inequality, results from rural Odisha shows that high growth can be associated with reduction of inequality also. This, in a way, confirms the findings of a cross country analysis by Bruno, Ravallion and Squire (1996) where they conclude that there is no correlation between growth and inequality. Note that the decline in inequality in rural Odisha occurs no matter which inequality measure we use. In that sense, the result is robust.

The results are different when we look at inequality in urban Odisha. Inequality in urban Odisha shows an upward trend between 1993-94and 2004-05 and also between 2004-05 and 2009-10.

While we try to measure poverty, again a number of measures are available to us such as Head Count Ratio, Poverty Gap Ratio, Sen's poverty Index and FGT index. Head Count Ratio is the simplest of all and we use this to present our results. However it may be noted that we get the same trend, no matter what poverty measures we use.

To calculate poverty index, we use the poverty line given by Tendulkar committee. This is the Poverty line adopted by the Planning Commission and will be in use until a new poverty line is given by the present committee headed by Dr Rangarajan of which Prof. Sundaram is also a member. Using NSS data on per capita consumption expenditure under Mixed Reference Period we find that HCR measure of poverty in rural Odisha declined from 60.81% in 2004-05 to 39.19% in 2009-10. In urban Odisha, it declined from 37.58% to 25.91% between 2004-05 and 2009-10. This is a sharp decline in poverty and is much higher than the decline in poverty at the national level. Also, I would like to emphasise that we get the same result no matter which poverty measure we adopt. This decline is also seen if we are measuring poverty among various social groups, be it Scheduled Caste or Scheduled tribes or OBCs.

Another point to note that is that between 1993-94and 2004-05 there has been only marginal decline in poverty in rural Odisha and marginal increase in poverty in urban Odisha. The decline is sharp and significant between 2004-05 and 2009-10. Note also that this is the period of high growth. It is not difficult to infer that high growth rate can be seen as a necessary condition for reduction in poverty. Pursuing the path of high growth seems to be the right policy for poverty reduction.

3. Education:

We have just seen that Odisha has grown at an appreciable rate in the last ten years coupled with sharp decline in poverty. Given this, one expects positive outcomes on education. To assess the performance in education we use some standard parameters such as literacy rate, gross/net enrolment ratio at various levels, dropout rates, gender parity index and so on. While all these figures throw light on quantitative expansion of education, it does not reveal the quality of education being imparted. We try to assess the quality of education in the State, particularly at the level of higher education.

When we look at the literacy rate, we see that literacy rate in the State has risen steadily. In 1951, it was 15.8%, in 2001, it was 63.08% and in 2011, it was 73.45%. This is close to the national average of 74%. The gender gap in literacy levels has been declining also but still far from the desired level. In 2011, male literacy rate was 82.4% whereas female literacy rate was only 64.36%. If we compare with Kerala, the figures are respectively, 96.2% and 91.8%. So, a lot is still to be achieved to bridge the gender gap.

If we examine the enrolment ratio in primary education, both GER and NER have shown marked improvement over the last ten years. NER has improved from 73% to 93% during this period which is close to the national average. The drop out rate in primary and upper primary level has been reduced substantially. At upper primary level, the drop out rate in 2003-04 was 57%. In 2011-12, it has been reduced to 3%. It is clear that with reduction in poverty, there is less pressure on families to withdraw children from school and force them to join the work force. However, the dropout rate at secondary level is still very high, standing at 50% in 2011-12.

If we look at secondary and higher education, number of high schools in the State has grown from 7300 in 2005 to 8280 in 2011-12 but the transition rate for higher secondary level was only 48%, as against 78% in Tamil Nadu and 74% in West Bengal. This could be because there are not enough seats at the university level as being demanded. If state doesn't have resources, private players could be given an opportunity to establish universities to pursue liberal education.

Quantitative expansion cannot be the sole criterion of measuring success in educational attainments. Imparting quality education should be a major interest behind expanding education. One of the key elements of maintaining quality in education is to attract, appoint and retain good faculty. No educational institution can attain excellence without good faculty. The performance of the State on this count has been rather dismal. Following a policy where regular positions are filled up by contractual teachers with paltry salaries or filling them up with adhoc teachers for a fairly long time, the authorities have only helped to downgrade the quality of higher education in the State. Having 50 -60% positions vacant in colleges and universities is a common scene now. It is time for the authorities to realize that this may inflict irrevocable damage on the quality of education and that corrective measures soon be taken to reverse this trend.

4. Health

In order to assess the performance of the State on health, we look at some standard indicators such as Crude Birth Rate (CDR), Infant Mortality Rate (IMR), Under 5 Mortality Rate (U5MR), Life Expectancy at Birth and Total Fertility Rate (TFR). We also look at the health infrastructure the State has created over the last 10 years and whether the State is spending enough on health.

When we look at some basic indicators, all indicators have improved over the last five years. For example, IMR declined from 75 in 2005 to 57 in 2011; CDR fell from 9.5 to 8.5, Crude Birth Rate fell from 22.3 to 20.1 during same period. However each indicator is worse than the all Indian figure and worse than our neighbouring state West Bengal. So, the broad conclusion we get is that things have improved in the State in the last ten years but not adequate. It could have done better.

If we look at the health infrastructure, we get a dismal picture. Going by Govt. of India norm, the short fall in sub centres is 17.8% and in Public Health Centres it is 7%. The short fall in manpower is quite stark: 44% short fall in surgeons, 89% short fall in physicians, 73% short fall in paediatricians, 57% short fall in doctors at PHCs, 73% short fall in nursing staff, 89% short fall in radiographers and the list goes on. Add to this the fact that the Odisha has 6 medical colleges with 750 seats amounting to 1 medical seat per 55,930 population (2011 census). All India figure is 1 seat per 30,000 population. This convinces us that there is a huge shortfall in human resources to adequately cater to the health needs of the population. All India situation in these respects is bad, Odisha is doing much worse.

When we look at the public expenditure on health, India spends only 1.2% of its GDP on health. In comparison, China spends 2.7%, Brazil 4.2%, U.S.A. 8.5%. Interestingly, India is the only country where private spending on health far exceeds public spending. For India, the figure was 2.9% in 2010. Odisha also falls into the same category and does worse. Health expenditure as a percentage of GSDP has varied between 0.56% to 0.88% between 2004-05 and 2012-13. 2012-13 budget estimate puts it at 0.69% of GSDP. The abysmal infrastructure we see in provisioning of health is clearly due to lack of adequate investment in health infrastructure.

To the extent possible, a modern welfare State must strive to provide minimum level of health care to those who are unable to afford it. So, to provide the support for health care, public expenditure has to be stepped up to the tuneof at least 3% of GSDP. If the State is unable to provide that kind of financial resources then a proper heath policy should be formulated where private players can come in to provide health care all over the State and the deserving households are given a health insurance to cover all expenses.

5. Cocluding Remarks:

Odisha's growth has been impressive since 2003-04. This has impacted substantial reduction in poverty also. One expects that reduction in poverty should lead to improved school enrolment. The data supports this hypothesis. Gross Enrolment Ratio up to upper primary is close to 100% in 2011 and dropout rate is negligible at 2%. There is scope for expanding higher education facilities in the state but the State has to invest in human resource to maintain the quality in education. Health facilities have improved but are not so satisfactory. The state has to increase the expenditure on health in order to create a health provisioning infrastructure worthy of name. For covering expenses on major illness, insurance cover seems to be a good idea and the State can actively participate in it.

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APPENDIX

Year	Growth Rate at 2004-05		
	Prices		
1993-94	7.36		
1994-95	5.16		
1995-96	4.12		
1996-97	-4.85		
1997-98	13.39		
1998-99	2.84		
1999-2000	8.59		
2000-01	-1.72		
2001-02	4.82		
2002-03	-0.08		
2003-04	12.84		
2004-05	12.82		
2005-06	5.68		
2006-07	12.85		
2007-08	10.94		
2008-09	7.75		
2009-10	4.55		
2010-11	7.5		
2011-12	4.92		
2012-13	9.14		

Table-1: Growth Rate of GSDP

Source : Odisha Economic Survey, 2012-13

Table-2: Summary of results: Growth Rate of GSDP

Dependant Variable	1981-82 till 2002-03 β ₀	2003-04 till 2012-13 β ₀₊ β ₁	Change in Rate of Growth β,
GSDP	3-4	7.88	4.49
GSDP 3 year moving average	3.38	8.14	4-75

	Level			3-year	Moving ave	erage
	Upto 2003-04		Upto	2003-04		
Sector	2002-03	onwards	Change	2002-03	onwards	Change
Primary	1.0	4.4	3.4	1.4	5.0	3.7
Secondary	1.9	9.9	8.0	2.0	10.2	8.2
Tertiary	6.1	9.9	3.8	6.1	9.9	3.8

Table-3: Growth Rates of GSDP Sectorwise

Table-4: Major Drivers of Growth

(Shares of growth since 2003-04)

Sector	Contribution to Growth (%)
Primary	15.9
Secondary	30.6
Manufacturing	15.9
Registered	12.9
Construction	10.1
Tertiary	53.4
Transport, Storage and Communication	10.5
Trade, Hotels and Restaurants	15.1

Table-5: Inequality in Rural Odisha

Inequality Measures	1993-94	2004-05	2009-10
Relative Mean Deviation	0.155	0.189	0.178
Gini Coefficient	0.223	0.265	0.253
Kakwani Measure	0.047	0.065	0.059

Social Groups		1993-94	2004-05	2009-10
ST		0.202	0.220	0.221
SC		0.200	0.226	0.213
OBC			0.244	0.231
Others	Including OBC	0.219	0.256	0.242
	Excluding OBC		0.264	0.256

Table-6: Inequality in Rural Odihsa by Social Groups (Gini Coefficient)

Table-7: Inequality in Urban Odisha

Inequality Measures	1993-94	2004-05	2009-10
Relative Mean Deviation	0.213	0.248	0.282
Gini Coefficient	0.294	0.340	0.385
Kakwani Measure	0.077	0.101	0.131

Table-8: Inequality in Urban Odisha by Social Groups (Gini Coefficient)

Social Gro	ups	1993-94	2004-05	2009-10
ST		0.279	0.330	0.322
SC		0.233	0.297	0.307
OBC		—	0.318	0.283
Others	Including OBC	0.292	0.329	0.383
	Excluding OBC		0.317	0.394

Poverty Measures	1993-94	2004-05	2009-10
Head Count Ratio %	63.16	60.81	39.19
Poverty Gap Ratio %	16.03	17.38	8.99
Sen Index*100	21.760	23.15	12.41
FGT Index*100	5.683	6.638	3.003

Table-9: Poverty in Rural Odisha

Planning Commission Poverty line for Rural Odisha :

1993-94: Rs.224.20 2004-05: Rs.407.8 2009-10: Rs.567.1

Table-10: Poverty in Rural Odisha by Social Groups

Social Grou	ps	Poverty Measures	1993-94	2004-05	2009-10
ST		HCR	82.14	84.52	66.03
		Poverty Gap	26.10	30.46	19.58
		Sen Index	33.85	37.98	25.83
		FGT Index	10.50	13.04	7.63
SC		HCR	62.82	67.88	47.11
		Poverty Gap	15.83	19.01	9.16
		Sen Index	21.56	25.48	12.47
		FGT Index	5.67	7.22	2.58
OBC		HCR		52.59	25.62
		Poverty Gap		12.55	4.64
		Sen Index		17.05	6.4
		FGT Index		4.18	1.23
Others	Including	HCR	54.78	47.90	25.20
	OBC	Poverty Gap	11.60	10.96	4.62
		Sen Index	15.96	14.99	6.45
		FGT Index	3.53	3.56	1.28
	Excluding	HCR		37.22	24.54
	OBC	Poverty Gap		7.35	4.59
		Sen Index		10.18	6.51
		FGT Index		2.14	1.359

Poverty Measures	1993-94	2004-05	2009-10
Head Count Ratio %	34.76	37.58	25.91
Poverty Gap Ratio%	8.35	9.60	5.31
Sen Index*100	11.45	13.15	7.55
FGT Index*100	2.86	3.50	1.70

Table-11: Poverty in Urban Odisha

Planning Commission Poverty line for Urban Odisha

1993-94 : Rs. 279.3	295.9 all India
2004-05 : Rs. 497.31	578.8 all India
2009-10 : Rs. 736.00	859.6 all India

Table-12: Poverty in Urban Odisha by Social Groups (HCR)

Social Groups		PL: 279.30 1993-94	PL : 497-31 2004-05	PL : 736.00 2009-10
ST		58.05	53.40	34.06
SC		38.96 63.73		47.05
OBC			42.36	25.96
Others	Including OBC	30.32	31.11	14.03
	Excluding OBC		23.77	18.00

Table-13: Poverty Comparision: Odisha and All India (HCR)

		1993-94	2004-05	2009-10
RURAL	Odisha	63.16	60.81	39.19
	All India	65.79	41.83	33.81
URBAN	Odisha	34.76	37.58	25.91
	All India	39.09	25.74	20.88

Year	Odis	All India		
	Male	Female	Total	Total
1951	27.32	4.52	15.8	18.33
1961	34.68	8.65	21.66	27.30
1971	38.29	13.92	26.18	34.45
1981	46.39	20.6	33.62	43.57
1991	63.09	34.68	49.09	52.21
2001	75.35	50.51	63.08	64.8
2011	82.40	64.36	73.45	74.04

Table-14 : Literacy Rates for Odisha & All India

Source : Census of India 1951-2011

Table- 15: Enrolment in Selected Years

Year	GER				NER	-
	Primary	Upper Primary	Total	Primary (6-11yrs.)	Upper Primary (11-14yrs.)	Total (6-14yrs)
2004-05 2005-06 2006-07 2007-08 2008-09 2009-10 2010-11 2011-12	104.26 92.25 90.98 96.66 96.92 94.04 99.06 99.69	81.29 83.3 100.31 106.09 99.06 104.11 105.45 104.93	92.77 87.78 95.65 99.47 98.27 99.79 101.32 101.31	93.13 78.58 82.06 84.23 92.28 92.88 91.83 93.3	69.04 71.84 63.11 76.62 85.52 85.68 83.84 93.24	73.65 78.58 82.02 82.03 90.47 91.29 90.78 93.27

Source : OPEPA

Table-16: Dropout Rates for Selected Years

Year	Prin	Primary		Upper Primary		ndary
	Girls	Total	Girls	Total	Girls	Total
2003-04	35.4	33.6	58.60	57.50	66.7	64.4
2006-07	10.72	10.53	18.47	18.05	62	61
2008-09	4.89	4.95	8.43	8.42	60.6	59.3
2010-11	2.86	2.60	7.31	7.23	52.1	51.0
2011-12	0.62	0.43	2.23	3.07	51.8	49.5

Source : OPEPA

Indicator	Odisha	India	West Bengal
1. Life expectancy at birth (Female) 2006-10	63.9	67.7	71
2. Life expectancy at birth (Male) 2006-10	62.2	64.6	67.4
3. Infant Mortality Rate, 2011 (Per 1000 live births)	57	44	32
4. Crude Birth Rate, 2011 (Per 1000)	20.1	21.8	16.3
5. Crude Death Rate, 2011 (Per 1000)	8.5	7.1	6.2
6. Under Five Mortality Rate, 2010	78	59	
7. Total Fertility Rate , 2010	2.3	2.5	
8. Sex Ratio, 2011 (No. of females/1000 males)	978	940	947

Table-17: Some basic indicators

Source: Economic Survey 2012-13

Table-18: Health Expenditure in Selected Countries

Country	Expenditure on health (2010 or latest available year				
	Public	Private	Total		
Australia	6.2	2.9	9.1		
U.K.	8.0	1.6	9.6		
U.S.A	8.5	9.1	17.6		
Mexico	2.9	3.3	6.2		
Brazil	4.2	4.8	9.0		
Russia	3.2	1.9	5.1		
China	2.7	2.4	5.1		
South Africa	3.9	5.0	8.9		
India	1.2	2.9	4.1		

Source : Economic Survey 2012-13

I

India: Need for a New Development Paradigm[,]

Pulin B Nayak²

Let me begin by expressing my deep sense of gratitude to the Orissa Economics Association for inviting me to deliver the First Kshetra Mohan Patnaik Memorial Lecture at the 46th Annual Conference organized under the aegis of Rimuli College, Keonjhar. Prof. K. M.Patnaik was a theoretical economist of the highest calibre that Odisha has ever produced. In his long and illustrious teaching career he trained generations of students, many of whom have had highly successful careers in the academia as well as other walks of life. It is indeed fitting that along with the family members of Prof. Patnaik, the OEA should have decided to institute a lecture series in his memory.

At the present juncture in 2014, after 67 years of Independence, the Indian economy is at a very important crossroads. The growth experience in the past decade has had some exceptionally good runs. During the years 2005-06 up till 2007-08 the gross domestic product (GDP) recorded a growth rate of 9 per cent plus. The international financial crisis of 2008 brought about a significant downturn in the growth rate, but again during 2010-11 the growth rate recorded was 8.9 per cent. Admittedly, during the following three years the growth rate has been severely curtailed and for a period was even in the sub 5 per cent zone. However, figures for the second quarter of 2014 reveal a positive upward trend.

What is clear from the experience of the past decade is that an annual growth rate in the region of 8 to 9 per cent is not an excessively optimistic target, for the simple reason that in four out of the past ten years this target has actually been achieved. A higher growth rate would typically enable the government to mobilise a higher quantum of resources for the development effort.

The relatively brief episode of 9 per cent growth rate had put India alongside China as two of the fastest growing countries of the world. These are also the only two economies with a billion plus population each. They together account for just under 40 per cent of the world's labour force. They are also two of the key low wage economies of the world. Sustained high growth in these two economies has the potential of significantly altering the pattern of production and trade in the world at large.

^{1.} Professor K M Pattnaik Memorial Lecture delivered in the 46th Annual Conference of Orissa Economics Association on 16 Feb. 2014

^{2.} Professor of Economics, Delhi School of Economics

One must hasten to add that one of the key concerns in India's recent development experience has been the sustained and high inflation. Food inflation in particular has been very high. One can not overemphasize the adverse consequences it has for the well being of the poor and the vulnerable classes. The performance of industry and the manufacturing sector too has been sluggish in the past two years.

II

Our purpose in this lecture is to ask some larger questions regarding the pattern of economic development that we have so far followed. We are particularly keen to examine whether we do not need to consider some alternative paradigms of development. The reasons for this should be obvious. After more than six decades of planned economic development about 30 per cent of the population is below the officially designated poverty line. The National Commission for Enterprises in the Unorganised Sector (NCEUS) had reported in 2008 that if one thinks of Rs 20 as the cut off expenditure of daily requirement per person then 77 per cent of the country's population forms the poor and vulnerable group.

Income inequality in India is high and has been growing quite sharply during the past two decades. China's income inequality is also quite high and is getting further accentuated but that should be no cause for comfort. India has some of the worst social sector indicators in the world. About 48 per cent of children in the age group 0-5 are undernourished. India also has possibly one of the lowest sex ratios (940 females to 1000 males) in the world. Ironically some of the states that have a higher per capita state domestic product (SDP) have a poorer sex ratio statistic. Haryana's figure is 877 and the figure for Punjab is 893. More than half, nearly 55 per cent, women in the age group 15-49 are anaemic.

More than half of Indians defecate in the open. This has serious consequences for the infection of water bodies, as well as the environment generally. A major consequence of this is stunting in children, as is revealed in a substantial body of new research.

Bangladesh, with almost half the per capita income of India in purchasing power parity terms, has considerably better social sector indicators.

In the education sector our quality indicators are deplorable. Extensive surveys by the non governmental organization (NGO) 'Pratham' reveal that the language and arithmetic skills of children in Class V are barely of the level of Class II. This phenomenon is prevalent across major Indian states.

In the health sector public expenditure comprises a bare 1.3 per cent of GDP. This is one of the lowest figures in the world. The figure for China is 2.9 per cent of GDP. In

many European countries public expenditure on health comprises almost 7 to 8 per cent of GDP. The figure for the Netherlands is in excess of 10 per cent of GDP.

There are two further aspects of the development process that should give cause for concern. The first has to do with the substantial ecological degradation that the process of haphazard growth has brought about in the last six decades. The second has to do with the high degree of regional imbalance in the growth process that has contributed to the high degree of disparity in incomes.

III

Before articulating any new paradigm of development it might be useful to outline some of the existing major formulations. It is certainly the case that the fundamental issue of development was originally posed by the classical masters Smith, Ricardo, Malthus, Mill and Marx. When Joseph Schumpeter wrote his 'Theory of Economic Development' in 1912 he was addressing the development issues of advanced countries like England and Germany.

However there is a sense in which the issue of development economics came to be redefined afresh in the post Second World War phase. This coincided with the end of colonialism in large tracts of Asia, Africa and Latin America. These were countries marked by low per capita income, widespread illiteracy and ill health.

For its sheer depth and scale of the above problems India provided a natural context and testing ground for new alternative hypotheses. Some of the early contributors to the field were Paul Rosenstein-Rodan, Sir William Arthur Lewis, Ragnar Nurkse and Albert Hirschman, among others.

But through all this there has been a strong Indian tradition too. In the late 1890s the grand old man of India, Dadabhai Naoroji, had talked of the 'drain' of wealth from India owing to colonial rule. Mahadev Govind Ranade had questioned the relevance of the classical political economy of Smith, Ricardo and Mill in the Indian context. Ranade was more attracted to the German historical school writers like Friedrich List who had emphasized the critical role of the state to give a fillip to the process of development.

It is in this context that we need to examine the profound contributions of Gandhiji. Gandhiji penned his 'Hind Swaraj' in 1909 while on a sea voyage from London to South Africa. This small pamphlet contains his core social and economic thoughts. He had written this after his extensive travels across the length and breadth of the country, following the advise of his mentor Gopal Krishna Gokhale. He had appraised himself of the poverty, the open and disguised unemployment, and the general wretched conditions of the agricultural labourers and factory workers in the country at first hand. Gandhiji believed that the overwhelming bulk of the country lived in its villages and had therefore felt that India would gain true 'swaraj' or self rule by developing the village republics as self sufficient units. In Hind Swaraj Gandhiji wrote scathingly about two things: Western civilization and machinery. The truth was that he was not against machines as such. It was when machines displaced labour that Gandhi had a problem because of his deep commitment to provide work to the teeming masses of India.

Gandhiji was not trained in the orthodox economics of Smith, Ricardo and Mill. This might have been an advantage in enabling Gandhiji to understand the Indian reality from his own original standpoint. There is no doubt that the theoretical formulations of the great masters were built on the ground realities of England and continental Europe. Gandhiji's formulations for India were entirely of a sui generis nature.

A major contribution of Gandhiji was to advocate 'limitation of wants'. This was the exact obverse of the mainstream Western economic project of expanding the goods space to satisfy ever increasing human wants. This might possibly be the single biggest contribution of Gandhiji to the notion of ecological sustainability. There is considerable interest in this aspect of Gandhiji's thought among scholars of ecological economics today.

There were of course several other thinkers in the pre-Independence phase. Some of the prominent names were those of Jawaharlal Nehru, Babasaheb Ambedkar, J.C. Kumarappa and Jayaprakash Narain, among many others. Nehru, Ambedkar and Narain were all critics of the Gandhian position. Narain was a trenchant critic in the early 1930s. He later mellowed considerably and embraced the neo Gandhian 'bhoodan' movement of Vinoba Bhave. Nehru never challenged Gandhiji in a confrontationist mode, though his opposing point of view was quite well known. But through the late 1950s and early1960s, he too seems to have come intellectually closer to Gandhiji's formulations.

Kumarappa was a strong adherent of the Gandhian view. He coined the expression 'Gandhian economics'. Sadly, this alternative formulation forms no part of the Economics curricula of most Indian universities.

In the 1920s and '30s Nehru was attracted to Fabian socialism and had been greatly attracted by early Soviet planning. Nehru stood for modernization and believed that the answer to India's poverty lay in rapid industrialization. In 1938, nine years before India's independence, the Congress Party, which was spearheading the political struggle for freedom, set up the National Planning Committee, which was chaired by Jawaharlal Nehru. Eminent politicians, industrialists and scientists were members of this Committee. The Committee met a number of times but the protracted Second World War kept any meaningful consideration of development issues in a limbo. In any case, the implementation of any new developmental blueprint presupposed India's independence.

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The absence of Gandhiji from the political scene from early 1948 made Pandit Nehru the supreme arbiter of India's development strategy that was to be followed. Nehru fundamentally believed in state planning and accordingly the Planning Commission was established in 1950. The first Five Year Plan got off to a start in 1951. The second Five Year Plan had Nehru and Mahalanobis offering its intellectual rationale of emphasizing the heavy industry sector for bringing about rapid industrialization.

The post Independent period saw a large number of prominent Indian economists, all of whom were supremely proficient in the mainstream economics of the Anglo-American school. These included, among others, VKRV Rao, A K Dasgupta, K N Raj, Amartya Sen, Sukhamoy Chakravarty and Jagdish Bhagwati. Even though there were some, for example the followers of the Bombay school, who argued for a free market and free trade, there was broad agreement that given India's widespread poverty and poor social and economic infrastructure, the state had to play a very strong role in the development process.

IV

The Indian development process is today at a very important conjuncture. In the past decade the country has legislated epochal rights based development initiatives, notably, the Right to Education, the MGNREGA, the RTI and the Right to Food Act. There is unprecedented social, political and economic churning.

The constituents of our new paradigm do not have elements that seek to reinvent the wheel. We do not wish to repudiate the dictates of the inexorable logic of fundamental economic processes. Yet we feel that there is great need to stop being fetishisht about achieving high growth rates of GDP. We need to address the crying needs of our times: elimination of poverty, environmental sustainability, greater emphasis on education and provision of widely available public health for all. The argument that the Right to Food would be unduly profligate is without any basis. This would call for additional spending that would be within 0.2 % of GDP, and certainly well within our fiscal capability.

There is great urgency to push up the tax to GDP ratio from the existing 16-17% range to about 20% by early implementation of the Direct Taxes Code and the GST. The new development paradigm one needs to consider has to be relevant to our specific conditions. We still have a long way to go in achieving adequate standards in education, health, nutrition and sanitation. We need to conceptualise our situation in a sui generis manner, not unlike what 'Hind Swaraj' had sought to do more than a hundred years earlier. But we do this armed with the knowledge of some of the basic tendencies of the economic and social processes that we have been able to assimilate in the past half century. Time on our hands is short. We need to address these issues with great urgency.

Revisiting the Role of Industry as the Key to Pro-poor Growth¹

Arup Mitra²

Introduction

From the historical experience of the present day developed nations we note that one important determinant of economic growth is industrialization. The role of industry is crucial in generating high productivity employment and enhancing the standard of living of the population. In the process of development there takes place a structural shift both in the value added and work force composition away from the primary sector first towards the secondary and later towards the tertiary sector. This structural change is accompanied not only by a rise in per capita income but also improvement in many other development indicators. It involves upward mobility of individual occupations and incomes and a shift in rural-urban composition of the population (Kuznets, 1966). However, in the Indian context the share of manufacturing in the total work force has been dwindling at a low level of 11 per cent or so even after experiencing rapid economic growth in last several years.

Szirmai and Verspagen (2011) in the context of developing countries point out that manufacturing since 1990 is becoming a more difficult route to growth than before. They also find interesting interaction effects of manufacturing with education and income gaps. Dellas and Koubi (2001) argue that the industrialization of labour is the main engine of growth during the early stages of economic development. Often the equipment investment has played a less important role than non-equipment investment. Besides it has proved growth enhancing when it either encountered a substantial industrial labour force or fostered a large increase in the share of industrial employment. These findings, as Dellas and Koubi (2001) view, draw attention to the effects of investment on the composition of the labour force; and unlike recent claims emphasizing industrialization via equipment investment, they suggest that employment industrialization policies may hold the key to success in the developing countries.

The most important factor which aggravates the mismatch between the demand for and supply of labour is the sluggish employment growth in the high productivity industrial

^{1.} Prof Baidyanath Misra Endowment Lecture delivered in the Annual Conference of the Orissa Economic Association on 15 Feb. 2014.

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sector. This could be due to the limited spread of the industry and/or adoption of capital intensive technology, leading to a residual absorption of labour in the low productivity informal sector with meagre earnings accruing to the workers and compelling them to reside in slums and squatter settlements. Globalization has compelled countries to enhance growth. Several growth-oriented strategies, that include trade-openness, FDI-inflows and capital mobility, including technology transfer, have been adopted in a big way. The argument, which is usually given in favour of technology transfer, is that the wheel that has already been adopted need not have to be rediscovered if countries seek to be cost efficient³. However, one important hypothesis in the context of sluggish employment growth in the industrial sector relates to the acquisition of capital intensive technology imported from abroad⁴. The import of new technology, which is primarily capital intensive and skill-intensive, results in increased demand for skilled workers and not for the less skilled ones (Wood, 1997)⁵.

Performance till 1997-98

The performance of the organized manufacturing in India in terms of the growth rate in gross value added showed marked improvement in the nineties compared to the earlier period (Table-1). Whether this growth had also resulted in faster employment elasticity or not, has been a matter of serious concern. In terms of mere growth rates of course both the number of workers and total persons increased from a mere 1 per cent per annum during the deregulated regime (1984-85 to 1990-91) to around 3 per cent per annum over the nineties though this growth has been only marginally above the growth rate that

- 3. It is argued that countries further from the frontier have lower R&D returns, implying that the cost of innovation is more in a poor country than in a rich country. Hence, it is still cheaper for a latecomer to buy the technology already invented by others than to re-invent the wheel though it is widely noted that international technology does not come cheap (UNIDO, 2005).
- 4. Research for various Latin American countries is indicative of widening impact of trade on wage inequality, and more importantly this is spearheaded by the notion of skill-biased technological change induced through trade (Hasan 2003).
- 5. Hasan and Mitra (2003) noted that trade is enhancing rapidly the premium to skills in developing countries due to the skill-biased production technologies embodied in imported inputs. Globalization raises capital flows from developed to developing countries which means that, even without technology imports, capital output ratios in developing countries would rise and, given the complementary relationship between capital and skills, this would raise the relative demand for skilled labour (Mayer, 2000). Johanson (2004) argues that it is not possible to disentangle the interlinked factors responsible for changes in skill demands, but at least three main forces are at work in increasing the demand for skills worldwide which are technological change, changes in work organization and trade openness. Rodrik (1997) further argued that trade, while generating more employment opportunities, may also diminish the bargaining power of workers, thus resulting in deterioration of working conditions.

was experienced during the regulated regime (1973-74 through 1984-85). Man-days per worker and man-days per person grew negligibly during the eighties and nineties. For employees other than workers it is not a matter of serious concern because they are fulltimers. But for 'workers' category, man-days per worker is an important determinant of earnings, and hence the stagnancy in man-days per worker may have serious implications in terms of workers' income as it may have resulted from the decline in full-time jobs to the workers in the organized industrial sector. However, the constancy of man-days per worker or person may also have resulted from a rise in outsourcing and sub-contracting and assignment of jobs on piece rate basis. Also, it could be an outcome of exhaustion of scope to utilize labour more intensively (Bhalotra, 1998 and Nagaraj, 1994). For example, the contract workers were already utilized to the optimum and there was hardly any scope for further increase in the man-days per worker. Since the scope to utilize labour more intensively was possibly exhausted, firms were forced to employ additional workers in the nineties, reflected in higher employment growth rate.

The increase in the employment growth rate in the organized manufacturing in the nineties, particularly between 1990-91 and 1995-96, could also be explained by the huge expansion that took place in the early reform period. Both domestic and foreign investors invested at large quantities in this period with an over-expectation about the future prospects demand in the Indian economy and led to expansion in the capacity. This possibly led to an increase in the employment growth rate in the organized manufacturing, particularly in the private and joint sector. But, as output started declining or stagnating in the late 1990s, this resulted in capacity underutilization, which might have resulted in job losses (Nagaraj, 2004)⁶. Despite this downturn, some argue that the employment growth in the organised manufacturing has increased in the nineties compared to the eighties (Goldar, 2000).

Wages per worker shows a fall in the growth rate, marginal though, during the nineties. (This fall in growth of wages may also be one of the reasons for increase in the employment growth in the nineties⁷). However, emoluments per person did not reveal so (Table-1). Quite clearly, the earnings of the skilled/educated employees other than the workers seem to have increased faster than those of the workers over 1990-91 through 1997-98⁸.

^{6.} Nagaraj (2004) argues that in the second half of 1990s, organized manufacturing sector has lost 15 percent of workers across the states and industry groups, mostly due to VRS in public sector and retrenchments and lay-offs in the private sector followed by relaxed labour laws in the country.

^{7.} Goldar (2000).

^{8.} Reforms were initiated in July 1991 in India.

Variables	1973-74 to	1984-85 to	1990-91 to
	1984-85	1990-91	1997-98
Gross Value Added	6.4	7.9	9.4
Gross Output	7.6	8.4	8.6
No. of Workers	2.8	1.1	3.1
Mandays per Worker	1.9	0.2	0.2
No. of Persons Employed	2.9	1.1	3.2
Mandays per Person Employed	1.7	0.3	0.2
Wages per Worker	3.0	3.2	2.7
Emoluments per Person Employed	2.4	2.9	3.3
Fixed Capital	7.1	6.4	10.8

Table-1: Growth Rate of Select Variables (per cent per annum)

Note: 1.Gross output and value added have been deflated by the wholesale price index of the corresponding product group, and fixed capital, by the combined price index of machinery and metal products with 1981-82 as base).

2. Persons include workers and other employees inclusive of administrative and managerial staff. Source: Annual Survey of Industry Data (compiled by Economic and Political Weekly Research Foundation).

For the period 1973-74 through 1997-98 the employment elasticity in the organized manufacturing was seen to be quite different from what was noted in other studies.9 However, the overall level of employment elasticity (measured particularly in relation to workers and not employees) was on the low side considering the fact that Indian economy did not yet appear to have crossed the so-called Lewis turning point in the labour market. On the other hand, although the employment elasticity with respect to value-added declined at the aggregate level in the reform period, the extent of decline was nominal. This picture at the disaggregated level of industry groups is quite different though: while around onefifth of the industries at the three-digit level experienced rising elasticity, in the rest it remained either very low or stagnant and the reforms have had no impact on the elasticity. However, there are industries which are characterized by high labour intensity and they also have experienced reasonably high employment elasticity (0.5 or more) and fast growth in value added for a period of almost three decades: country liquor (223), tobacco (226), bleaching of silk (246), bleaching of jute and mesta (257), textile garments (265), footwear (291), wearing apparel (292), leather (293), man-made fibers (308), bicycles (376), bullock carts (378), and jewelry articles (383). If we keep aside the criterion of employment elasticity and consider industries which are highly labour intensive and have shown fast growth rates in value added over the decades, the list is as follows: grain milling (204), bicycles (376),

9. Majumdar & Sarkar (2004) find that employment elasticity has dropped from 0.99 in 1974-80 to 0.33 in 1986-96, although in the intermittent period (i.e., between 1980-86) it was –0.16.
country liquor (223), bidi (226), textile garments (265), footwear (291), wearing apparel (292), weaving and finishing of cotton khadi (232), weaving and finishing of cotton textiles on power-loom (234), preparatory operations (253), manufacture of wearing apparel of leather & substitutes of leather (292), manufacture of consumer goods of leather & substitutes of leather than apparel & footwear (293), manufacture of bullock-carts, pushcarts and hand-carts (378), manufacture of jewelry and related articles (383), manufacture of sports and athletic goods (385). This list has considerable overlaps with the former. These industry groups are important indeed from policy point of view as they seem to meet the objectives of pro-poor growth. Another conclusion that emerges from this analysis is that the theoretical wage-employment relation is not very important in the manufacturing sector. This could be due to the existing institutional mechanisms in wage fixation.

Findings over 1998-99 through 2007-08

Since economic reforms in the Indian context were initiated in 1991 it would have been reasonable to consider the entire period starting from 1990-91 till date in our empirical analysis. However, till 1997-98 the ASI data followed the National Industrial Classification (NIC) -1987 which are not pretty comparable with the classification followed thereafter. Since the NIC-1998 and NIC-2004 are by and large the same, a comparable series of various three digit groups could be generated for the period 1998-99 through 2007-08. However, after 2007-08 we could not consider the figures because of the comparability problem again, arising from the latest NIC-2008.

In our dataset the nominal variables have been converted into real terms: the value added figures have been deflated by the WPI (1993-94 base) of the closest commodity group. Fixed Asset is deflated by the price index of machinery and machine, and the real wages and salaries are derived on the basis of consumer price index for industrial workers (1993 base).

Gross value added growth rate continued to be a little above 9 per cent per annum during 1998-99 to 2007-08 (Table-2). However, the employment growth rate which was already low during 1990-91 to 1997-98 decelerated marginally, more so in the case of employees other than workers¹⁰. As a result, labour productivity defined as the value added per person employed grew at almost 7 per cent per annum. Wages per worker remained almost stagnant while the remuneration per person shot up significantly, implying a substantial growth in the salaries per employee (excluding workers). It is again the fixed capital, the growth rate of which decelerated to almost half, resulting in a sluggish growth

^{10.} The employment growth rate in the organized manufacturing sector over 1998-99 through 2007-08 as per the ASI data is however higher than the total employment growth rate shown by the NSS employment-unemployment survey over 2004-05 to 2009-10 though the ASI growth rate is quite close to the NSS estimate over 1999-2000 to 2004-05.

in capital-labour ratio. Since Indian entrepreneurs had already accumulated a huge stock of capital evident from a sustained growth in fixed capital over the preceding period (Table-1), the decline in the growth rate over the recent phase (from 1997-98 to 2007-08) does not come as a surprise.

Variables	Rate of Growth (% p.a.)
Gross Value Added	9.45
No. of Workers	2.98
No. of Persons Employed	2.58
Wages per Worker	0.20
Emoluments per Person Employed	5.31
Fixed Capital	4.34
Labour Productivity (Value Added per Person Employed)	6.87
Capital-Labour Ratio (Fixed Capital per Person)	1.75

Table-2: Growth Rate of Select Variables	(per cent per annum)
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Source: Annual Survey of Industry Data (compiled by Economic and Political Weekly Research Foundation).

The distribution of value added and employment across various three-digit industry groups seems to be evenly spread out with a few exceptions. For example, only each of the following industry groups - 153, 154, 160, 171, 181, 241, 242, 269, 271 and 291 - accounted on an average for nearly 3 or more percentage of the total manufacturing employment. Many of these industries and a few more (232, 292 and 341) also accounted for a 3 or more percentage share in value added terms. Interestingly, not too many of them recorded a rapid employment growth rate of 4 or more per cent per annum over the period 1998-99 to 2007-08 (i.e., 181, 232 and 269). As an opening remark, industries which dominated in terms of employment size did not necessarily unravel a fast employment growth.

Over this phase several industries grew rapidly in terms of value added (Table-3). The poorly performing industries have been, in fact, very few in number¹¹. In addition, another group of six industries reported a positive but less than 4 per cent per annum growth rate in value added¹². Total employment growth in all these industries with sluggish growth in terms of value added has been either negative or sluggishly positive (Table-3).

^{11.} The worst performing industries with a negative value added growth are about 243 (manufacture of man-made fibers), 313 (manufacture of insulated wire and cables), 333 (manufacture of watches and clocks) and 241(manufacture of basic chemicals) which registered a negative value added growth rate.

^{12. 151 (}production of meat, fish, fruit, vegetables etc), 152 (manufacture of dairy product), 251 (manufacture of rubber products), 160 (manufacture of tobacco products), and 154 (manufacture of other food products) and 353 (manufacture of aircraft and spacecraft).

Overall, industries not performing well in terms of value added did not perform well in terms of employment either.

Ind. Code	Workers	Employees other than workers	Total persons engaged	Value added
243	-4.04	-6.35	-4.53	-14.00
313	-0.09	-4.04	-1.21	-0.98
333	-6.08	-12.30	-7.55	-0.57
241	-1.68	-3.35	-2.24	-0.12
151	3.12	0.40	2.44	0.32
152	3.34	-1.14	1.81	0.94
251	1.29	-0.53	0.87	2.29
160	-0.88	-0.91	-0.88	2.49
154	0.47	-1.22	0.13	2.66
353	4.30	-0.36	2.37	3.59

Table-3: Poorly Performing Industries (negative value added growth or positive but less than 4 per cent p.a.)

Note: Industries entered in the ascending order in terms of value added growth rate. Source: Annual Survey of Industries, (ASI).

There is a strong positive correlation between the average value added growth and total employment growth measured across all the three digit manufacturing groups (0.77), implying growth is essential for employment generation. However, not necessarily rapid value added growth has resulted in faster employment growth. In spite of the fact that many industries grew rapidly in value added terms total employment increased only at around 2.6 per cent per annum at the aggregate level over the period 1998-99 through 2007-8. However, during the sub-period 2003-04 through 2008-09 as Goldar (2011) pointed out, the employment and value added both grew sizably.

The list of industries with a rapid employment growth (i.e., of at least 4 per cent per annum) and a rapid value added growth (i.e., of at least 7 per cent per annum) over 1998-99 to 2007-08 includes

155 (manufacture of beverages), 369 (manufacturing n.e.c.), 332 (manufacture of optical instruments etc), 372 (recycling of non-metal waste and scrap), 312 (manufacture of electricity distribution and control apparatus), 191 (tanning and dressing of leather, handbags), 273 (casting of metals), 252 (manufacture of plastic products), 361 (manufacture of furniture), 371 (recycling of metal waste and scrap), others, 289 (manufacture of other fabricated metal products), 181 (manufacture of wearing apparel), 343 (manufacture of

parts for motor vehicles and their engines), 173 (manufacture of knitted and crocheted fabrics), 172 (manufacture of other textiles), 281 (manufacture of structural metal products, tanks etc), 319 (manufacture of other electrical equipment), 300 (manufacture of office, accounting and computing machinery), 232 (Manufacture of refined petroleum products), 182 (Dressing and dyeing of fur etc), 269 (manufacture of non-metallic mineral products), 192 (manufacture of footwear etc): see the box below.

Industries with Rapid Value Added Growth and Employment Growth

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More than 7 per cent growth in value added (in ascending order)
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223, 210, 261, 155, 242, 351,361, 181, 369, 202, 342, 322, Total , 272, 323, 271,291, 172, 269,289, 292, 315, 182,343, 319, 371 , 332, 314, 359,331, 173, 281, 311,, 312, 231,

Others, 341, 300, 232, 372

More than 4 percent employment growth rate (in ascending order)

273, 191, 361, 155, 252, 232, 182, 332, 269, 312, 300, 281, 192, 289, 319,

Others, 343, 369, 371, 181, 173, 172, 372

Source: See Table-1

Four clusters are discernible from Tables-4 and 5: (a) low employment and low value added growth, (b) low employment but high value added growth, (c) moderate employment and high value added growth and (d) high employment and high value added growth.

		Value Added Grov	vth Rate	
Employment Growth Rate	Negative/ Sluggish (less than 4% p.a.)	Moderate (4 and above but less than 7 % p.a.)	High (7 % p.a. and above)	Total
Negative/Sluggish (less than 2% p.a.)	152, 154, 160, 241, 243 ,251, 313, 333	153, 171, 201, 221, 293, 352	223, 261, 272, 291, 311, 314, 322, 323, 341, 351, 359	25
Moderate (2 and above but less than 4 % p.a.)	151, 353	222, 321	202, 210, 231, 242, 271, 292, 315, 331, 342, Aggregate	14
High (4 % p.a. and above)	0	191, 192, 252,273	155, 172, 173, 181, 182, 232, 269, 281, 289, 300, 312, 319, 332 343, 361, 369, 371, 372, others	23
Total	10	12	39	61

Table-4: Value Added and Total Employment Growth (% per annum)

On the whole, we observe that for the entire period under consideration (1998-99 through 2007-08) value added growth has been fast in a number of industries. However, employment growth not necessarily has been impressive in these industries though rapidly growing industries in terms of employment witnessed faster value added growth as well. In fact, in some of the industries with a marginal or sluggish employment growth, value added still has grown sizably notwithstanding a strong positive correlation between the value added and employment (average) growth rates across industries. Particularly, the growth scenario of employees other than workers represents a gloomy picture since many industries showed a negative growth rate. This comes as a bit of surprise, particularly keeping in view the popular belief about a favorable job market for the ones who are highly skilled. Usually greater concern has been expressed for the unskilled workers as they are characterized by poor employability. Two reasons may be considered to explain this: (a) because of a high level of salary for the employees other than workers their absorption rate has been sluggish, (b) as mentioned in the previous section the recent phase of industrialization is partly because of the rapid spread of industries in the states which were less industrialized earlier and hence, this spur has been accompanied by a rise in the demand for shop floor workers. Nevertheless there are a sizeable number of industries which experienced rapid growth in terms of value added and total employment both.

Employment elasticity is defined as the proportionate change in employment due to proportionate change in value added. This, however, needs to be estimated econometrically after controlling for the remuneration to the human capital. On the whole, we are able to observe the partial elasticity of employment with respect to growth and that with respect to remuneration rate.

The employment elasticity function has been estimated separately for total persons engaged and workers. The logarithm transformation of total persons engaged (and separately for workers) has been regressed on logarithm transformation of total value added and emoluments per person (and wages per worker in the specification for workers). Both the growth elasticity and wage/remuneration elasticity have been estimated to assess the growth and wage sensitivity of employment. For the aggregate manufacturing sector the elasticity of total employment with respect to value added is 0.43 and the elasticity of workers with respect to value added is 0.35. On the other hand, the impact of remuneration per employee (or wages per worker) on total employment (or workers) is not statistically significant. Also, for a number of industries the elasticity of total employment with respect to growth does not turn out to be statistically significant¹³. Industries which recorded an

 ^{152 (}manufacture of dairy product), 154 (manufacture of other food products), 155 (manufacture of beverages), 160 (manufacture of tobacco products), 201(Saw milling and planing of wood etc), 202 (manufacture of products of wood, cork etc), 243 (manufacture of man-made fibers), 252 (manufacture of plastic products), 261 (manufacture of glass and glass products), 292 (manufacture of special purpose machinery), 293 (manufacture of domestic appliances), 311 (manufacture of electric motors,

employment elasticity of up to 0.4 are many¹⁴ and only a handful of the industries had an employment elasticity of more than 0.55.

Policy implications

Industries which have experienced rapid growth in both value added and employment need to be given priority. Those with high employment elasticity with respect to growth can be encouraged for enhancing manufacturing employment. The industries which are highly labour intensive and have recorded a sizeable employment growth naturally deserve a greater attention¹⁵. Even the industries which are labour intensive but are not able to grow at a rapid pace fall into the domain of a closer scrutiny.

Even in the capital intensive sector possibilities have to be explored if some of the phases in the production process can be carried out on the basis of labour intensive methods. Since labour productivity growth and not employment has been the major contributing factor to value added growth, emphasis has to be laid on reducing the capital accumulation process if manufacturing has to be the engine of employment generation.

Labour market deregulation may not bring in rapid employment growth because the responsiveness of employment with respect to wages is not statistically significant across a number of industry groups. The contractualisation is already on the rise in several industries even without much deregulation measures carried out in black and white. In spite of that if employment could not pick up sizably other constructive routes to employment generation need to be pursued instead of blaming the labour market laws univocally.

Improvement in employability is an important consideration from policy point of view. For this, skill formation is an essential prerequisite which can be attained by accessing

generators and transformers), 313 (manufacture of insulated wire and cables), 314 (manufacture of accumulators, primary cells and batteries), 315 (manufacture of electric lamps etc), 319 (manufacture of other electrical equipment), 321 (manufacture of electronic valves and tubes etc., 322 (manufacture of television and radio transmitters), 333 (manufacture of watches and clocks), 343 (manufacture of parts for motor vehicles and their engines), 351 (building and repair of ships & boats), 352 (manufacture of railway and tramway locomotives), 361 (manufacture of furniture) and other.

- 14. 231 (manufacture of coke oven products), 332 (manufacture of optical instruments etc), 353 (manufacture of aircraft and spacecraft), 232 (manufacture of refined petroleum products), 153 (manufacture of grain mill products etc), 221 (publishing), 191 (tanning and dressing of leather, handbags), 242 (manufacture of other chemical products), 323 (manufacture of television and radio receivers, recording apparatus), 151 (production of meat, fish, fruit, vegetables, etc), 300 (manufacture of office, accounting and computing machinery), 222 (printing and service related to printing), 312 (manufacture of electricity distribution and control apparatus), 272 (manufacture of basic precious and non-ferrous metals), 291 (manufacture of general purpose machinery), 369 (manufacturing n.e.c.), 251 (manufacture of rubber products), 171 (spinning, weaving and finishing of textiles) and 181 (manufacture of wearing apparel).
- 15. 181, 182, 192, 191, 369, 281, 372, 371, 172, 361, 273, 289, 312, 173, 319, 343

quality education and participating in institutions which impart training in skill formation. Such technical institutions, particularly which provide diplomas, are however few in number and thus government initiative is indeed crucial. From the point of view of the quality of vocational education again greater efforts are called for. Besides, on the job training is another important way of eliminating skill mismatches.

Realising the importance that over the next decade, India has to create gainful employment opportunities for a large section of its population, with varying degrees of skills and qualifications, the manufacturing sector is expected to be the engine of this employment creation initiative. Apart from the employment imperative, the development of the manufacturing sector is critical from the point of view of ensuring a sustainable economic growth in India. Thus, with the objective of developing Indian manufacturing sector to reflect its true potential, the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, has embarked on creating a policy environment that would be suitable for the manufacturing sector to grow rapidly. Keeping in view the importance of the employment-industrialization-policies as mentioned above and also the fact that India has not been able to generate employment opportunities in the organized/ formal manufacturing sector on a large scale, the national manufacturing policy comes as a silver lining.

In the backdrop of a global recession and large job losses if corrective steps are not taken India's situation can be worse off. From this perspective, the recently cleared National Manufacturing Policy (NMP) promises to create a 100 million more jobs and contribute 25 per cent to country's GDP in a decade. In the face of dampening demand and rising cost of capital the experts in the policy circle believed that it can change the fate of manufacturing in India and turnaround the overall economy. The policy addresses in great detail the environment and regulatory issues, labour laws and taxation, but it is the proposed creation of National Manufacturing Investment Zones (NIMZs) or clustering of manufacturing units that is treated as a unique way of integrating the industrial infrastructure and achieve economies of scale. NIMZs will be developed as integrated industrial townships with world class infrastructure and land use on the basis of zoning, clean and energy efficient technology with a size of at least 5000 hectare. The NIMZs will be on the non-agricultural land with adequate water supply and the ownership will be with the state government. It aims at introducing flexibility in the labour market by offering greater freedom to the employers while hiring and firing. It also enables the sunset industrial units to follow a simplified exit mechanism. At the same time it insists on workers' rights which run the risk of being compromised in the name of flexibility.

An important feature of the manufacturing policy is its financial and development incentives to the small and medium enterprises. On the whole, the policy, promises to

increase the share of manufacturing sector to the country's gross domestic product to 25 per cent from existing 16. However, the national manufacturing policy's objective of raising the industrial employment to an unprecedented level may not be realized as the organized manufacturing employment comprises only a fraction of the total manufacturing employment.

It may be therefore useful to consider the employment potential of the unorganized manufacturing sector as well and tap the potentials to create quality-employment in this sector. Small and Medium Enterprises (SMEs) need to undergo an innovative revolution in terms of scale of operations, technology, financing and ways to upgrade skills of workers. Since labour intensive sectors like food processing, apparels and textiles, leather and footwear contribute to over 60 per cent of SMEs' employment (Kant, 2013), greater focus on the labour intensive sectors will enable productive absorption of surplus unskilled labour. Though our study did not deal with the regional profile of the labour market and aspects relating to inter-spatial industrial growth disparity, the policy initiatives need to give top priority to labour intensive goods based industrial growth in regions characterized by greater magnitudes of unskilled labour and insignificant industrialization.

Issues relating to infrastructure shortage, constraints on energy supply, sluggish exports growth and poor performance of labour intensive exportable goods sector, the lack of innovations required for developing appropriate technology and bureaucratic and administrative rigidities in areas where they tend to hamper growth and employment or attract foreign investment are undoubtedly important though an empirical investigation of all of that remained outside the ambit of the present study.

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A Snapshot View of Sectoral Interdependence in Odisha Economy

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The Odisha Economic Survey, 2012-13 highlights the structural changes in the State economy with a high growth trajectory in recent years. The Service Sector is becoming more and more pronounced. As per "advance estimates" for 2012-13, the share of this sector in the real Gross State Domestic Product (GSDP) of the State is 58.28 percent, that of the Industry Sector 24.23 percent and Agriculture Sector 17.49 percent. The sectoral composition of the Odisha economy has undergone a structural shift over the years. One of the best ways to examine the structural relationship among the sectors in an economy is the Input-Output approach. This technique provides valuable insights into the interdependence of various sectors. Attempt has been made in this paper to examine this aspect. Towards this end an inter-industry approach has been employed. 'Chenery & Watanabe' method is used to study the structure of the economy. 'Yan & Ames' methodology is applied to examine the economic interdependence among various sectors. Finally, 'Rasmussen Backward and Forward Linkages' are put to use for specification of key sector of the state economy. The production structure and inter-relatedness exemplifies the scope of industrialization in Odisha. Under the key sector argument, manufacturing sector has an edge over others in the state economy.

JEL Classification: C67, L52, O14

Key Words: Input-Output Analysis, Linkage Analysis, Odisha Economy

The Odisha Economic Survey, 2012-13 highlights the structural changes in the State economy with a high growth trajectory in recent years. The Service Sector is becoming more and more pronounced. As per "advance estimates" for 2012-13, the share of this sector in the real Gross State Domestic Product (GSDP) of the State is 58.28 percent, that of the Industry Sector 24.23 percent and Agriculture Sector 17.49 percent. The sectoral composition of the Odisha economy has undergone a structural shift over the years. The shift is perhaps best exemplified in terms of the changes in the shares of agricultural, industrial and services sectors in the GSDP. From a primarily agro-based economy during the 1970s, the Odisha economy has emerged as predominant in the services sector during the 1990s. The shift in the composition is likely to cause substantial changes in the production and demand linkages among various sectors and in turn, could have significant ramifications for the growth and development process in the Odisha economy.

The analysis of the sectoral composition of GSDP for the period 1950-2010 brings out the fact that during the process of economic development in the state, as has been observed across various countries by Kuznets (1966), a growing 'tertiarisation' of the structure of production and employment has been taking place. During the process of growth over the years 1950-51 to 2009-10, the Odisha economy has experienced a change in the production structure with a shift away from agriculture towards industry and the tertiary sector. The share of agricultural sector in real GSDP, at 2004-05 prices, declined from 55.75 per cent in the 1950s to 22.14 per cent in 2000s. The share of industry and services increased from 7.69 per cent to 23.43 per cent and 36.56 per cent to 54.43 per cent respectively during the same period. During the 1950s it was the primary sector that was the dominant sector of the economy which accounted for the largest share in GSDP. But the whole scenario changed subsequently, and especially in the 2000s. Service sector output increased at a rate of 8.24 per cent per annum during the decade 2000-10.

It is to be noted here that while the agriculture and manufacturing sectors have experienced phases of deceleration, stagnation in growth, the tertiary sector has shown a uniform growth trend during the period 1950-51 to 1999-2000. In fact, the recent years' experience shows that "the growth of services sector has imparted resilience to the economy, particularly at times of adverse agricultural shocks as also driving cyclical downturns in industry" [RBI 2000: III 38].

Structural relationships among sectors in an economy are generally examined in three ways. The first one is purely statistical and involves rigorous causality tests in the growth of various sectors. The second approach involves econometric models encompassing various sectors in an economy for generating dynamic forecasts and policy simulations. The third technique is based on input-output (I-O) tables, which provide valuable insights into the interdependence of various sectors.

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Preparation of input-output table involves voluminous data collection, hence, these are not available on an annual basis. Although juxtaposition of several such tables for different time periods could reveal the broad trends in structural shifts but results based on them are generally static and relate mainly to the reference period [Sonis et al., 1995; Zakariah and Ahmed, 1999]. Fortunately for Odisha economy three such tables are available for the reference year 1983-84¹ [Dhal, 1996], 1994-95² [Patra, 2002] and 2003-04³ [NCAER, 2007]. However, the sectoral divisions of these tables are not uniform. Therefore, we are not in a position to compare these tables. So, we confine our attention to examine a snapshot view of the intersectoral dependence of Odisha economy for the latest time period.

The plan of the paper is as follows: Section-I gives a bird's eye view of sectoral share of GSDP in Odisha. Section-II presents the theoretical model adopted for the analysis. Section-III depicts data and empirical results. The conclusion is drawn in the last section.

Section-I: Sectoral Composition of the Odisha Economy

Before analyzing the sectoral interdependence in the Odisha economy, it would be useful to review the changes in the sectoral composition of GSDP, in terms of agriculture, industry and services sector. Sectoral shares at 2004-05 prices are given in Table-1. it can be seen from the table that over the last four decades (1970-71 to 2009-10), there is a major shift away from the agriculture towards industrial and service sector. Agricultural sector which accounted for about 50 per cent of the total GSDP in 1970s, contributed only 22 per cent in the decade 2000s. On the other side, during the same period the share of the service sector was consistently increasing and reached to a level of 54 per cent in 2000s from around 38 per cent in 1970s. Over the corresponding period the share of the service sector in GSDP has been doubled from 12 per cent to 24 per cent.

Table-2 provides decadal sectoral growth rate in respect of different sectors of the economy. The sectoral growth pattern reflects that the performance of all the sectors was reasonably good during the decade 1980s, contributing to a GSDP growth of 4.14 per cent. But in the 1990s, the economy was decelerated and the growth rate of GSDP was only 3.67 per cent per annum. However, the growth rate was picked up in 2000s. GSDP was grown at a rate of 8.42 per cent per annum during the decade. The growth rate of industrial sector is highest, i.e., 13.58 per cent, followed by service sector 8.42 per cent and agriculture sector 3.87 per cent per annum.

Agriculture	Industry	Service	GSDP	
50.11	12.23	37.66	100	
46.62	13.12	40.26	100	
32.57	17.51	49.92	100	
22.14	23.43	54.43	100	
	Agriculture 50.11 46.62 32.57 22.14	AgricultureIndustry50.1112.2346.6213.1232.5717.5122.1423.43	AgricultureIndustryService50.1112.2337.6646.6213.1240.2632.5717.5149.9222.1423.4354.43	AgricultureIndustryServiceGSDP50.1112.2337.6610046.6213.1240.2610032.5717.5149.9210022.1423.4354.43100

Table-1: Sectoral Composition of Output in Odisha (%)

Source: Author's calculation

Note: Based on 2004-05 prices

Year	Agriculture	Industry	Service	GSDP
1970-80	0.93	5.77	4.03	2.69
1980-90	2.07	7.97	5.30	4.14
1990-00	1.45	5.00	4.62	3.67
2000-10	3.87	13.58	8.24	8.42

Table-2: Sectoral Growth Rates of Output in Odisha

Source: Author's calculation

Note: Based on 2004-05 prices

Section-II: Analytical Framework

Leontief's input-output model is basically designed for the analysis of the production process of an economy. The input-output table or the inter-industry transactions show the flow of goods and services from a sector of the economy to all the other sectors over a specified period of time (say a year). It gives the systematic description of interdependence of different sectors of the economy by way of a two-way table. Under this technique the economy is segregated into a number of homogeneous sectors, each of which is represented in the table by a row and a column. The rows of the table give the distribution of the output of the sector while the columns give the inputs consumed by the sector. Since each figure in any horizontal row is also a figure in vertical column, the output of each sector is shown to be an input in some other. The additional columns, known as final demand, record the sales by each sector to the consumers.

The Leontief model is represented through the equation: $X = (I-A)^{-1}Y$ (Leontief, 1960). Where, X & Y are column vector of outputs and final demand respectively. A is the square matrix of technical coefficient ($a_{ij} = X_{ij} / X_{j}$; X_{ij} is the output of sector i used in sector j as input and X_{i} is the total output of sector j).

The Input-output table is an ideal analytical tool for the study of mutual dependence of different sectors. The table has been used for establishing the linkages between sectors of the economy. In this article following three methods have been employed to investigate the sectoral interdependence of the economy of Odisha.

- 1) 'Chenery & Watanabe' method to study the structure of the economy (Chenery & Watanabe, 1958).
- 2) 'Yan & Ames' technique to examine the economic interrelatedness among various sectors (Yan & Ames, 1965).
- 3) 'Rasmussen Backward & Forward linkages' for specification of key sector (Rasmussen, 1957).

Linkage means the interconnection between a sector and other sectors. The concept of linkage was originally introduced by Hirschman (1958). This linkage can be of two types: Backward & Forward. A sector is linked with the other sectors, which supply inputs to it, and also with those, which use its output as their own inputs. Thus the expansion of a sector induces a large demand for inputs for its input-supplying sectors and also provides large input supply to other sectors using its output. The former type of inducement is called backward linkage and the latter forward linkage.

The Chenery & Watanabe indicators measure direct linkage only. Under this method the sectors of the economy are classified into four categories on the basis of linkage effect. U_j represents backward linkage and W_i forward linkage. U_j is defined as the ratio of intermediate input of sector j to the total output of sector j (U_j = $\sum_{i=1}^{n} X_{ij} / X_j$), whereas, W_i is defined as the total intermediate demand for output of sector i to the total demand for sector i (W_i = $\sum_{j=1}^{n} X_{ij} / X_j$). The word 'final' describes the sectors with low value of W, while the word 'primary' is used for sectors with low value of U. on the contrary 'intermediate' describes the sector with high value of W and 'manufacturing' is used for high value of U. Accordingly all the sectors of the economy are clubbed into four categories:

- 1. High Backward and High Forward Linkage Intermediate Manufacture
- 2. High Backward and Low Forward Linkage Final Manufacture
- 3. Low Backward and High Forward Linkage Intermediate Primary
- 4. Low Backward and Low Forward Linkage Final Primary production

A sector may sell to or buy directly from a few others, yet its customers and suppliers may be connected with many other sectors of the economy. Hence a particular sector may have a great influence over the economy through its indirect relations with other sectors. It is therefore highly essential to examine all direct and indirect relations of a sector vis-à-vis others to decide upon the importance of each sector. This is here termed as the 'interrelatedness' of a sector. The technique suggested by Yan & Ames to measure interrelatedness is used here.

Yan & Ames defined an order matrix M for any matrix A having non-negative elements. M has the same order as A. They have examined the sequence $[a_{ij}], [a_{ij}]^2, [a_{ij}]^3$, and find the first non-zero term in the sequence. If this term is the kth (k = 1, 2, 3,) then set $m_{ij} = k$. If $a_{ij}^{k} = 0$, then set $m_{ij} \neq \infty$.

Let M
$$\begin{bmatrix} i_1 & \cdots & i_r \\ \cdots & \cdots & \cdots \\ \vdots & \cdots & \cdots \\ j_1 & \cdots & j_r \end{bmatrix}$$
 be an arbitrary sub matrix of an order matrix M, then the

interrelatedness function R corresponding to this sub matrix is defined by

$$\mathsf{R} \begin{pmatrix} i_1 & \cdots & \cdots & i_r \\ \cdots & \cdots & \cdots & \cdots \\ \vdots & \cdots & \cdots & \vdots \\ j_1 & \cdots & \cdots & j_s \end{pmatrix} = \frac{1}{rs} \sum_{\nu=1}^s \sum_{w=1}^s \frac{1}{b_{i\nu j w_{\nu}}}$$

The aspect of interdependence between various sectors of the economy has led to explore the notion of key sector. The key sectors are those, which by their powerful linkages with other sectors are in a favourable position to induce the expansion of other sectors and sometimes even help the initiation of new industries. For specification of key sector Rasmussen method is used. This method captures both direct and indirect effect by using Leontief inverse matrix. This technique is based on the use of matrix multipliers instead of technical coefficients.

Rasmussen (1957), defined the forward and backward linkages as:

$$Y_{i} = \frac{\frac{1}{n} \sum_{j=1}^{n} z_{ij}}{\frac{1}{n^{2}} \sum_{i=1}^{n} \sum_{j=1}^{n} z_{ij}} \qquad \text{fr} \qquad Y_{j} = \frac{\frac{1}{n} \sum_{i=1}^{n} z_{ij}}{\frac{1}{n^{2}} \sum_{j=1}^{n} \sum_{i=1}^{n} z_{ij}} \quad \text{respectively.}$$

Where, (z_{ij}) 's denotes the elements of the Leontief inverse matrix $(I-A)^{-1}$.

Section-III: Data & Empirical Results

To analyse the structure of the economy and the sectoral interdependence in the State of Odisha we have used the input-output table prepared by National Council of Applied Economic Research for the state of Odisha (NCAER, 2007). The reference year is 2003-04. In the original table the state economy is divided into 43 sectors, but in the present analysis we have purposively condensed the table into 25 sectors (see Annexure Table).

Table-3 depicts the classification of sectors of Odisha economy as per Chenery-Watanabe statistics. The C-W analysis concludes that all the major producing sectors of the Odisha economy like agriculture, forestry and logging, fishing, and different service sectors resulting in 66.47 per cent of gross output are in the low backward and low forward linkage category. Similarly the final manufacturing sector comprising of construction responsible for 24.29 per cent of gross output are in the high backward linkage and low forward linkage category. The intermediate manufacture sector, which has high backward and high forward linkage, comprises of manufacturing and electricity generating 5.36 per cent of the gross output of the state economy. The rest 3.88 per cent of gross output is produced by two sectors naming Mining and Cotton Textile with low backward & high forward linkages.

Table-4 represents the index of interrelatedness of various sectors in Odisha. The value of row index of the Transport & Communication, Trade & Commerce and Producer &

Personal Services sectors are equal to 1. This means these items are almost used by all other sectors. Therefore, these sectors are most important to other sectors as the supplier of intermediate inputs to them. The other important output supplying sector is electricity. The value of column indices reveals that except animal husbandry all other sectors are important as users of intermediate products. The reason being the low variation (0.38) between the highest and lowest index values. Some important users of the intermediate outputs are Miscellaneous Manufacturing Industries, Non-Marketable Social Services, Food Products, and Wood & Furniture etc.

Table-5 represents the linkage indices derived under Rasmussen technique. It is clear from the Table that four sectors have high forward and high backward linkage. These are Chemicals (11), Iron & steel (13), Electricity, Gas & Water Supply (21) and, Rubber, petroleum, plastic, coal (10). These sectors are identified as key sectors under Rasmussen linkage indices.

Secto	r Sector Name	BL (U _j)	FL (W _j)
No.			
	Intermediate Manufacture: High backward and High fo	rward	
	(5.36 Percent of gross output)		
10	Rubber, petroleum, plastic, coal	0.781	2.136
11	Chemicals, etc.	0.894	1.916
15	Metal products except mach. And transport equipment	0.707	1.156
16	Tractors, agriculture Implements, other machinery	0.703	1.938
17	Electrical, electronic machinery and applications	0.836	1.036
18	Transport equipment	0.683	2.120
19	0.616	0.832	
	Final Manufacture: High backward and Low forwar	ď	
	(24.29 percent of gross output)		
6	Food Products	0.754	0.184
9	Paper & printing, etc.	0.660	0.667
12	Non-metallic products	0.669	0.513
13	Iron & steel	0.673	0.444
20	Construction	0.595	0.163
21	Electricity, Gas & WS	0.626	0.537

Table-3: Classification of Sectors in Odisha as per C-W Classification

	Intermediate primary production: Low backward and High forward				
	(3.88 percent of gross output)				
5	Mining	0.204	0.812		
7	Cotton+ wool+ art silk+ textile products	0.486	1.201		
	Final Primary production: Low backward and low for	ward			
	(66.47 percent of gross output)				
1	Agriculture	0.234	0.298		
2	Animal Husbandry	0.305	0.508		
3	Forestry & Logging	0.218	0.149		
4	Fishing	0.084	0.054		
8	Wood, furniture, etc.	0.456	0.669		
14	Non ferrous metals	0.443	0.251		
22	Transport & Communication	0.472	0.477		
23	Trade & Commerce	0.195	0.460		
24	Producer & Personal Services	0.330	0.293		
25	Non-Marketable Social Services	0.311	0.184		
	Average Value	0.517	0.760		

Source: Computed by the Author

Table 4: Index of Interreladedness in Odisha

Sector No.	Sector Name	Row Index	Column Index
1	Agriculture	0.800	0.640
2	Animal Husbandry	0.660	0.440
3	Forestry & Logging	0.620	0.740
4	Fishing	0.267	0.620
5	Mining	0.893	0.760
6	Food Products	0.660	0.940
7	Cotton+wool+art silk+textile products	0.960	0.887
8	Wood, furniture, etc.	0.880	0.920
9	Paper & printing, etc.	0.913	0.920
10	Rubber, petroleum, plastic, coal	0.980	0.860
11	Chemicals, etc.	0.960	0.940

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12	Non-metallic products	0.733	0.900
13	Iron & steel	0.813	0.880
14	Non ferrous metals	0.753	0.840
15	Metal products except mach. And transport equipment	0.900	0.893
16	Tractors, agriculture. Implements, other machinery	0.920	0.893
17	Electrical, electronic machinery and applications	0.880	0.893
18	Transport equipment	0.740	0.893
19	Miscellaneous manufacturing industries	0.920	1.000
20	Construction	0.940	0.933
21	Electricity, Gas & WS	0.980	0.793
22	Transport & Communication	1.000	0.853
23	Trade & Commerce	1.000	0.820
24	Producer & Personal Services	1.000	0.900
25	Non-Marketable Social Services	0.960	0.973
	Average	0.845	0.845

Source: Computed by the Author

Table-5: Rasmussen Backward & Forward Linkages of Odisha

Sector	Sector Name	BL = Yj	Rank	FL = Yi	Rank
No.					
1	Agriculture	0.729	20	1.323	8
2	Animal Husbandry	0.724	21	0.628	20
3	Forestry & Logging	0.708	23	0.644	19
4	Fishing	0.573	25	0.505	25
5	Mining	0.711	22	1.843	1
6	Food Products	1.113	10	0.621	21
7	Cotton+wool+art silk+textile products	0.952	15	0.701	15
8	Wood, furniture, etc.	0.885	17	0.615	22
9	Paper & printing, etc.	1.194	6	0.814	12
10	Rubber, petroleum, plastic, coal **	1.153	8	1.238	9
11	Chemicals, etc. **	1.503	1	1.737	2
12	Non-metallic products	1.100	12	0.605	24

13	Iron & steel **	1.173	7	1.623	3
14	Non ferrous metals	0.916	16	0.875	11
15	Metal products except mach.	1.207	4	0.744	13
	And transport equipment				
16	Tractors, agriculture. Implements,	1.232	3	0.714	14
	other machinery				
17	Electrical, electronic machinery	1.408	2	0.695	16
	and applications				
18	Transport equipment	1.207	5	0.607	23
19	Miscellaneous manufacturing industries	1.120	9	0.656	18
20	Construction	1.070	13	0.681	17
21	Electricity, Gas & Water Supply **	1.101	11	1.488	6
22	Transport & Communication	0.969	14	1.567	5
23	Trade & Commerce	0.674	24	1.577	4
24	Producer & Personal Services	0.778	19	1.343	7
25	Non-Marketable Social Services	0.799	18	1.156	10

Source: Computed by the Author; Note: '**' Represents Key Sector

Section-IV: Conclusion

All the major producing sectors in Odisha are under primary production category either intermediate or final, that accounts (3.88 + 66.47 =) 70.35 per cent of gross output signifying the fact that production in Odisha is not much round- about. The relatively lower importance of manufacturing sector points towards the low level of development of the economy. This is also confirmed by the fact that final manufacturing goods category account for a meager share in total gross output (24.29 per cent). Hence, Odisha is a primary producing economy.

However, various sectors are intensively interrelated in the economy. This can be verified from the index of interrelatedness. As the average value of both column and row indices are equal to 0.845.

The conclusion emerging from linkage analysis depicts importance of the manufacturing sector in the state economy. The primary sectors, particularly the agriculture sector reveals low backward linkage, which may be due to continuation of traditional technique of production and less use of modern inputs in this sector. However, Agriculture sector generates high forward linkage. The study indicates existence of potentiality in mining sector so far as forward linkage is considered. This sector tops the list in this regard, though its backward linkage is very poor. Various service sectors viz., Electricity, Gas &

Water Supply, Transport & Communication, Trade & Commerce and Producer & Personal Services sectors also exhibit high forward linkage.

The foregoing discussion clearly points out that the production structure of the state economy is dominated by the primary activities. Therefore, this leaves ample space for industrialization. Interrelatedness among various sectors in the production process of Odisha economy corroborates this argument. The manufacturing and service sector have an edge over primary sector. Hence, while formulating policies in Odisha the objective should be to promote sectors belonging to high forward and high backward linkage category. More specifically, the manufacturing, electricity and infrastructure sectors are to be targeted for intensive development.

Annexure Table

Sector No.	In the Present Analysis	In Original NCAER Table
1	Agriculture	Food Crops
		Cash Crops
		Plantation Crops
		Other Crops
2	Animal Husbandry	Animal Husbandry
3	Forestry & Logging	Forestry & Logging
4	Fishing	Fishing
5	Mining	Coal & Lignite
		Crude Petroleum, Natural Gas
		Iron Ore
		Other Minerals
6	Food Products	Food Products
7	Cotton+ wool+ art silk+ textile products	Cotton+ wool+ art silk+ textile products
8	Wood, furniture, etc.	Wood, furniture, etc.
9	Paper & printing, etc.	Paper & printing, etc.
10	Rubber, petroleum, plastic, coal	Rubber, petroleum, plastic, coal
11	Chemicals, etc.	Chemicals, etc.
12	Non-metallic products	Non-metallic products
13	Iron & steel	Iron & steel

Sectorisation Scheme of Odisha Economy

14	Non ferrous metals	Non ferrous metals
15	Metal products except mach. And transport equipment	Metal products except mach. And transport equipment
16	Tractors, agriculture Implements, other machinery	Tractors, agriculture Implements, other machinery
17	Electrical, electronic machinery and applications	Electrical, electronic machinery and applications
18	Transport equipment	Transport equipment
19	Miscellaneous manufacturing industries	Beverages, Tobacco, etc.
		Leather & Leather Products
		Miscellaneous manufacturing industries
20	Construction	Construction
21	Electricity, Gas & WS	Electricity
		Gas & water supply
22	Transport & Communication	Railway transport services
		Other transport services
		Storage and warehousing
		Communication
23	Trade & Commerce	Trade
24	Producer & Personal Services	Hotels and restaurants
		Banking
		Insurance
		Ownership of dwellings
25	Non-Marketable Social Services	Education and research
		Medical and health
		Other services
		Public administration

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¹ The first ever Input-Output Table prepared for Odisha for the Reference Year 1983-84 consists of 31 sectors. Out of which one belongs to Agriculture and Allied Activities, one to Mining, 23 to Manufacturing and 6 to Service Sectors.

² The second Input-Output Table for Odisha is related to the Reference Year 1994-95 and has 23 sectors. 3 of this belong to agriculture, 14 to manufacturing and one each to Animal Husbandry, Forestry & Logging, Fishing, Mining, Construction and Electricity.

³ The Input-Output table prepared by NCAER for the Odisha economy, with the Reference Year 2003-04, is segregated into 43 sectors. In the primary production, 4 categories belong to agriculture, 4 to mining and 1 each to animal husbandry, forestry & logging, fishing. The manufacturing activities are sub divided into 16 categories. Tertiary activities include sub sector one each to construction, electricity, gas & water supply, railway transport services, other transport services, storage & warehousing, communication, trade, hotels & restaurant, banking, insurance, ownership of dwellings, education & research, medical & health, other services and public administration

Input-Output Matrix and Sectoral Linkages in Odisha Economy

Ramakrushna Panigrahi¹

In the context of sustainable growth of an economy, importance of optimal intersectoral linkages cannot be overemphasized. In a predominantly agrarian economy like Odisha, where the State Domestic Product (SDP) as well as per capita income is far below national averages, these linkages assume much more importance as better efficiency need to be achieved to get out of the vicious circle of underdevelopment. The conventional input-output framework does not include environmental aspects. The academic rhetoric had laid too much focus only on aspects of economic growth. But in recent decades, with increasing incidences of negative externalities due to ever expanding secondary sector across all countries, environmental concerns have assumed significance. However, no single robust study has been conducted yet to consider inter sectoral linkages from a holistic viewpoint including externalities. This paper advocates such inter sectoral linkages on an input-output framework which can include environmental concerns in the context of Odisha economy.

Keywords: Input Output Framework; green value addition; Sectoral Linkages

Introduction

In the context of sustainable growth of an economy, importance of optimal intersectoral linkages cannot be overemphasized. This is because the rhetoric of economic growth and subsequently development is heavily based on maximization of national output. For maximization of output, in the neoclassical theories, enough emphasis has been laid on the *process* of production. The efficient *processes* rule and the inefficient ones get crowded out in an unbiased economic system. The sectoral linkages are best captured in an inputoutput framework pioneered by Wassily Leontief. The input-output analysis captures the process to a large extent in quantifiable measures to gives us a hint whether allocative efficiency as well as technical efficiency is attained in the economy. This holds true in any economy irrespective of the composition of primary, secondary and Tertiary sector contributions to the GDP. However, this is more emphasized in an economy which is predominantly agriculture and manufacturing. The input-output model captures the process with a certain degree of ambiguity in services sector as quantification techniques are less robust in the context of welfare implications of their production for the economy. The example of transport sector in most of the third world economies illustrates this point of ambiguity.

In a predominantly agrarian economy like Odisha, where the State Domestic Product (SDP) as well as per capita income is far below national averages, sectoral linkages assume much more importance as better efficiency need to be achieved to get out of the vicious circle of underdevelopment. In this context it is very much relevant to do an analysis with respect to inter-sectoral linkages in an input-output framework. However, the input-output framework advocated by Wassily Leontief in 1930's had not included the environmental aspects. This is because, during those days levels of production in manufacturing sector was far too less and subsequently, pollution and externalities were not much evident. Also, during those days (till first half of 20th century), the academic rhetoric had laid too much focus only on aspects of economic growth. But in subsequent decades, with increasing incidences of negative externalities due to ever expanding secondary sector across all countries, environmental concerns became a focal point. The environmental degradation and depletion of natural resources due to the process of industrialisation have drawn the attention of academicians to this aspect in the recent decades. Traditionally, both environmental aspects were neglected in the standard accounting system of an economy, since the objective was to accomplish a higher rate of growth through optimum usage of available resources. Further, with expansion and growth of an economy, the uses of environmental and natural resources become more intensive, and their depletion posed a threat to the sustainability of the existing system of production.

Environmental resources have been considered as *free goods* in economics. Such an approach to environmental problems did not reflect the real cost of resources. This resulted in over-exploitation of environmental resources (especially air and water) and subsequent exhaustion of exhaustible resources in a competitive market economy, where firm maximizes profits by minimizing costs. However, in the wake of global environmental awareness, environmental repercussions resulting from the economic activities can no longer be neglected, especially in the estimations of national / regional incomes aggregates.

National income has been considered as one of the most important indicators of development. In general, on the definition of *income*, it is apt to quote J. R. Hicks¹ (1946) here:

"The purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves. Following

out this idea it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and *still expects to be as well off at the end of the week as he was at the beginning.* Thus when a person *saves* he plans to be better off in the future; when he lives beyond *his income* he plans to be worse off. Remembering that the practical purpose of income is to serve as a guide for present conduct, I think it is fairly clear that this is what the central meaning must be".

In the study of national income accounting and sectoral linkages, it is essential to understand the indicators of income, such as: Gross Domestic Product (GDP), Gross National Product (GNP), Net National Product (NNP), Value Additions, Depreciation, Consumption patterns and Stock of resourcesⁱⁱ etc. All data necessary for the purpose of computation of indices that measure the income of an economy are provided by the Systems of National Accounts(SNA). National income measured in terms of *Value Added* is defined as a single measure of the value of goods and services produced in an economy during a particular period of time (one year), which ensures that none of the value of goods and services produced is counted more than once.

If the income is overestimated, it provides a wrong guide, and subsequently distorts the estimates of growth, development and welfare. In SNA, *depreciation factor* is of utmost importance as the 'Net Value Additions' is considered national income. If *depreciation* is underestimated, income gets inflated and *vice-versa*.

In SNA, consumption of fixed capital (assets) i.e., depreciation is estimated only for man-made capital while ignoring the environmental capital. Environmental economists argue that the depreciation factor in SNA is grossly underestimated, since the depletion of environmental resources (such as land, air and water) and natural resources (such as forests and minerals) is not taken into account though they are used for all economic activities. The computations of Net Value Additions do not consider this depreciation in conventional SNA. These resources and their depreciation need to be considered as fixed capital (at par with man-made capital) in the production process, since any economic activity cannot be undertaken without having a bearing on such resources. However, a mere increase in national income cannot be considered as a true indicator of economic development particularly if it is attained at the cost of a degraded environment and depleted natural resource base. Thus, for sustainable growth, macroeconomic policies need figures of sustainable income.

Issues in System of National Accounts

In India, National income aggregates are estimated every year by the Central Statistical Organization (CSO) of the Government of India and the State income aggregates are estimated by Directorate of Economics and Statistics (DES) of the state governments. These are the official estimates of income in the framework of SNA. Surprisingly, the

present national income figures do not adequately represent *sustainable income*. Thus, it is necessary to integrate environmental aspects with the SNA. This is the basic motivation of the present study.

In this context of income accounting and sectoral linkages, a number of pertinent issues can be raised as they are related to analytical, empirical and policy aspects of environmental concerns. Some of these issues may include the following:

- 1. Are the depletion of natural resources and degradation of environmental resources well defined and addressed in the existing framework of SNA?
- 2. Does SNA account for environmental protection costs arising from pollution and degradation? If so, how? If not, why not?
- 3. Does the usual depreciation include, or adequately represent, depreciation of natural capital in the existing framework of SNA?
- 4. Is there a framework of environmental accounting that explicitly takes into account all environmental repercussions of economic activities in the SNA?
- 5. Are there unique methodologies that can be applied to capture sector-wise environmental costs?
- 6. Do the estimates of income aggregates in the existing framework of SNA represent true income for a country / region? If not, do the current estimates underestimate or overestimate the true income?
- 7. Can the environmental repercussions be taken into account in SNA by individual sectors in an economy? If not, should all sectors be considered as interdependent of an economy for estimation of environmentally adjusted national / regional income?
- 8. What are the valuation problems in estimating environmental and natural resources?
- 9. What are the policy implications of integrating environmental aspects in the framework of income accounting and by generating green income aggregates?
- 10. Can these environmental concerns be addressed in a quantifiable input-output framework for more robust understanding of processes in income generation which is sustainable?

An attempt is required to address these concerns in a comprehensive manner. In this paper we raise a few aspects of these concerns listed above.

Review of Literature

In his pioneering contribution, Hotelling (1931) has analysed the consequences of the depletion of exhaustible natural and mineral resources due to their excessive

cheapness. Brookshire, et al., (1980) developed a general model for valuation of changes in natural service flow, consistent with the Hicksian concept of consumer surplus. Mitra (1981) pointed out that in economic analysis, natural resources are almost invariably assumed to be supplied exogenously in given amounts, which is clearly unsuitable for examining the optimal pattern of depletion of exhaustible resources. Nadkarni (1987) points out that the economists have been sharply criticised for their excessive concern with economic growth in a narrow perspective without caring for its sustainability. Lutz and Serafy (1988) bring out many shortcomings of the current national income measures. Firstly, welfare aspects in the present SNA are inadequate for gauging long-term sustainable growth or income because natural resource depletion or degradation is not being considered. With the formula provided by Serafy (1989), the "depletion factor" or the "user cost" should be set aside as a capital investment and be excluded from the national income. Serafy (1989) pointed out the methods to calculate the environmental cost due to the depletion of natural resources. Norgaard (1989) argues against the economic approach to "sustainability of development", based on accounting that relies on market valuations. Gilbert, et. al., (1990), classified the environmental assets into unconditionally renewable and conditionally renewable environmental assets. Rao (1991) has made an attempt to provide an analytical framework for understanding the causes of ecological degradation in the context of changing crop and livestock economy as well as in the context of the impact of these two on rural poverty. Nadkarni (1993), underlines the ecological issues in Indian agriculture in the context of sustainable development. Barbier and Markandya (1993), deal with the relationship between environmental quality and sustainable economic activity. Swaminathan (2008) makes an attempt to develop a regional input-output table for the state of Maharashtra but the study does not include any environmental aspects. Similarly, Inderjit Singh and Lakvinder Singh (2011) have made an attempt at a regional input-output table for the state of Punjab in a traditional input-output framework but again without considering environmental sector. It is evident from the literature survey that no single robust study has been conducted yet to consider inter sectoral linkages from a holistic viewpoint; i.e. consideration of optimality in the process as well as negative externalities. Though there are many studies in existing literature with regard to environmental implications as well as the patterns of sectoral linkages, they are not captured as yet in an input-output framework; particularly at a state level. This paper makes an attempt to analyse such inter sectoral linkages and advocates a theoretical input-output framework which can include environmental concerns in the context of Odisha economy.

Input-Output Framework for Green Regional Income Accounting

According to Leontief (1936), an input-output table (also called as the transaction table) shows the flow of goods and services from each sector of the economy to different sectors of the economy over a specified period of time (usually a year, since the income calculations at any macro level are done at a frequency of one year). For producing the

output in any branch of the economy, different types of raw-material inputs and capital equipments along with labor are required. The outputs produced by each sector are allocated to the other sectors that use them as inputs into their production process and to final consumers. Thus, the input-output table provides a systematic description of this interdependence among different sectors in the economy. This table is regarded as a disaggregation of the production accounts in a national accounting system.

Table 6.1 presents a general schematic theoretical arrangement of input-output relationships between all producing and consuming sectors in an economy, which helps in explaining the technical and empirical linkages between input-output model and SNA.

Consuming Sectors				Total	
Sectors				Final Demand Output	
	1	2	 n		
Producing Sectors					
1	X ₁₁	X ₁₂	 X _{1n}	F ₁	X ₁
2	X_21	X	 X _{2n}	F ₂	X ₂
•					
•					
•					
•					
n	X _{n1}	X _{n2}	 X _{nn}	F _n	X _n
Primary Inputs					
	V ₁₁	V ₁₂	 $V_{_{1n}}$	V _{1, n+1}	
	$V_{_{21}}$	$V_{_{22}}$	 $V_{_{2n}}$	V _{2, n+1}	
	$V_{_{K_1}}$	$V_{_{K_2}}$	 V _{Kn}	V _{k, n+1}	
Total Output	X ₁	X_2	 X _n		

Theoretical Input-Output transaction table

In the construction of this input-output table, the economy is divided into a number of sectors. Each sector is represented in the input-output table by a row as a producing sector of output and a column as a consuming sector of output. The row corresponding to the sector gives the use pattern of the total supply of output of the sector while the column gives the details of the inputs absorbed by the sector. The entry to the cell of *i*th row and *j*th column is the quantity of output of sector *i* consumed as input by sector *j* and is denoted by X_{ij} . The output of the sector *j* is denoted by X_{ij} . Alternatively, the input-output table consists of four quadrants. The first quadrant gives the allocation of that part of the output, which is absorbed by the producing sectors of the economy. The second quadrant gives the consumption by the final consumers and denoted by F_i . Its components include the private consumption expenditure, government current expenditure, gross fixed capital formation, changes in inventories, imports and exports. The first and second quadrants together allocate the total output supply of each sector in the economy. The third quadrant consists of the primary inputs (inputs not being produced) utilized by the different producing sectors and is denoted by V_{ij} . The primary inputs consist of payments to labour and capital (requirements for production), indirect taxes, non-competing imports and depreciation. The first and third quadrants together show the total inputs used in production by each sector of the economy. The fourth quadrant records the primary inputs into final demand sectors and is denoted by $V_{k,nei}$.

Thus, a formal structure of an economy consisting of *n* sectors is presented by the following *n* balance equations:

$$\mathbf{X}_i = \sum_j \mathbf{X}_{ij} + \mathbf{F}_i, \ i = 1, 2, 3 \dots n$$
 (1)

These equations represent that the total demand for output of each sector is equal to the sum of the output consumed by different sectors (including the sector itself) as intermediate input uses and the final demand. Following Chenery and Clark [(1959), pp.23], it is assumed that,

where a_{ij} is the requirement of the output sector *i* used as input for a unit production of sector *j*. In formal terms, a_{ij} is called the technical coefficient. Using (2) in (1), the following equations are obtained.

The system of equations in (3) summarizes the relationships between output, total inter-industry input use and final demand for each of the sectors in the economy. In matrix form, equation (3) can be written as follows:

 $(I - A) \mathbf{X} = \mathbf{F}$ (4)

where,

A is (n x n) matrix of technical coefficients;

l is (n x n) identity matrix;

X is (1 x n) vector of sectoral output; and

F is (1 x n) vector of sectoral final demands.

Then, equilibrium output level for each of the producing sectors can be determined as a solution to the following equation.

Λ

where, $(I - A)^{-1}$ is the familiar Leontief inverse matrix, and X is $(1 \times n)$ vector of equilibrium sectoral output.

Each element in Leontief's inverse matrix represents the amount of output of sector *i* required directly and indirectly for a unit of final demand for sector *i* or *j*. Thus, this matrix captures the total impact of changes in final demand on the equilibrium output in all sectors. Further, the effect of the final demand requirements on primary inputs is estimated by multiplying the primary input rows with $(I - A)^{-1}$.

From the supply side, the total inputs absorbed by any sector (including the primary inputs) will be equal to the output of the sector. Thus, the sum of input coefficients is equal to unity. Since each column of the matrix gives the distribution of the total cost of the sector, it is called the cost structure of the sector. Thus, the supply side equations of output for each sector may be written as follows:

The input-output relationships above depend on the assumption that inputs are dependent on the level of corresponding output in physical terms only and the input coefficients per unit of gross output are invariant with respect to changes in prices of units or outputs. But in practice almost all tables are prepared in values (monetary) accounts. If the coefficients are in physical terms, it is not possible to add up the different inputs going into a sector because different inputs are measured in different units. However, aggregation of output is very important since total of output less the total value of inputs gives the *value added* by the sector. From these *value added* figures of each producing sectors, the national income is estimated for the economy.

In order to link up the input-output table and SNA in value terms, first of all equation (3) and (6) are written as follows:

where, all variables with an asterisk (*) represents the variable in value terms. (e.g. $X_j^* = X_j P_j$; where P_i is a vector of output prices)¹.

Next, summing over all the columns and rows of equation (7) and (8) respectively,

Equation (9) or (10) shows the balance between aggregate value of supply of and demand for goods from the production side or consumption side of the economy respectively. Combining equation (9) and (10), the following important relationship is obtained.

That is, the sum of the value of final demand in all consuming goods is equal to value added in all sectors of the economy. Since the final demand gives the gross national product by industry of origin, which is equal to the sum of the value added by all the sectors of the economy, input-output table helps in estimating the national product from the production approach (the sum of the value added by all the sectors) and the expenditure approach (the total of the final demand).

It might be added here that, if an economy is open to international trade, the treatment of exports and imports is included for the analysis above. In general, exports in an input-output table are shown in the form of a column in the final demand in national level analysis. For imports, one way to treat is to show it as one of the columns of the final demand with negative entries and the distribution of the row will consist of the indigenous as well as imported goods. The other way to treat the imports is in a row of primary inputs. In this case the inputs shown in the main body of the table are out of domestically produced commodities. By treating imports in a row however, one can work out the import requirements of a particular sector.

On the other hand, in the presence of an active government sector, the inputoutput analysis above needs to be explicit about the treatment of taxes and/or of subsidies for produced/consumed goods. In general, only the indirect taxes form part of the inputoutput model. These form a part of the margin between producers' and purchasers' prices. When the table is prepared in producers' prices, commodity taxes paid on intermediate inputs can be shown by way of a primary row. In case of tables at purchasers' prices taxes form part of the other inputs and are not shown separately.

If environmental costs associated with primary sector, secondary sector and tertiary sector could be calculated, an attempt can be made to re-estimate the green income using the framework of input-output analysis above. For this purpose, to start with, the data needs and availability are explored below.

Input-Output model Integrating Environmental Costs

To incorporate environmental repercussions (arising from the existing system of production process and consumption pattern) in an input-output framework, Input-Output transaction (detailed sector-wise) table for Odisha for a particular year will be needed. The availability of these data is examined below.

The input-output tables are constructed at national and regional (state) levels in India. At the national level, the input-output tables are constructed by CSO. The inputoutput transaction tables (henceforth, IOTT) include the complete table, the details of methodology adopted, the database and a brief analysis of the results. The supplementary tables derived from the IOTT like the input structure and commodity composition of output are included. Specifically, the IOTT includes the absorption matrix (known as the commodity x Industry matrix), Output Matrix (Make matrix i.e. Industry x Commodity matrix), Product Mix matrix, Make share matrix, Commodity x Commodity matrix under industry technology assumption and Commodity x Industry matrix². The latest input-output table (130 x 130 sectors at all India level) is constructed for the year 2003-04 and published in 2007. The previous IOTT were published for the year 1998-99, 1993-94, 1989-90, 1983-84, 1978-79, 1973-74 and 1968-69 at all India level. The sector specific Input-output tables are also constructed in India. For example, NCAER (2012) has prepared a Tourism Satellite Account (TSA) for India for the year 2009-10. The TSA is a set of 10 comprehensive tourism specific accounts which reflect the contribution of tourism to the Indian economy using the input output model.

At the regional level³, input-output tables have been constructed for Bihar, Haryana, Punjab, Gujarat, Rajasthan and Maharashtra. The compilation of the state level table was for the first time taken up at the government level by the state of Uttar Pradesh (UP). The table was prepared by the Planning Institute of U.P. for the year 1970-71. Apart from this most of the regional tables are constructed by individual researchers or the research organizations. The regional input-output tables are constructed with the same spirit as that of input-output tables at the national level. The only distinction is that the Rest of the World (ROW) sector is not included. In general, for lack of data on exports and imports at a state level, these two are best omitted from the regional input-output table. Like in national level input-output table, the final demand in a regional table gives the state domestic product by industry of origin, which is equal to the sum of the value added by all the sectors of the regional economy.

For Karnataka, the input-output table was constructed by V.R. Panchamukhi (1981) for the year 1966. In the input-output table for Karnataka, Panchamukhi had considered 66 sectors of the regional economy. Subsequently, however, there has been no effort to construct a regional input-output table for Karnataka either by official authorities or individual researchers and research organizations. NCAER has been actively involved in preparing regional tourism satellite accounts for Indian states to assess the contribution of tourism sector to the Indian economy in an input-output framework. Also, NCAER is in the process of developing an input output table for the state of Gujarat with new green industries. However, no study so far as has considered environment as one of the sectors in an input-output framework to provide a green accounting framework which can provide green macro aggregates for national or regional economy. This study proposes and advocates for a green input-output table for the state of Odisha

An Alternative Approach for Construction of Input-Output Table for Odisha

Since the basic input-output table for the state of Odisha for any period and purpose of this study does not exist, the following approach can be examined. That is, from the national level input-output transaction table, surrogates of technical coefficients at the state level could be derived for the year 2003-04 on the assumption that technological coefficients at the national level and regional level are identical (though this may be far from reality). Though the results of input-output analysis based on this assumption and extended to environmental repercussions may not be *exact* in terms of *green value additions* for a state, it provides a framework to capture environmental repercussions in income accounting in an input output analysis.

The specific but preliminary steps in the generation of input-output table for Odisha state and framework of the alternative approach above are as follows.

First, the sectoral income figures need to be estimated for all the sectors in the state of Odisha where the environmental repercussions are very high. Once these sectors are identified, it will appropriate to construct a 11x11 sector input-output transaction table for the state of Odisha based on availability of relevant data. This calls for reduction and reclassification of national level sectors which number to 130x130 as per latest Input-Output table into 11x11 sectors for the Odisha economy for operational ease. Also it will not serve any purpose to include the sectors which do not damage environment *per se* and their inclusion will add to complications in computing the transaction table. To start with it should be noted that CSO has aggregated all the sectors in Indian economy into 130 major sectors,

for the construction of, among others, *commodity x commodity* input-output transaction tables. To construct an input-output table for Odisha, this table shall form the basis. The following Table describes the sectors that are aggregated to constitute all India input-output transaction tables.

Sector	Sector	Sector	Sector	Sector	Sector
No.	Name	<u>NO.</u>	Nallie	NO.	
1.	Paddy	26.	Fishing	48.	Woolen Textiles
2.	Wheat	27.	Coal and lignite	49.	Silk Textiles
3.	Jowar	28.	Natural Gas	50.	Art Silk, Synthetic fiber
4.	Bajra	29.	Crude Petroleum	Г1	Textiles
5.	Maize	30.	Iron Ore	51.	Jule, Hemp, Mesia Textiles
6.	Gram	31.	Manganese Ore	52.	Carpet Weaving
7.	Pulses	32.	Bauxite	53.	Readymade Garments
8.	Sugarcane	33.	Copper Ore		and Made up Textile
9.	Groundnut	34.	Other Metallic minerals		Goods
10.	Coconut	35.	Lime Stone	54.	Miscellaneous Textiles
11.	Other Oil Seeds	36.	Mica		Products
12.	Jute	37.	Other Non-Metallic	55.	Furniture and Fixture-
13.	Cotton		Minerals	56	Wood and Wood
14.	Теа	38.	Sugar	50.	Products
15.	Coffee	39.	Khandsari, bura	57.	Paper, paper Products
16.	Rubber	40.	Hydrogenated Oil		and News Print
17.	Tobacco		(Vanaspati)	58.	Printing and Publishing
18.	Fruits	41.	Edible Oils Other	59.	Leather Footwear
19.	Vegetables	40	than Vanaspati	60.	Leather and Leather
20.	Other Crops	42.	recossing		products
21	Milk & Milk Products	10	Miccollangous	61.	Rubber Products
21.	Animal Services	43.	Food Products	62.	Plastic Products
22.	(Agricultural)	11	Reveranes	63.	Petroleum Products
23	Poultry and Edgs	44. 15	Tobacco Droducts	64.	Coal Iar Products
20.	Other Livestock	4J. 14	Khadi Cotton toxtilos	65.	Inorganic Heavy
27.	Products	40.	(Handlooms)	L L	
25.	Forestry and Logging	47.	Cotton Textiles	00.	Chemicals
-					

Sectoral disaggregation in all-India Input-Output table – 2003-04

Sector No.	Sector Name	Sector No.	Sector Name	Sector No.	Sector Name
67.	Fertilizers	88.	Electrical Industrial		Services
68.	Pesticides		Machinery	110.	Land Transport
69.	Paints, Varnishes and Lacquers	89.	Electric Cables and Wires	111.	Including Via Pipeline Water Transport
70.	Drugs and Medicines	90.	Batteries	112.	Air Transport
71.	Soaps, Cosmetics and Glycerin	91. 92.	Electrical appliances Communication	113.	Supporting and Auxiliary Transport Activities
72.	Synthetic Fibers & resin		Equipments	114.	Storage and
73.	Other Chemicals	93.	Other Electrical		Warehousing
74.	Structural Clay		machinery	115.	Communication
	Products	94.	Electronic Equipments	116.	Trade
75.	Cement	05	Including TV Shine and Deate	117.	Hotels and Restaurants
76.	Other Non-Metallic	95. 07	Ships and Boals	118.	Banking
	Mineral Products	90. 07	Rall Equipments	119.	Insurance
77.	Iron, Steel and Ferro	97.	Motor Venicies	120.	Ownership of
70	alloys	98.	Motor Cycles and Scooters		Dwellings
/8.	and forging	00	Bicycles Cycle	121.	Education and
70	Iron and Stoel foundries	//.	rickshaws		Research
20.	Non forrous basic	100.	Other Transport	122.	Medical and Health
00.	metals		Equipments	123.	Business Services
81.	Hand Tools, hardware	101.	Watches and Clocks	124.	Computer and Related
82.	Miscellaneous metal	102.	Medical, Precision and	105	Activities
	products		Optical Instruments	120.	Legal Services
83.	Tractors and agri.	103.	Gems and Jewellery	120. 107	Real Estate Activities
	Implements	104.	Aircraft and Spacecraft	127.	and Equipment
84.	Industrial Machinery	105.	Miscellaneous	128.	Other Communication.
	(F&I)	101	Manufacturing		Social and Personal
85.	Industrial Machinery	106.	Construction		Services
96	Machino Tools	107.	Electricity	129.	Other Services
00. 07	Other Nen Electrical	108.	Water Supply	130.	Public Administration
07.	Machinery	109.	Railway Transport		

Source: Input-Output Transaction Table, Central Statistical Organization (2007)

In reclassifying the above 130 sectors into lesser number of sectors to construct input-output table for Odisha, it was found that, the elements of transaction table (both rows and columns) in the sectors like "Public Administration" and "Real Estate, Ownership of Dwellings and Business Services" appear as zeros¹. However, this precludes the existence of Leontief inverse matrix, which is essential to obtain solution in equation (5). In theoretical terms, the non-existence of Leontief inverse matrix implies that the familiar Hawkins-Simon condition for the workability of the input-output system or solvability of the structure of linear equations does not exist. Hence, such sectors could be merged with the sector with "Banking and Insurance". This reduces the 130 x 130 matrix to 12 x 12 sector input-output table for the integration of environmental costs. The following Table presents the aggregation of sectors from the all India 130 sectors.

Sector No.	Sector	Sectors in IOTT Table (2003-04)
1.	Agriculture	1 to 24
2.	Forestry and Logging	25
3.	Fisheries	26
4.	Mining and Quarrying	27 to 37
5.	Manufacturing	38 to 105,
6.	Construction	106
7.	Electricity, Gas and Water Supply	107 and 108
8.	Transport, Storage and Communicatio	n 109 to 115
9.	Trade, Hotels and Restaurants	116 and 117
10.	Banking and Insurance	118,119,120 and 130
11.	Other Services	121 to129
12.	Environment	To be incorporated

A Suggestive Reclassification of sectoral disaggregation

Source: Classified by the author

Using the above classification of sectors at the all India level, and empirical framework in equation (7), the 12 sectors all-India input-output transaction table can be derived which can subsequently be used to construct a table for Odisha economy

Conclusion

In the light of above discussions, it may be concluded that, if environmental repercussions are integrated into SNA by taking into account the sectoral inter-dependence in the framework of input-output analysis, the green incomes could be estimated which shall provide us a guidance to our economic well being by computing true (sustainable)
income for any economy. The contemporary studies suggest that the green income tends be lower than the income levels estimated by authorities in conventional SNA, but they will be fair income estimates which are sustainable and provide appropriate policy guidelines to the policy makers. This study advocates preparing an input-output table for the state of Odisha which can accommodate "environment" as one of the sectors in the conventional input-output framework. Such an effort will provide a framework of green input-output tables which will provide the policy makers with green (sustainable) macroeconomic aggregates.

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End Notes:

¹ Daly (1989) quotes J.R. Hicks' (1946) definition of income in his paper.

² The details of GDP and other indicators of national income can be found in any standard textbook of macroeconomics; such as, Dornbusch et. al (1998).

³ It should be pointed out that the introduction of input-output relationship (from the supply side of output) in value terms implies that the output prices are endogenously determined in the system. This implication is clearly explained in Leontief (1970; pp265-266). The explanation reveals that output prices are determined given the value added in each sector of the economy. Next, given the equilibrium prices, the transaction table is obtained in value terms (i.e. by multiplying the equilibrium prices by the X_{ij} s). That is the input-output relationship from the demand side of the output. In practice, however, the input-output transaction tables are constructed with market prices.

⁴ The details of all these matrices can be found in CSO (2000), Input-Output transaction Tables- 1993-94.

⁵ For details see Venkatramaiah et. al. (1979)

⁶ The presence of zero elements is due to non-existence of input-output relationship between these sectors and rest of the economy. This is evident from the all India input-output transaction table for the year 1993-94 for the *commodity x commodity* matrices.

The sector specific Input-output tables are also constructed in India. For example, NCAER (2012) has prepared a Tourism Satellite Account (TSA) for India for the year 2009-10. The TSA is a set of 10 comprehensive tourism specific accounts which reflect the contribution of tourism to the Indian economy using the input output model.

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The Dynamics of Linkage of Agricultural and Industrial Sectors to Economic Growth of Odisha

Ananya Mitra¹ Shradhanjali Panda²

The development of the state is based on the development of each of its sectors. This grassroot development is interlinked with each other as national development is an aggregation; the failure in one sector undermines the success in others, in turn retarding the overall growth of the total. Hence it becomes pertinent to study the performance of different sectors in terms of their relative positions within the state's landscape. A comparative analysis between certain measurable economic variables of Odisha and its sectors, preferably agriculture and industrial sectors, may clear the way to have a bird's eye view of the position of the sectors. For this all data are collected from RBI handbook, Economic Survey of Odisha, and Planning Commission reports. The time period is 8 years i.e 2004-05 to 2011-12. Keeping this in mind this present comparative study aims at examining the position of two of the prominent sectors i.e. agriculture and industry on some selected economic parameters. Though Odisha may not be the most promising state in India, yet its situation cannot be tagged as bad. It needs to perform better in various sectors to strengthen its position.

Introduction

It is a wide spread belief in the local population that Odisha is a neglected state. Being the 9th largest state by area and the 11th largest by population, Odisha has not been a focus of investment by the central government, causing its infrastructure and educational standards to lag behind the rest of the country. If figures are to be believed, then only about 20% of the road network is paved and in rural areas over 65% of the population has no access to safe drinking water. But, in the current year i.e. 2012, the per capita investment in the state is the highest in the country and it is the focus of investment from foreign investors. Odisha has abundant natural resources and a large coastline. It contains a fifth of

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India's coal, a quarter of its iron ore, a third of its bauxite reserves and most of the chromites. At the same time Odisha is dominantly an agrarian state with Agriculture and animal Husbandry sector contributing a larger portion of the total employment.

It is a fact that agriculture and industry should simultaneously dominate the growth of a region. Favouring any one of the two may lead to imbalance. There has been a lot of debate regarding the economic growth of India besides its growing regional imbalance. Some states remain to dominate the rank card over decades while others including Odisha remain in the bottom. One of the reasons that economists put forward is heavy dependence on agriculture and allied sectors. Agriculture in Odisha has been in subsistence level depending mostly on natural factors. A fall in agriculture leads to a fall in the living standard of population depending on it Green revolution post liberalization had very less impact on agricultural sector. Rapid price fluctuation has also skewed the cropping pattern. Industry which has the potentiality to improve a region out of its poverty is more often not emphasized optimally. Additionally, both the sectors have their own inherent reasons, financial scarcity being a major factor among all.

Objectives of the study

The objective of the present study is to analyze the impact of the two major sectors agriculture and industry, on economic development of Odisha. Broadly speaking objectives of the present paper are-

- 1. To study the contribution of various sectors towards economic growth of Odisha,
- 2. To compute the growth rate of agriculture and industrial sectors over the years,
- 3. To fit trend line to production in agriculture and industry for future prediction,
- 4. To check the extent of linear relationship of various components of agricultural sector with total agriculture output, and the extent of linear relationship of various components of industrial sector with total industry output.
- 5. To suggest measures to improve the weak areas in both sectors.

Database and methodology

Keeping in mind the importance of agriculture and industry for economic growth of Odisha, this paper aims at examining the position of these sectors, agriculture with industrial on the basis of some selected economic parameters. Having identified the gray areas, some measures are also suggested in the study to overcome them.

Recent Data are used. Various reports of central and state governments are used in this paper. The major sources of information are RBI handbook, reports of Planning

Commission, and Economic Survey of India and Odisha. Various newspapers are also referred to for updating data. Past historical data may be necessary for future prediction. In such view of things, this paper has used data from 2004-05 onwards till 2012-13.

Various statistical tools are used to generate some meaningful conclusions. Correlation has been calculated to detect any possible linear relationship between the sectors and their components and the kind of relation, positive or negative, if any. Regression has been used to predict the future expected values under study. Trend line by method of least square is fitted to check the extent of diversification between the observed and the calculated values.

Agriculture and Economic Growth in Odisha

The agricultural sector is divided into three broad categories -agriculture, forestry & logging, and fishing. Odisha is surrounded by a magnificent marine life, and hence the income from fishery cultivation is having a positive correlation (r=0.87) to economic growth, but the contribution of agriculture to GSDP has been declining over the years. The contribution of forestry and logging has remained almost stagnant compared to fishing that has made a slight improvement. Agriculture shows a more positive linear relation to total agriculture (r=0.998) which also includes forestry and logging, and fishing.

	Agriculture	Forestry and Logging	Fishing	Total
Agriculture	1			
Forestry & Logging	0.321723	1		
Fishing	0.858042	0.537085	1	
Total	0.998905	0.362833	0.876311	1

Table-1: Correlation matrix of agricultural sector output (Rupees Billion)*

Source: Authors' own estimates

Except for the year 2011-12 there has been an increase in the total production of agricultural goods. The average output is quite good which turns out to be worth Rupees 350 billion with a standard deviation of 18.5. Within agriculture, agricultural production contributes the most (worth Rupees 1416 billion), followed by forestry and logging (worth Rupees 240 billion), and fishing (worth Rupees 95 billion).

Year	Agriculture	Agriculture Trend	Agriculture
	Total	Value	Growth Rate
2004-05	171.69	169.906	3.355656
2005-06	177.45	176.112	1.702608
2006-07	180.47	182.318	4.39381
2007-08	188.40	188.524	1.399691
2008-09	191.04	194.73	7.749348
2009-10	205.84	200.936	1.548404
2010-11	209.03	207.141	-5.45946
2011-12	197.62	213.347	16.89869
2012-13	231.01	219.553	
SUM	1752.5		
Avg.	350.51		

Table-2: Trend in	agriculture sector	production in	n Rupees Billion

Source: Authors' own estimates

The growth rate of Odisha's agriculture has been quite unstable over the last 8 years. The range of fluctuation is very wide. The minimum was -5.4 but strangely the maximum growth rate was attained in the subsequent year at 16.89. Just the year before i.e. in the negative growth rate was merely -1.5. To prevent such catastrophic changes the government has increased its expenditure on irrigation and flood control measures.

Since there has been a huge positive sign in the agriculture in the year 2011-12, people have started visualizing agriculture as an emerging business unit, with greater margin of profit if systematic route of cultivation is mingled with sophisticated equipments. Agriculture is no longer a gamble in the monsoon since business units are involved in corporate farming. Keeping this in mind Odisha became the first state to implement agriculture policy and lay out special budget for agriculture under Agriculture Policy-2013, to uplift those surviving on agriculture and simultaneously attract large business houses. A dramatic change in subsidy pattern on various sections of agriculture and allied sectors, to achieve faster growth, is the hallmark of the new Agriculture Policy-2013.

Industry and Economic Growth in Odisha

If the latest Economic Survey is to be believed, the share of industrial sector is predicted to fall from 25.78 per cent to 24.22 per cent of the state's GSDP in 2012-13, due to global economic slowdown, and disruption in other mining activities. But it is believed that the picture is not so bad. Odisha has tremendous potential and can revive its position in less time. There are multiple reasons to trust this belief. The state has prepared a number of project proposals valued at Rs 4.7 lakh crore, according to Department of Industrial Policy and Promotion (DIPP) data.

Variables	Mining &	Manufacturing	Manufacturing	Manufacturing	Electricity, Gas
	Quarrying	- Registered	- Unregistered		& Water Supply
Mining and					
Quarrying	1				
Manufacturing - Registered	0.696072	1			
Manufacturing - Unregistered	-0.31033	-0.32228	1		
Manufacturing	0.679345	0.992219	-0.20192	1	
Electricity, Gas and Water Supply	-0.76	-0.50514	0.731514	-0.42641	1

Table-3: Correlation matrix of industrial sector	production	(Rupees Billion)
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Source: Authors' own estimates

The industrial sector has been subdivided into electricity, gas and water supply; manufacturing both unregistered and registered; and mining and quarrying. Studying each individually will give more specific information regarding their contribution to growth. The mining and quarrying sector has been in dark side for quite some time. For the last 8 years, its average growth rate is negative (-4.5). This is something that needs immediate attention; because its poor condition is not sudden rather it is structural in nature, persistent in almost every year. The manufacturing sector has an average negative growth rate of -3.2 for the last 8 years. This negative growth is due to the registered units whose average growth for the time period is negative (-7.9). The unregistered units have a positive (4.9) growth rate but the huge negative value of the registered manufacturing units offsets the positive figure. Electricity, gas and water supply are the only units that have a positive average growth rate of 13.09 for the last 8 years, though there are fluctuation in different years.

Year	Industry Total	Industry Growth Rate
2004-05	128.904	-5.5172
2005-06	121.792	26.5370
2006-07	154.112	13.2738
2007-08	174.568	5.87243
2008-09	184.82	-28.745
2009-10	131.692	0.12893
2010-11	131.861	-4.2115
2011-12	126.308	-21.773
2012-13	98.7992	
SUM	1252.85	
Avg.	250.571	

Table-4: Trend of industrial sector output (Rupees Billion)

Source: Authors' own estimates

Agriculture - Industry Interdependence

It's common knowledge that agriculture and industry are both dependent on one another. The extent of dependency differs from one economy to another. There exists a negative correlation between agriculture and industrial output (r= - 0.4384) in Odisha.

Table- 5: Correlation	between ir	ndustry & ag	griculture
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CORRELATION	INDUSTRY	AGRICULTURE
INDUSTRY	1	
AGRICULTURE	- 0.4384	1

Source: Authors' own estimates

The regression equations of both the sectors are:

Industry= - 0.299Agriculture + 183.87

Agriculture = - 0.641 Industry + 284.07

The agricultural output has a positive skewness of 0.799 and the industrial production has a positive skewness of 0.5424 indicating a distribution with an asymmetric tail extending toward more positive values. Agricultural yield shows a kurtosis of 0.4652

(positive kurtosis indicates a relatively peaked distribution) and industrial sector has a negative kurtosis of -0.223 (negative kurtosis indicates a relatively flat distribution). To test the significance of correlation coefficient t test has been applied.

 $H_{a}: \tilde{n} = 0$ (i.e. variables are uncorrelated in the population)

 $H_1: \tilde{n}$ "" o (i.e. variables are correlated in the population, two tailed)

$$t = r \frac{\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$$

t=1.288 (7 d.f and at 5% level of significance)

Since the calculated t value is less than tabulated value (2.8) the correlation coefficient is rejected. There exists no linear relationship between the production of the two sectors.

The economic growth of the state has also helped construction, transport, storage & communication, trade, hotels & restaurant etc activities.

Conclusion

Odisha was once considered as a state ill fated to remain poor. But thanks to the innovations in public service delivery introduced by the state, it now figures among states with low leakage in the leaky public distribution system (PDS). While redistributive policy is a major factor in poverty reduction, the state has also excelled in making the growth propoor. Thus not only Odisha has grown faster but it has also ensured that the benefits accrue to the poorest. The infrastructure sector also makes an impact on the economic growth of the state. All the three sectors have grown with time, but their growth rate is different. Apart from industrial sector other sectors have done fairly well. Looking at the ongoing and expected business prospective it can be said that Odisha might turn out splendidly well off in near future.

Agriculture and industrial sector both depend on each other even though the test shows a week correlation. The government of Odisha is motivated to give priority to both the sectors simultaneously. Apart from the government facilities many other secondary steps can be adopted to improve the growth rate. These steps can be taken up by the individuals themselves, as well as by the private sector. In case of industries, they can hire various private agencies to do the forecasting as prediction requires great degree of precision due to its high investment. To increase sales various consumer financing techniques provided by banks, investment banks, Insurance companies, credit card companies and others may be provided. To acquire better finance they can tie-up with financial institutions. The farmers at their own level can solve many problems by simply maintaining annual records. A trend analysis to farm income and net worth over time along with expected future market values can be used to forecast the production for the next year. By having good farm records, a farmer can evaluate where he has been, where he is now, and whether or not he is moving in the right direction. There are multiple tools provided by private sector in the financial market that an agriculturalist can choose depending on his/her risk bearing ability like purchase of multi-peril crop insurance coverage to stabilize income, purchase of whole farm revenue insurance to provide a safety net, review business insurance policies and be certain to carry sufficient liability coverage, form or join a marketing cooperative to secure enhanced prices and a market guarantee, enter into sales or price contracts with buyers, finding off-farm employment etc.

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Trend and Patterns of Sectoral Linkages in Odisha Economy

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Evaluation of sectoral economic performance and sectoral growth linkages are important for designing economic development policies for an economy. Investment should be directed towards those sectors with high backward and forward linkages, as they have the potential of creating a significant impact on increasing output, per capita income and employment levels in the economy. These basic sectors of the economy have the capacity to stimulate greater economic activity in other sectors through a larger multiplier effect on growth and development. Identification of these basic industries with high linkage effect is required to promote growth in these sectors and make appropriate decision. In spite of being an agrarian state, Odisha has not only shown a decline in growth rate of agriculture but also of that of the industrial sector. Though some sub-sectors within the secondary sector shows a high linkage Index, they do not exhibit adequate growth due to lack of infrastructural facilities, while the other with low linkage has higher growth rate. This calls for appropriate policy initiatives to address the issue and sustain the growth momentum.

Keywords: Sectors, Linkages, Multiplier, Growth

1. Introduction

Economic development of a country is influenced by many factors which affect the decision of the policy makers. There is a positive co-relation between economic development and its sectoral growth linkages. With economic development and enlargement of the GDP basket, there occurs a transformation in economic activity from primary towards the manufacturing and the service sector (Fisher, 1939). For any economy, the three phases of sectoral linkages are charted out as follows: In phase-I, agriculture is the primary sector which provides food, labour, capital, foreign exchange and other inputs required for the industrial sector. In phase-II, the expansion of the industrial sector contributes a larger share to the overall GDP. The rising industrial wages on the one hand fosters higher demand for agricultural products and on the other hand attracts the surplus labour from agriculture to industry. In phase-III, as the economy grows and the linkages

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between the sectors become more prominent, there is bi-directional linkage between agricultural and non-agricultural sectors. With an increase in the output of the agricultural sector, its income increases which in turn increases the demand for industrial goods both for consumption and investments purposes. Further, any endogenous or exogenous shock in the services sector is likely to influence the demand for industrial goods (Shastry et al., 2003). Increasing modernity and complexity increases the dynamism of these linkages. An improved educational sector provides educated and skilled human resource to the secondary and tertiary sector enhancing the productivity of these sectors. As they provide improved tools and inputs to the agricultural sector, it increases its productivity, which thereby releases 'surplus labour' to be absorbed in the manufacturing and tertiary sector. The development of these prime sectors in turn depends on the existence of efficient energy and transport facilities and other infrastructure of the economy. Thus, these facilities have to keep pace with urbanization of the population. With the overall growth of all these sectors the GDP of the economy increases which in turn increases the demand for goods and services of these sectors (Atanu, 2011). According to Hirschman, Singer, Streeten and Fleming, balanced growth of all sectors is neither feasible nor appropriate. So these supporters of unbalanced growth strategy recommend deliberate unbalancing of economies (particularly for under-developed and developing economies) to foster economic development. Due to underdevelopment characteristics like low per capita income, high unemployment, low growth rate etc., the all-around investment cannot be done in all sectors in a balanced way. According to Hirschman deliberate unbalancing of the economy is required if it has to be kept ahead by maintaining tension, disproportion and disequilibrium. Thus unbalanced investment can both be complementary and can correct existing imbalances taking the economy on its natural path of development.

From the above observations it is obvious that the inter-sectoral linkages among the constituent sectors are the sources for economic development of an economy as they generate positive growth impulses which are to be identified and maintained to sustain the growth momentum. Keeping in mind these views, this paper seeks to identify those sectors exhibiting inter-sectoral linkages in India and Odisha. It also attempts to link the sectoral analysis with economic growth in Odisha and make some policy recommendations at the end.

2. Existing sectoral linkages between the sectors in India and Odisha:

There always exists desirable investment opportunities in an economy which implies that it requires unbalanced investment to complement the existing imbalance. These investments in turn will create a new imbalance, inducing another balancing investment. And as some sectors would be more productive than the others, it would create a continous need for new investments as complementary injections to correct the existing imbalances. Now any economy can create this imbalance either through shortage of Social Overhead Capital (SOC) or through excess of SOC. Direct investment in Directly Productive Activities (DPAs) would increase the demand for SOC, inducing further investments. On the other hand, a prior expansion of SOC would reduce the required facilities lessening the cost of investing in DPAs. This is because the cost of producing any unit of output of DPA is inversely proportional to the availability of SOCs. Both paths would set up incentives whose efficiency is determined by the strength of the investment motivations generated and on the response of the authorities to deal with the public pressure created due to DPAs. A forward linkage is created in those sectors which develop subsequently as a result of the investment in the present sector while a backward linkage is created in those sectors whose output would enter as inputs and enable the present project to succeed. For example, investment in the steel industry creates backward linkages in mining, transport and communication etc., while it creates forward linkages in the consumers' goods sector, educational sector etc.

Several studies have been conducted to analyse this structural relationship among sectors. This is done using the techniques of Input-Output tables, causality tests and econometric models. While the former two techniques help to identify the 'key' or 'causal' sectors of the economy, the econometric analysis helps to generate dynamic forecasts and policy simulation. According to Hirschman's concept of linkage, ongoing activities will create the necessary incentives to invest in new activities. Thus, while backward linkage will be created in the input providing sectors, the forward linkage effects are generated in the output utilization sectors. The Total linkage for an industry 'i' is defined as $TL = \sum X_i P_{ii}$, with X_i being the net outputs of industry i, and P_i being the probability that each of the industries j will be set up as a consequence of the establishment of industry 'i'. The probability for backward linkages is given as the ratio of annual inputs required from industry 'i', denoted by y, over the minimum economic size, denoted by z (interpreted in terms of annual productive capacity of the firms that would produce these outputs, (i.e., p=y/z). However, as the forward linkage would be depending on the market that would be created which in turn is dependent on the importance of the product of industry 'i 'to be used as inputs in the forthcoming industries, its probability is difficult to define. However, these backward and forward linkages are not automatic as they would in turn depend upon a host of allied factors like technological requirement and availability, capital availability and injection, market accessibility and knowledge (Hirschman, 1958). However, it has to be mentioned here that these I-O ratios measure only the degree of interdependence of different sectors in terms of the degree of inputs used from another sector. A high ratio can also exist among the sectors due to sectoral inter-dependence and may not be due to

only linkage effects. In such cases, the sector did not develop as a result of linkages to another sector but rather in tandem with it.

2.1 Sectoral Growth Analysis in India

The structural transformation of sectoral growth as is witnessed in other economies of the world i.e., from agrarian economy to a service economy en route the industrial economy has not been seen in India over the years (Hansda, 2001). In India, there is seen a dominance of services ahead of industry with the decline of agriculture, giving rise to apprehensions as to whether the sequence of growth process would be reversed in future particularly when industrial sector picks up the adequate growth momentum which is lacking now. Also in terms of employment creation, the expanding service sector has accounted for only 23.5% of the total employment in the country, while the declining agriculture sector still accounts for a major share of employment despite its secular decline in terms of share in GDP. The structural transformation from a primarily agrarian economy in the 1970s to a service sector oriented economy since the 90s has brought about significant changes in the Production and Demand linkages between the various sectors which in turn have significant impact on the growth and development of the Indian economy.

Sector	Share in GDP in %				
	1970-71	1980-81	1990-91	2000-01	
Agriculture	46.34	39.71	32.00	24.00	
Industry	15.58	17.62	21.70	21.80	
Services	38.07	42.66	46.09	54.20	

Table-1: Sectoral Composition of GDP of India at 1993-94 Prices

Source: Shastry et al., 2003

Table-1 shows the sectoral composition of GDP at 1993-94 prices. It shows that over this period of 3 decades the sectoral composition has moved from agricultural towards the services sector. While the share of agriculture was 46.34% in 1970-71, it declined to 24% in 2000-01. However, the share of industry has increased from 15.58% to 21.70% over 1970-71 to 1990-91, after which it has remained almost stable at 21.80% in 2000-01. A significant improvement is seen only in the tertiary sector from 38.07% to 54.20% over this period. Thus, over the years while the share of the service sector has increased significantly, the share of the industrial sector has changed very little and there is a fall in the share of agriculture sector.

Sector	1970-71 to 1980-81	1980-81 to 1990-91	1990-91 to 2000-01
Agriculture	1.49	3.42	2.68
Industry	4.35	7.84	5.82
Services	4.25	6.43	7.46
OverallGDP	3.07	5.61	5.75

Table-2: Sectoral Growth Rates of GDP at 1993-94 Prices

Source: Shastry et al., 2003

Table-2 gives the growth rate of each of these sectors over the various decades. The point worth mentioning here is that both agricultural and industrial sectors have shown a decline in the growth rate from 3.42% (over 1980-81 to 1990-91) to 2.68 % (over 1990-91 to 2000-01) for agriculture and from 7.84 to 5.82 for the industrial sector over the same period despite the fact being that 1990-91 was the year of economic reforms. But however, the tertiary sector growth rate has increased from 6.43 to 7.46 over the same period. As the service sector grows, it increases the demand of the agriculture and industrial sector thus leading to an increase in demand for consumer and financial goods and services as well as for distribution and communication (Kaur et al., 2009).

2.2 Sectoral Analysis of Odisha's Economy

An analysis of the Odisha's sectoral changes however shows a difference from the national trend of sectoral changes with the economy expanding through sectoral shifts in GSDP from agriculture to industry and to service sector. Its economy is mainly agrarian with 87% of the 31.66 million population depending on agriculture directly or indirectly for their livelihood. The state's annual growth rate during the period 1980-81 to 1999-00 was at 1.9% which was below the national average of 3.4%. This was mainly attributed to the slow agricultural growth rate over this period, given the heavy dependence on agriculture. The table below clearly points to this shortfall in primary sector's contribution.

Year	Odisha		Ind	ia
	GSDP	Agriculture	GSDP	Agriculture
1981-82 to 85-86	4.37	4.74	4.58	2.84
1985-86 to 90-91	3.75	0.32	5.85	3.40
1990-91to 95-96	1.43	-1.72	5.34	3.24
1995-96 to 99-00	4.33	-0.18	6.16	2.47
1981-82 to 90-91	3.32	0.89	5.30	3.44
1990-91 to 99-00	2.84	-0.98	5.58	2.59
2000-01 to 05-06	4.45	1.02	8.00	3.00

Table-3: Annual Average Growth Rate of GSDP (%) and Agricultural Sector

Source: Ghose and Kumar, 2010

Table-3 points out the contribution of agriculture to the GDP both for the state as also for the Indian economy. It can be seen that while agriculture was the main contributor to GSDP over 1981-82 to 1985-86, it severely declined over the years. In fact, the contribution was negative to the GSDP in the 1990s. For the country as a whole, though the share has been positive over the years, yet its contribution has been declining. Table-4 provides the sectoral composition of GSDP over the years. It indicates a clear transformation from primary sector towards industrial and tertiary sectors. While the contribution of the primary sector to the GSDP was 60.6% in the 1950s it has significantly declined to 36.5 in the 1990s. Over this period the share of the industrial sector has increased from 11.7% to 25% and the share of the service sector has increased from 27.7% to 38.5%.

Decade	Sectoral Compositions of GSDP (%)			
	Agriculture	Industry	Services	
1950s	60.6	11.7	27.7	
1960s	57.4	17.2	25.4	
1970s	54.8	18.8	26.4	
1980s	51.0	18.9	30.1	
19905	36.5	25.0	38.5	

Table-4: Odisha's GSDP:Sectoral Compositions: 1950-2000

Source: Annual Plan: 2012-13, Odisha

Table-5: Odisha Decadal Real Growth Rates: 1950-2000

Decade	Real growth rate (%) ,2004-05 prices				
	GSDP	Agriculture	Industry	Services	
1950s	2.6	1.3	11.1	3.5	
1960s	4.1	4.8	4.5	3.0	
1970s	2.0	0.9	5.8	2.5	
1980s	5.3	5.9	4.3	6.1	
1990s	2.7	-1.1	5.1	5.8	

Source: Annual Plan: 2012-13, Odisha

The real sectoral growth rate of Odisha in terms of 2004-05 prices is given in *Table-5*. While it was 1.3 for agriculture in the 1950s, it declined to -1.1 in the 1990s. Over the same period while the real growth rate for industry has declined from 11.1 to 5.1, it has increased for the service sector from 3.5 to 5.8.

The real growth rate in terms of 2004-05 prices over the plan periods is reflected in Table-6 while the sectoral composition is reflected in Table-7. While the real growth rate was 2.70 per cent for agriculture in the 10th plan, it increased to 4.12 per cent over the 11th plan period. The industrial sector has shown a decline from 12.80 per cent to 9.12 per cent in its real growth rate while it has increased for the service sector from 9.80 per cent to 9.86 per cent.

Table-6: Odisha's Plan Performance (Annual Plan: 2012-13, Odisha) 10th and 11th plan: 2002-2012

Plan	Real growth rate (%),2004-05 prices					
	GSDP Agriculture Industry Services					
10 th plan	9.24	2.70	12.80	9.80		
11 th plan(1 st 4 years)	8.50	4.12	9.12	9.86		
12 th Plan(Projection)	9.00	4.05	12.68	12.07		

Source: Annual Plan: 2012-13, Odisha

Table-7: Odisha's Sectoral Co	mposition of GSDP (%)
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Plan	Sectoral composition of GSDP (%)					
	Agriculture Industry Services					
10 th Plan	25.46	21.66	52.88			
11 th Plan(1 st 4 years)	18.60	26.52	54.88			
12 ^{th P} lan (Projection)	14.20	28.10	57.70			

Source: Annual Plan: 2012-13, Odisha

The contribution of agriculture to GSDP has declined from 25.46 per cent over the 10th plan period to 18.60 per cent over the 11th plan period, while that of both the industrial and service sectors have increased. The projection for the 12th plan per cent wise is 14.20, 28.10 and 57.70 for each of these three sectors respectively.

2.3 Production and Demand Linkages in India

A shift in the GDP basket brings with it a substantial change in the inter-sectoral production and demand linkages. Production linkages existing between the sectors are reflected in terms of the input requirement (dependence) in different sectors as well as on itself. Table-8 analyses the production linkages between these major sectors. As is revealed, for the agricultural sector, in 1979-80, to produce 1 unit of its product, the output required was 0.068 units from industry 0.020 units, from the services sector and 0.160 units from agriculture itself. Relative to this, in 1993-94, these figures are 0.140, 0.048 and 0.145. Thus, there was an increase of dependence on industries and services as the modernization of the primary sector requires the inputs as well as demand for financial, transport and communication and other services.

1979-80	Agriculture	Industry	Services
Agriculture	0.160	0.130	0.039
Industry	0.068	0.345	0.105
Services	0.020	0.149	0.096
1989-90	Agriculture	Industry	Services
Agriculture	1.166	0.042	0.035
Industry	1.144	0.373	0.172
Services	0.047	0.188	0.187
1993-94	Agriculture	Industry	Services
Agriculture	0.145	0.035	0.034
Industry	0.140	0.365	0.150
Services	0.048	0.213	0.195

Table-8: Sectoral Share Matrices (Production Linkages)

Source: Shastry et al., 2003

For the Industrial sector however there was a sharp fall in dependence on agriculture from 0.130 in 1979-80 to 0.035 in 1993-94, suggesting that over the years the industrial sector in India has become broad based thus decreasing the dependence on agriculture for inputs. And as is obvious, its production linkage with service sector has increased from 0.149 in 1979-80 to 0.213 per units over this period. While there is some increase in production linkages with industrial sector from 0.105 to 0.150 from 1979-80 to 1993-94, there is actually

a decline from 0.172 per unit in 1989-90 to 0.150 in 1993-94. However, the production linkage with agriculture has declined moderately while there has been a sharp increase in production linkage with its own sector.

1979-80	Agriculture	Industry	Services
Agriculture	1.214	0.260	0.083
Industry	0.315	1.601	0.191
Services	0.049	0.269	1.139
1993-94	Agriculture	Industry	Services
Agriculture	1.187	0.087	0.066
Industry	0.297	1.704	0.330
Services	0.149	0.457	1.334

Table-9: Sectoral Demand Matrices [(I-A)⁻¹] (Demand Linkages)

Source: Shastry et al., 2003

Table-9 represents the demand linkages over the years. It shows that a 1 unit increase in agricultural output increases demand for its own product by 1.214 units, 0.135 for industries and 0.049 for services in 1979-80. The corresponding figures for 1993-94 were 1.187, 0.297 and 0.149 respectively. However, for the industrial sector there was a sharp fall in demand for agricultural sector from 0.260 in 1979-80 to 0.087 in 1993-94, though it has increased for both its own and service sector output. For the service sector, there has been a sharp fall for agricultural sector output (from 0.083 in 1979-80 to 0.066 in 1993-94), but it has increased moderately for both industrial and service sector output. Any fall in aggregate demand of any sector for other sectors or its own output may likely cause a serious constraint affecting both the production and demand linkages.

2.4 Intersectoral Linkages in Odisha

Studies investigating the existing linkages between different sectors of Odisha's economy (Behera, 2012) using the Granger Causality Test from 1980 to 2011 finds a weak linkage between the primary and the secondary sector in the growth process which is due to lack of technological progress, declining food crops productivity and a low rate of public investment. With regard to the linkages with the tertiary sector, it showed some linkages with some of the sub-sectors within the tertiary sector. However a strong linkage was observed between primary sector and trade, hotel and restaurant sectors over the entire period of study, while an independent relationship exists with transport-storage-

communication (TSC), finance, Insurance, real estate and business services (FIRB) and social and community services (CSPD). A causality test between the secondary and tertiary sectors, finds independent relationship of industry with some sub-sectors of the tertiary sector like trade, hotel and restaurant and community, social and personal services. However, there exists one unidirectional causality between the secondary sector to finance, insurance, real estates and business services on the one hand and transport, storage and communication to secondary sector on the other.

Identification of those industries and encouraging activities having the strongest linkage effects in terms of input-output linkage are necessary to maximize induced decision making and promote growth in these sectors and in the overall economy. The correlation existing between the linkage effect of a sector and the growth rate of that sector is known as the Hirschman Compliance Test.

Sl No	Sectors	Total linkages	Growth rate of sectors during 1980-81 to 2000-02
1	Agriculture	1.315	9.65
2	Forestry	1.055	9.71
3	Fishing	1.134	15.77
4	Mining	1.345	18.45
5	Manufacturing	1.713	13.56
6	Electricity	1.487	18.32
7	Construction	1.520	14.83

Table-10: Total Linkage Index and Growth Rate of Orissan Economy

source:Patra, A. K, 2002

A Hirschman Compliance Test conducted on 7 sectors of Odisha's economy (Patra et al., 2005), showed the highest total linkage in manufacturing sector (1.713), followed construction (1.520) and electricity (1.487), while the highest growth rate was observed in the mining, electricity and fishing sectors in a decreasing order. The study found a low Hirschman Compliance Index in Odisha (of only + 0.3111), implying that the state has failed to promote adequate growth in those sectors with the highest total linkage effect. This is evident from the fact that the manufacturing sector with the highest linkage index has not shown adequate growth during the given time frame while mining sector with a low linkage effect has performed the highest growth during the period.

Thus, there has been an increasing realization among the policy makers about the importance of strengthening the infrastructure to provide a base for industrial development for a sustained growth. An addition to these social overhead capitals shall not only create inter-sectoral linkages but also provide outstanding technical and economic features to the industrial sector. This in turn will contribute to the socio-economic framework of the state ensuring spillovers from users to non-users and increasing returns to scale (Meena and Mishra, 2006). As a part of this vision, the Industrial Policy Resolution (IPR, 2001), has attempted a marked shift in the process of industrial growth like provisioning of an investment friendly environment so as also to encourage private investment and lessen the crowding-out effect and focusing on sectors like tourism, fisheries, horticulture etc. which can benefit the poor. Similarly, the Orissa Industries (Facilitation) Act, 2004 aims to provide a hassle free framework so as to reduce the transaction costs and time for investors.

Odisha abounds in mineral based industries like steel, aluminium and also power, refineries and ports. It is already the centre for top IT consulting firms like Satyam, Infosys and TCS (Tata Consultancy Services), along with IBM, WIPRO etc.Currently, the steel sector in Odisha has around 40 MOUs inked by the Government with involved investments exceeding US\$30 billion. The much talked about POSCO India is the single largest FDI in the entire country. The project itself is visioned to further the establishment of Mega infrastructures consisting of ports, railway lines, roads, townships etc. The spurt of growth in these mega industries has enhanced the demand for quality manpower and human resource development. This has pressurized the government to invest in technical universities suiting the need of the hour.

3. Conclusion

Odisha is a state prone to recurring natural calamities. Thus the state cannot rule out the exogenous shocks to the economy through agriculture due to adverse weather conditions. So in the absence of such uni-directional causality running from agricultural to non-agricultural growth, appropriate policy should be to encourage bi-directional sectoral linkages between industry and services. Also the reverse situation cannot be underestimated where some adverse shocks to the industrial and service sector may reverse the growth momentum in the absence of a stable and productive primary sector given the heavy dependence on this sector. A well developed irrigational system, encouraging financial facilities with easy access to credit and crop insurance, storage system etc., will strengthen this prime sector prompting it to be a major food producer of the nation. So the need is to identify the linkages and encourage the flow so as to strengthen and sustain the growth momentum throughout the economy.

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Identification of Linkage Between Social Sector Development and GSDP Growth in Odisha

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High Growth of GSDP of a state indicates success in its development policy. In the Indian context, states having higher growth rate than the national growth rate of GDP are adjudged as better performing states. This is possible by adopting a right strategy of investment in general, social and economic services. The public sector expenditure thus comprises of these three areas. The private sector is not interested to invest in social sector as the benefit flowing from this sector takes a long time and the profit is the minimum. The public sector is required to create an appropriate investment climate to attract the private sector investment into social development. Creation of right investment climate for private investment requires three things. These are: cost of investment, risks associated and the level of competitions in a particular activity (White, 2005). Countries wishing to encourage positive private investment decisions need to ensure a competitive market free from all types of imperfections. While growth depends on private investment, private investment depends on a sound infrastructure and adequate human capital, both of which depend on an adequate level of national investment. This paper intends to link up the social sector development of Odisha with the rate of growth of GSDP of the state for the period of fiscal stress and stability i.e from 1995-96 till 2012-13. The state witnessed a moderate growth during this period due to political stability and improved support from the national resource transfer agencies. The passing of FRBM Act made the government more accountable and rational in their expenditure programs. There is reduced emphasis on the economic services and it is expected that the social sector will gain out of this. The study intends to examine

- \square The status of social sector development in Odisha over the period;
- □ The emphasis on different components of social sector development during the same period
- $\hfill\square$ The impact of social sector allocations on the growth of GSDP of the state

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In conclusion it can be said that there exists a sense of withdrawl on the part of the state government from the investment scene and leave a bigger space to the private sector. The volume of investment (as the share of GSDP) in the social sector has been decreasing continuously which is a matter of concern for the future. The expectation was that after economic reform allocation to social sector will improve which is not happening. The composition of the social sector expenditure indicates low emphasis on education and health and more on water supply, sanitation, social welfare and nutrition. Continuation of this trend may be more due to political reasons which may harm in the long-run. The specific impact of social sector activities through econometric analysis reveals that among social sector only few activities are influencing the GSDP significantly. The impact of other variables is marginal indicating thereby the neglect of the government of these activities

Introduction

High Growth of GSDP of a state government indicates success of its development policy. In the Indian context, states having higher growth rate than growth rate of GDP are adjudged as better performing states. This is possible by adopting an appropriate strategy of investment in general, social and economic services. Since private sector is not interested to invest in social sector for obvious reasons the public sector is required to create an appropriate investment climate to attract the private sector investment into social sector development. States wishing to encourage positive private investment decisions need to ensure a competitive market free from all types of imperfections. While growth depends on private investment, the latter depends on a sound infrastructure and adequate human capital, both of which depend on an adequate level of national savings. In India, since the eighties, there is some improvement in the allocation to the social sector but the situation has not improved much compared to some other neighboring countries. (Joshi, 2005)

Social Sector and Economic Development

Social sectors have gained importance with the emergence of the concept of human development index and quality of life index. The status of social development in a region is reflected by the level of literacy, school enrolment ratio, infant mortality rate, life expectancy at birth, access to safe drinking water and sanitation as well as care for the poor and disadvantaged. Social sector promotes development of human capital and this is the most rewarding investment available to stimulate national development. Social sector creates social capital which is different from private capital. Social capital is the bond that links societies together and without which there is little opportunity for economic growth or individual well-being.

The real development challenge today and in the new millennium is the progress that countries must make in their social structures and human capital to achieve sustainable development. Policy makers and researchers have long recognized that economic development cannot happen without social change. For the most part, however, attention has continued to centre on the macroeconomic spheres of development. It was thought that economic growth would trickle down to those at the bottom end of the scale and thus bring about social change. However, we know that economic development alone is not enough and that productivity and social development depend as much on changing human factors as on economic policy. Research on the social side has largely focused on what to do about poverty and how to compensate the poor. Social ministries have been given the unenviable task of allocating funds and targeting anti-poverty programmes with the aim of helping the needy. This is not to say that compensatory programmes are not important and not needed, but they are not a substitute for policies and programmes that make fundamental structural changes in society which give people greater access to opportunities to better themselves through their own efforts. A pro-active and positive approach to social development aim for fundamental change in the underlying factors that determine social health and, in turn, economic development. Instead of incorporating a top-down approach, it is bottom up in its perspective, putting a human face on the determinants of social and economic development and the opportunities for their improvement. A rich social environment may be good both for individual wellbeing and for long run growth, but it may also subtract resources to private growth-enhancing activities (Vanin, 2001-02). Adequate social infrastructure raises productivity and lowers production costs, but it has to expand fast enough to accommodate growth. While the precise linkages between social infrastructure and development are yet to be firmly established, it is estimated that infrastructure capacity grows step by step with economic output.

The role of social infrastructure in economic development is complex and indirect. Hirschman argued that economic growth requires unbalanced path and social overhead capital is the starting point (Hirschman, 1958). In his 'Stages of Growth', Rostow held similar views and considered social overhead capital as one of the main pre-conditions for take-off (Rostow, 1960). The role of social overhead capital in accelerating economic growth and in enhancing public welfare is more pronounced in developing economies because the indivisibility in the social overhead capital has been identified as one of the main obstacles to the development of under-developed countries (Rosenstein-Rodan, 1943). The 1994 World Development Report had exclusively examined the status of infrastructure and divided it into two types. One is social infrastructure and the other is economic infrastructure. Social infrastructure includes education, health, water supply

and sanitation. Similarly economic infrastructure includes road, electricity, irrigation, communication and financial services. Adelman and Robinson (1989) point to the redistributive aspects of education, health and nutrition. Chenery goes a step further and argues that redistribution should precede growth. Such approaches towards social sectors ensure that the overall development strategy as well as sectoral strategies will be oriented towards improving capabilities of the masses which in turn has a favorable impact on growth. The WHO and some recent individual level studies have paid more attention to health and labour outcomes and consistently find a positive relationship between health and higher labour productivity and incomes. Most of the social sector items are the responsibility of the state government in the Indian federation. The centre intervenes in these items through centrally sponsored schemes. Proliferation of the centrally sponsored schemes created a situation of dependence of the states on the centre.

Scope and Objective

This paper intends to link up the social sector development of Odisha with the rate of growth of GSDP of the state for the period of fiscal stress and stability i.e from 1995-96 till 2012-13. The state witnessed moderate growth in this period due to political stability and improved support from the national resource transfer agencies. The passing of FRBM Act made the government more accountable and rational in their expenditure programs. There is reduced emphasis on the economic services and it is expected that the social sector will gain out of this. The study intends to examine

- The status of social sector development in Odisha over the period; and
- To assess the impact of social sector allocations on the growth of GSDP of the state.

Status of Social Sector Development in Odisha

Odisha continues to be one of the most backward states of the Indian Union since independence. Even after 62 years of planned development the position of the state has not changed much. For a long time, government investment in the economy was extremely poor due to low fiscal capacity of the state. Resource transfer to the state from the centre is not adequate enough to bring any radical change in the structure of the economy. Creation of adequate socio-economic infrastructure has become crucial for atracting private investment. Since economic reforms of the early 1990s and fiscal reforms in the state, the strategy of the government is to allow more private sector investment to the private sector in economic services. The government is now concentrating on social sector development to improve the quality of human and social capital. Table -1 below gives the trend of GSDP, total public expenditure and social sector expenditure of the state government for the period 1995-96 to 2012-13.

Table -1: Trend of GSDP, Total Public Expenditure and Social Sector Expenditure in Odisha

(Rupees in Crore)

Year	GSDP	Total Public Expenditure	Social Sector Expenditure	SSE as % GSDP
1995-96	29520	6013	1944	6.6
1996-97	29164	8319	2181	7.5
1997-98	35317	9370	2350	6.7
1998-99	39237	11002	2873	7.3
1999-00	42986	14043	4148	9.6
2000-01	43351	16207	3329	7.7
2001-02	46756	18585	3665	7.8
2002-03	49713	20784	3620	7.3
2003-04	61008	23026	3836	6.3
2004-05	77729	17336	4056	5.2
2005-06	85096	15746	4797	5.6
2006-07	101839	19346	4110	4.0
2007-08	129274	22844	7066	5.5
2008-09	148491	26923	9208	6.2
2009-10	163727	30541	8715	5.3
2010-11	194465	36051	10498	5.4
2011-12	215899	42105	11809	5.5
2012-13	258744	51837	15077	5.8

Source: RBI, Report on State Finances (Different Issues), Department of Economic Analysis and Policy, Mumbai and Government of Odisha: Odisha Budget At a Glance, (Different Issues). Finance Department, Bhubaneswar.

Growth of GSDP in the state from the year 2002-03 is very rapid due to all round development and increased investment. However, the state budget reflected a

conservative attitude by reducing the growth of public expenditure much below the GSDP growth. In the years of 2003-04 to 20005-06, there was a decelerating tendency in the total public expenditure. The trend of social sector expenditure has increased in absolute terms from Rs. 1944 crores in 95-96 to Rs.15077 crores in 1012 -13. This is more than seven times rise in a span of 18 years. In one year i.e in 2002-03 it decreased marginally. However, the growth is not at all satisfactory as percentage of GSDP. Upto 2002-03 the SSE expenditure was more than 7 percent of GSDP but thereafter it has remained at 5 to 6 percent till 2012-13. In the year 2006-07, it was reduced to the minimum of 4 percent only. Fig-1 presents the situation.



Fig-1: GSDP, Total Public Expenditure and Social Sector Expenditure in Odisha

Composition of Social Sector Expenditure

The exact coverage of social sector probably varies in the economic literature. The RBI report on state finances argues that social sector is larger than social services and includes activities under rural development, food storage and warehousing. But the state budget analysis uses social services and social sector as identical. The items included in the state budget are education, art and culture (EAC), health and family welfare (HFW), water supply, sanitation, housing and urban development(WSSH&UD), information and publicity(I&P), welfare of SCs, STs and OBCs(WSSO), social security and nutrition(SSN) and other social services. The trend of expenditure in different items of social expenditure is given in Table-2 below.

(Runees in Crore)

Table-2: Budgetary Allocation to Components of Social Sector in Odisha

							(Hapees	in crorej
Year	EAC	HFW	WSSH&UD	I&P	wsso	SSN	Others	Total
1995-96	945	266	189	6	166	303	12	1887
1996-97	1079	284	212	7	164	333	13	2092
1997-98	1211	308	251	8	169	322	13	2283
1998-99	1484	408	335	9	229	294	36	2784
1999-00	1939	432	343	9	233	1068	36	4050
2000-01	1769	459	314	10	223	411	72	3239
2001-02	1755	470	358	12	269	544	30	3407
2002-03	1902	498	385	13	267	531	25	3621
2003-04	1995	500	365	11	231	804	26	3836
2004-05	1997	630	391	12	242	761	22	4056
2005-06	2314	467	539	12	370	1066	28	4797
2006-07	2479	608	566	14	445	1295	32	5440
2007-08	3266	746	1247	15	487	1171	38	7059
2008-09	4501	937	1356	25	666	1675	46	9208
2009-10	5554	1171	1160	24	835	1600	42	10390
2010-11	6524	1272	1113	27	1211	2396	75	12707
2011-12	6909	1362	1105	25	1273	4232	88	14994
2012-13	8153	1933	1432	38	1805	3958	111	17627

Source-: RBI, Report on State Finances (Different Issues), Department of Economic Analysis and Policy, Mumbai and Government of Odisha : Odisha Budget At a Glance, (Different Issues). Finance Department, Bhubaneswar.

The allocation to different components of the social sector reveals interesting facts. Allocation to education, art and culture increased by eight times whereas the health and family welfare department is less fortunate with a seven fold increase. WSSO and SSN got the maximum benefit with 11 and 13 fold increase in favour of their allocation during the

same period. The growth of allocation to WSSH & UD is also around seven fold. Unusually high expenditure is noticed for 99-00 due to super cyclone in 14 districts of the state.

The rise in the allocation of WSSO and SSN to the extent of around 12 times is probably due to introduction of populist policies. This may create difficulties in quality improvement in the education and health activities which are very important for improving human capital of the state.

Social Sector Expenditure and GSDP Linkage: The Econometric Analysis

The Growth of GSDP of a state depends both on public and private investment. Of the two, the public investment plays a critical role to attract private investment. Public investment in core social infrastructure boosts the quality of human capital and provides incentive to the other sectors. To examine this linkage, an attempt is made to construct multiple linear regression models and deduce the relationship which may be very important for policy purposes. The relationship analysis is examined in two separate models. In model one , a regression relationship is established between GSDP as the dependent variable and Total Public Expenditure (TPE) and Social Sector Expenditure (SSE) as the independent variable. In model-2, the relationship is examined between GSDP and SSE only.

Overall Impact

The first model assumes that GSDP growth is dependent on TPE and SSE. The data used in the analysis is for the period 1995-96 to 2012-13 covering 18 years. The linear model can be expressed as

GSDP=a+b₁(TPE)+b₂(SSE)+ U₁ ------ (1)

The regression coefficients are estimated by using Gretl Econometrics package and the results are given below.

Model-1: OLS, using observations 1-18						
	Dependent v	ariable: GSDP				
Independent Variable	Coefficient	Std. Error	t-ratio	p-value		
const	-10823.5	7283.62	-1.4860	0.15799		
Total Public Expenditure	0.429454	0.995601	0.4314	0.67235		
Social Sector Expenditure	17.2307	3.18552	5.4091	0.00007 ***		
Mean dependent var	97350.89	S.D. depende	ent var	71383.61		
Sum squared resid	2 . 89e+09	S.E. of regre	ssion	13890.88		
R-squared	0.966588	Adjusted R-s	quared	0.962133		
F(2, 15)	216.9688	P-value(F)		8.50e-12		

Inferences made from the model are;

- ✤ GSDP is positively related to both TPE and SSE
- The regression coefficient associated with SSE is much higher than the coefficient associated with TPE. A one rupee increase in TPE and SSE leads to 0.4 rupees and 17 rupee rise in GSDP respectively.
- The overall significance of the regression model is satisfactory as the value of R² is
 0.966.
- Since the computed F-value is much higher, it can be said that the independent variables have significant influence in explaining the variation in GSDP.
- Out of the two partial regression coefficients, only the coefficient of SSE has passed the significance test and thus significantly explains variation in GSDP. The role of TPE in the model is not significant.

The second model intends to fit a two variable model with GSDP as the dependent and SSE as the independent. The equation to be estimated in this model can be presented as expressed:

The regression coefficients estimated and other results are given below. The inferences from this model are not much different from those the first model and the explanatory power is much better at 0.986

Model-2: OLS, using observations 1-18 Dependent variable: GSDP

Independent Variable	Coefficie	nt Std. Error	t-ratio p-value
Social Sector Exp 17.427	2 0.486472	2 35.8236	<0.00001 ***
Mean dependent var	97350.89	S.D. dependent var	71383.61
Sum squared resid	3.36e+09	S.E. of regression	14064.41
R-squared	0.986926	Adjusted R-squared	0.986926
F(1, 17)	1283.329	P-value(F)	1.87e-17

Specific Impact

Here each component of the Social sector is taken as a separate variable and a six variable model is fitted to the collected information. There are five independent variables with GSDP as the dependent variable. The equation of the model is

GSDP=a+b₁(EAC)+b₂(HFW)+b₃(WSSH UD)+b₄(WSSO)+ b₅ (WSSO)+ U₁ ------ (1)

The regression coefficients estimated and the other results are given below.

Model-3: OLS, using observations 1-18 Dependent variable: GSDP

Independent Variables	Coefficient	Std. Error	t-ratio	p-value	
Const	-2054.93	7057.84	-0.2912	0.77590	
EAC	6.49	8.22671	0.7889	0.44548	
HFW	30.693	35.0482	0.8757	0.39836	
WSSH_UD	49.1888	13.5935	3.6186	0.00352	***
WSSO	17.6043	34.3525	0.5125	0.61763	
SSN	13.1306	6.56209	2.0010	0.06854	*
Mean dependent var	97350.89	S.D. depend	ent var	71383.61	
Sum squared resid	1.14e+09	S.E. of regre	ssion	9732.404	
R-squared	0.986879	Adjusted R-s	quared	0.981412	
F(5, 12)	180.5092	P-value(F)		7.36e-11	

- GSDP is positively related to all the five variables.
- The regression coefficient associated with water supply, sanitation, housing and urban development has the highest value followed by health and family welfare. The coefficient value of education, art and culture is the lowest.
- All the five variables taken together explain 98.6 percent of the variation in GSDP which is very satisfactory.
- Since the computed F-value is much higher, it can be said that the independent variables have significant influence in explaining the variation in GSDP.
- Out of the five partial regression coefficients only two i.e the coefficients WSSH&UD and SSN are significant. This means, the impact of education, health and welfare of SC, ST and OBC has marginal influence on GSDP.

Conclusions

The following broad conclusions can be drawn from the study

1. There exists a sense of withdrawal on the part of the state government from the investment scene leaving a bigger space to the private sector. The volume of investment (as the share of GSDP) in the social sector has been decreasing continuously which is a matter of concern for the future. The expectation that after economic reforms, allocation to social sector will improve is not fulfilled.

- 2. The composition of the social sector expenditure indicates low emphasis on education and health and more on water supply, sanitation and social welfare and nutrition. Continuation of this may be more due to political reasons which may harm in the longrun.
- 3. The specific impact of social sector activities through econometric analysis reveals that among social sector only a few activities are influencing the GSDP significantly. The impact of other variables is marginal indicating thereby the neglect of the government of these activities.

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Mining and the Economy: An Empirical Inquest with Special Reference to Odisha

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The prevailing process of mining operations gives more importance to revenue generation by neglecting its employment aspect. It was also observed that there is a lack of value addition of the minerals produced in the State. A fixed proportion of the value of minerals produced need to be invested in physical capital, so that the State will maintain the total capital stock – natural plus physical capital. There was discrimination in fixing royalty in different states in India.

Key Words: mining, economic growth, natural resources, investment, foreign direct investment.

JEL Classification: D92, E22, E62, F21, F43, L71, N5, O13, O47.

It is commonly accepted that the economies endowed with natural resources are expected to grow faster. But it has been rejected by Sachs and Warner (1995). Empirically, it was found that economic growth rate of the resource poor countries such as Singapore, South Korea, Hong Kong and Taiwan was much higher than that of resource rich countries like Srilanka, the Philippines and Burma. Similarly, sub-Saharan Africa, which is rich in minerals, timber, and land, has suffered negative economic growth rates since the mid-196os (Vincent et al 1997). On the other hand, an economy may grow by depleting more and more natural resources such as minerals, water and land; but over exploitation of such resources will eventually end up with its sustainability risk (Jansson et al 1994; Heywood 1995; Postel et al 1996; Houghton et al 1996; Vitousek et al 1997).

1. Natural Resources, Export Earning, Investment and Economic Growth: A Literature Review

It has been observed that the export earnings of resource rich countries have fluctuated. They have mostly declined over time. This might be due to fluctuating prices of

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resource-based commodities (Smith 1979) or imperfect market in terms of importers control over resource market¹ (Vincent 1997).

Natural resources as a form of capital (Pearce and Turner 1990), if depleted, must be either regenerated or substituted, if countries are to maintain or expand their assets² and thus maintain a constant or rising trend of economic growth (Hartwick 1977; Dasgupta and Heal 1979; Solow 1986; Vincent 1997). To ensure this, there must be enough investment in reproducible capital to compensate resource degradation (Vincent 1997), otherwise, in the long run, the tempo of economic growth cannot be maintained. Similarly, it has been argued that commodity export earning is the potential source of funds for investment. Even temporary price booms provide windfalls that, if invested, can enhance future growth (Deaton 1999 cited in Stijns 2000).

From the above it is observed that there are different schools of thoughts on natural resources and economic growth. However, there is little empirical evidence of how natural resources and economic growth behave in a resource rich state, i.e. Odisha. The present paper is an attempt to ascertain the empirical link.

2. Minerals and Economic Growth

Odisha has acquired a unique position in the Mineral Map of India. The state tops in a few rare and valuable minerals. As per 1999-2000 estimation, mineral reserve of the State in respect of Chromite, Nickel ore, Graphite, Bauxite, Iron Ore, Manganese ore and Coal is about 98.40 per cent, 91.80 per cent, 71.00 per cent, 59.50 per cent, 32.90 per cent, 67.60 per cent and 24.80 per cent respectively, of the total stock of such minerals in India.

Around thirty varieties of minerals are being produced in the State. Out of these, the following minerals are important in terms of generating revenue towards the State economy: Coal, Chromite, Iron ore, Bauxite, Dolomite and Limestone, and Manganese. The district wise mineral produce in Odisha is given in the Map.

During 2002-03, there were total 313 working mines over an area of 78,728 hectare in the State. Out of which, Coal mines constitute 26 nos., 89 mines of metalic minerals including Iron ore, Bauxite, Chromite and Manganese, and the remaining are non-metalic mines. Out of the total, coal alone constitutes about eight percent of working mines with 22.25 per cent of area, 36.99 per cent of workers, more than 65 per cent of output and about 70 per cent of revenue. Similarly, Iron ore constitutes about 15 per cent of the total number of mines, 20 per cent of the area, one-fourth of the total number of workers, 20.84 per cent of output, 11.29 per cent of the total value produced and 4.79 per cent of the total mineral revenue of Odisha.

^{1.} It is worth noting that, resource market (price) does ignore the 'user cost' of resource extraction, and hence it becomes artificially less scarce. Consequently, it is under valued.

^{2.} Here asset includes natural assets, physical assets and human assets.

2.1 Value of minerals produced and value addition

With regard to the value of mineral production in major states in India, in Odisha it is as high as Rs. 6149 crore, which constitutes 10.21 per cent of the total value of mineral production in the country. Moreover, unlike other states, the percentage share of the value of mineral production has been increasing in Odisha over the years (Fig-1). In spite of having a major share of the total stock of minerals and comparatively higher rate of its exploitation

in terms of quantity and value, Odisha is the poorest among the poor states in India. Rather, a section of the population, especially, those living in and around the natural resources is being marginalised (Jena and Pandey 2004). One of the important factors responsible for this may be the low value addition of the natural resources being produced in the State.



Figure - 1

It is commonly understood that, a poor state like Odisha having rich minerals needs more and more value addition of its resources within the State itself. It will not only create direct and indirect employment opportunities, but also ensure the additional capital investment in the State. In turn, the additional capital investment through value



addition will compensate the depletion of the natural capital, such as minerals. Indeed, the rate of compensation depends on both the extent of mineral depletion, and the volume of additional capital investment. However, the value addition with respect to the output in the state is found to be very poor (Govt. of India 2002). During the winter session 2006 of the Odisha Assembly, the Minister of Mines has admitted that more than 50 per cent of the minerals produced have been exported from Odisha without value addition.

1.1 Item wise quantity, value, workers and revenue from mining sector

It is found that there has been rapid growth in the quantity, value and revenue from

mineral production especially of Coal, Chromite, Iron ore, Bauxite and Manganese ore over the years. The rate of this growth is found to be higher in the post reform period than in the 1980s. One of the important reasons of such growth especially in post reform period is the liberalisation policy followed at both the Union and the State levels, such that corporate sector especially, a number of multinational companies have entered into the sector. However, it is also found that the total revenue from minerals as a percentage of the total value produced is limited to around 13 per cent. It can also be observed that Coal alone constitutes around two-third of the total minerals in terms of quantity, value and revenue/royalty. Therefore, a detailed analysis of Coal royalty over the years has been made in the following section.

		Output in '000 MT							Annual compound growth rate					
Mineral	1976	1981	1990- 91	1991- 92	2000- 01	2002- 03	2004- 05(P)	1976 to 1981	1981 to 1990- 91	1991- 92 to 2000- 01	2000- 01 to 2002- 03	2000- 01 to 2004- 05 (P)		
Coal	2106	3155.67	15273	20708	44813	52031	66814	8.42	19.15	8.96	7.75	10.50		
Bauxite		-	1854	1794	2906	3605	4912	NA	NA	5.51	11.38	14.02		
Chromite	389	298.416	910	982	1874	3287	3423	-5.16	13.19	7.44	32.44	16.25		
Iron ore	7785	5075.66	8388	8844	14350	22257	46063	-8.20	5.74	5.53	24.54	33.85		
Lead & Zink		7.913	133	136	74	18		NA	36.83	-6.54	-50.68	NA		
Manganese ore	694	458.102	552	620	550	632	1072	-7.97	2.09	-1.32	7.20	18.16		
Dolomite	705	633.198	1221	1402	1235	1152		-2.13	7.57	-1.40	-3.42	NA		
Graphite	21	46.232	57	73	81	53		17.10	2.35	1.16	-19.11	NA		
Limestone	3144	2958.260	2199	2108	725	853		-1.21	-3.24	-11.18	8.47	NA		
ALL (Odisha)	15135	13836	31077	37204	68867	87352	127048	-1.78	9.41	7.08	12.62	16.54		

Table-1: Output of important minerals in Odisha

Note: Bulk production of Bauxite in Odisha started in 1986. (Ref: Mineral Statistics 1991-92, p-7)

For 'Bauxite', the reference year 2001-02 has been taken in stead of 2002-03 as 2002-03 was not a normal year. Sources: For 2000-01: Statistical Abstract 2002, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar; For 1990-91: Mineral Statistics 1990, pp:22-24; 29-30; 31-38, Govt. of Odisha, Directorate of Mines, Bhubaneswar; For 2002-03: Statistical Abstract, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar; For 1981: Statistical Abstract 1985, 2005, page-93, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar.

			Figur	es in Rs.	Lakh			Annual compound growth rate			
Mineral	1976	1981	1990- 91	1991- 92	2000- 01	2002 -03	2004- 05(P)	1976 to 1981	1981 to 1990-91	1991- 92 to 2000- 01	
Coal	NA	82	437	3416	25000	NA	NA	NA	20.43	24.75	
Bauxite	NA	0.3	229	182	1217	NA	NA	NA	109.07	23.51	
Chromite	NA	37	325	363	4014	NA	NA	NA	27.31	30.61	
Iron ore	NA	110	233	207	1726	NA	NA	NA	8.70	26.57	
Lead & Zink	NA	-	24	25	28	NA	NA	NA	NA	1.27	
Manganese ore	NA	34	34	32	742	NA	NA	NA	0.00	41.81	
Limestone & Dolomite	NA	71	253	247	1144	NA	NA	NA	15.16	18.57	
Graphite	NA	3	7	10	32	NA	NA	NA	9.87	13.80	
Limestone	NA	-	59	50	196	NA	NA	NA	NA	16.39	
ALL (Odisha)	431	584	2272	6786	36041	44353	NA	NA	16.29	20.39	

Table-2: Revenue from important minerals in Odisha

Note: Bulk production of Bauxite in Odisha started in 1986. (Ref: Mineral Statistics 1991-92, p-7)

For 'Bauxite', the reference year 2001-02 has been taken in stead of 2002-03 as 2002-03 was not an normal year.

Sources: For 2000-01: Statistical Abstract 2002, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar;

For 1990-91: Mineral Statistics 1990, pp:22-24; 29-30; 31-38, Govt. of Odisha, Directorate of Mines, Bhubaneswar;

For 2002-03: Statistical Abstract, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar; For 1981: Statistical Abstract 1985, 2005, page-93, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar.

In spite of acceleration in the growth of quantity and value, and revenue from mining sector, the employment opportunity in this sector has been squeezed. The total direct employment in this sector was 56538 in 1981, which has been reduced to 44167 in 2002-03 (Table-3). The annual exponential growth rate of workers during 1980s was 2.06 per cent. But, unfortunately, during 1990s it has drastically come down with a negative growth rate of (-) 2.77 per cent. This may be due to the capital intensive method of mining operation, which is being followed by the private companies especially the MNCs. Consequently, it affects the life and livelihood of people living around the mine site as the very process has not only reduced the employment opportunities, but also disrupted the environment and the habitat of people living there (Dash 2004; MMP 2003; Samantara 2002; Singh 1997; Sing 1999; Shiva undated).

			Figu	res in nos.		
Mineral	1976	1981	1990-91	1991-92	2000-01	2002-03
Coal	11086	11512	18182	18417	19583	17657
Bauxite	-	-	404	400	603	458
Chromite	6161	4915	8489	9902	6743	4786
Iron ore	13775	12510	16027	15582	13255	10524
Lead & Zink	-	230	540	7383	478	326
Manganese ore	8257	7372	7968	530	4081	3660
Dolomite	-	1263	978	960	123	124
Graphite	-	2179	3173	2888	1242	700
Limestone	-	12212	1206	1372	339	241
ALL (Odisha)	51516	56538	66595	68886	52937	44167

Table-3: Workers employed in important minerals in Odisha

Note: Bulk production of Bauxite in Odisha started in 1986. (Ref: Mineral Statistics 1991-92, p-7) For 'Bauxite', the reference year 2001-02 has been taken in stead of 2002-03 as 2002-03 was not an normal year.

Sources: For 2000-01: Statistical Abstract 2002, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar;

For 1990-91: Mineral Statistics 1990, pp:22-24; 29-30; 31-38, Govt. of Odisha, Directorate of Mines, Bhubaneswar;

For 2002-03: Statistical Abstract, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar; For 1981: Statistical Abstract 1985, 2005, page-93, Govt. of Odisha, Directorate of Economics and Statistics, Bhubaneswar.

1. Contribution to State income

The mining and metallurgical sector is vital to the development and economic growth of Odisha. The rich minerals available in the State are not only essential for

developmental activities and many industrial processes, but it is also a valuable source of foreign exchange earnings. The contribution of mining sector to NSDP and primary sector at constant (1993-94) price (in %) has been increasing over the years (Fig-2).



This contribution was merely 0.59 per cent and 0.83 per cent to NSDP and primary sector respectively during 1950-51, which has increased to 1.77 per cent and 2.87 per cent, respectively, in 1981-82, 3.53 per cent and 7.63 per cent in 1990-91, and further to 7.45 per cent and 19.19 per cent in 2000-01. During 2002-03, this sector contributes about one-fourth to primary sector and nine per cent to total NSDP in the State

Mining and quarrying, the second largest contributor to NSDP from primary sector next to agriculture has been accelerating its growth rate as well as percentage share of NSDP. The annual exponential growth rate of income from this broad economic activity has increased from 11.42 per cent during 1980s to 13.53 per cent during 1990s (Table-.4).

Period	Agr. & Animal Husbandry	Forestry & Logging	Fishing	Mining & Quarrying	Total Primary Sector
1951-52 to 1960-61	(-) 1.07	(-) 0.19	(-) 15.96	6.96	(-) 1.00
	(R ² =0.0986)	(R ² =0.0007)	(R ² =0.9085)	(R²=0.8348)	(R ² =0.1128)
1961-62 to 1970-71	3.25	4.11	15.24	4.56	3.66
	(R ² =0.6967)	(R²=0.1486)	(R ² =0.9412)	(R²=0.8092)	(R ² =0.6195)
1971-72 to 1980-81	1.77	1.48	7.11	4.04	1.86
	(R ² =0.1562)	(R²=0.3492)	(R ² =0.9519)	(R²=0.7818)	(R ² =0.2581)
1981-82 to 1990-91	1.38	(-) 3.40	9.38	11.42	1.37
	(R ² =0.0903)	(R ² =0.7838)	(R ² =0.9721)	(R²=0.8915)	(R ² =0.1228)
1991-92 to 2000-01	(-) 0.28	1.01	6.00	13.53	1.69
	(R ² =0.0112)	(R²=0.1981)	(R ² =0.7336)	(R²=0.9769)	(R²=0.4133)
1981-82 to 2000-01	(-) 0.07	(-) 2.67	9.06	12.86	0.90
	(R ² =0.0012)	(R ² =0.7186)	(R ² =0.9621)	(R ² =0.9832)	(R ² =0.2610)
1951-52 to 2000-01	1.56	0.61	5.64	6.44	1.79
	(R²=0.7468)	(R²=0.0739)	(R ² =0.7397)	(R²=0.9288)	(R²=0.8347)

Table-4: Annual exponential growth rate of primary sector NSDP by kind of economic activity at factor cost at constant (1993-94) prices - In Rs. Lakh: 1951-52 to 2000-01

Note: Figures in parentheses show the respective R² value.

Source: 1. State Domestic Product of Odisha: From 1950-51 to 2002-03 (1993-94 Base), Directorate of Economics and Statistics, Government Odisha, Bhubaneswar.

2. Statistical Abstract of Odisha-2005, Directorate of Economics and Statistics, Government Odisha, Bhubaneswar.

Similarly, the contribution of the mining sector to total State's own non-tax revenue has been increasing over the years (Fig-3). In fact, the annual rate of this increase is found to be much higher in 1990s, as compared to that in 1980s. The mining royalty as percentage to total State's own non-tax revenue was only 4.02 per cent in 1980-81. It has increased to 11.30 per cent in 1990-91 and further to more than half of the State's total own non-tax revenue (i.e. 52.58 per cent) in 2000-01. Moreover, it has been found that there is a decline

in the overall growth rate of the State's own non-tax revenue during 1990s, as compared to that in 1980s; whereas the rate of growth of revenue from mining sector has increased. During 1990s, the annual rate growth of the State's own non-tax revenue was 8.69 per cent; whereas it was 18.84 per cent in case of mining revenue/royalty.





From the above, it is evident that the mining sector has not only been growing very fast, but also is vital to the Government in terms of revenue earning, though the value addition is much less.

3.1 Discrimination in fixing coal royalty

It has already been mentioned that the mineral royalty has been increasing over the years. However, the royalty from Coal constitutes more than two-third of the total mineral royalty of the State. But the State is being neglected due to the royalty rate on Coal fixed by the Government of India from time to time.

There are seven grades (Grade-A, B. C, D, E, F and G) of Coal available in India. Of these, Odisha does not have Grade-A Coal, i.e. cooking coal. It has been found that F and G grade coal (power grade³) constitute 93.5 per cent of the total production. In 1971, the royalty on the best quality coal (selected grade) was Rs. 1.90 per ton whereas; it was Rs. 1.70 on the lowest grade. This shows that the royalty on the highest grade coal was 11.76 per cent more than that on the lowest grade. But this gap between the highest and the lowest grade royalty rate has increased to 160 per cent with respect to 1981 revised rate, 380 per cent as per 1991 revised rate, 290 per cent in 1994 and 300 per cent with respect to 2002 revised rates. This also shows a sluggish growth rate of royalty on F and G grade coal, as compared to the much higher royalty growth rate in case of A grade coal. On the other

3. The coal available in Odisha is being used mostly for power generation.

hand, in case of Andhra Pradesh, the royalty has been fixed on an average Rs. 90 per ton irrespective of the coal gradation as per 2002 revised rates. In fact, a large share of coal in Andhra Pradesh belongs to D, E, F and G group. Had it been fixed on an average, considering the availability of categories of coal, it would not have been more than Rs. 75 per ton. It is one of the many examples of discrimination with respect to mining in Odisha. In spite of such discrimination, the revenue from the mining sector in Odisha has been increasing. It is because of the increase in the exploitation of minerals (as mentioned earlier).

3.2 Export

As mentioned earlier, more than 50 per cent of minerals are being exported to foreign countries without value addition. However, it is found that the export value of minerals and mineral based (metallurgical) items as a percentage to total export value from Odisha to foreign countries is 90.26 per cent in 2003-04, which is the most important source of foreign exchange earning. However, it is to be mentioned here that the Odisha Mining Corporation usually follows the long-term contract for export in the international market, for which the Corporation has not been able to avail the benefit from the ever increasing international market prices, especially, of Iron ore.

4. Private and Foreign Direct Investment (FDI) in Mining Sector

In the 1980s, Odisha got the attention of the world because of starvation death and selling of children in Kalahandi and other districts. But in the 1990s, the attention has shifted from these human stories to financial matters. Odisha has occupied an important place on the investment map of India with a long list of investment proposals, mostly during 1995-96; the state has received the largest amount of private investment in India, both foreign and domestic. According to the 11th *Quarterly Survey of Projects Investment* conducted by 'Projects Today' (http://ori.nic.in/diOdisha/fdiOdisha.htm), Odisha is ranked sixth in total outstanding investment in the country. As on 30th June 2003, Odisha had 205 projects worth of Rs. 112261 crore in various stages of planning and implementation. The projects owned by the private sector in the State are to the tune of 62 per cent, while that of the government is 38 per cent. The participation by the foreign companies in various projects in Odisha constitutes about one-third of the overall investment and about 54 per cent of the investment is by the private sector.

Particularly, from August 1991 to September 2003, total 139 projects in Odisha with either 'Foreign Direct Investment' (FDI) or 'Foreign Technology Cases' (FTC) have been approved by government (Table-5). The total cost of these projects was estimated at Rs. 155619.13 million, which consists of Rs. 82293.15 million (52.88 per cent) FDI, Rs. 65392.20 million (42.02 per cent) private investment and merely Rs. 7933.78 million (5.10 per cent) public sector investment (Table-6). Around 35 per cent of the projects (49 nos.), which were approved for mining and mineral based industries, account for more than 92 per cent of the total approved project costs. The proportion of the total foreign equities and the total private investments in the mining and mineral based projects, as a whole, was 91 per cent and 93.68 per cent, respectively.

Table-5

Projects with 'Foreign Direct Investment' (FDI) and 'Foreign Technology Cases' (FTCs) in Odisha approved by government from August 1991 to September 2003

	Project	s with FDI	Projects	with FTCs	Total F	Projects
Categories of Projects	In Nos.	% of respective Row Total	In Nos.	% of respective Row Total	In Nos.	% of respectiv e Row Total
Mining & Mineral based Projects	35 (38.90)	71.43	14 (28.57)	28.57	49 (35.25)	100.00
Other Projects	55 (61.11)	61.11	35 (71.43)	38.89	90 (64.75)	100.00
All Projects	90 (100.00)	64.75	49 (100.00)	35.25	139 (100.00)	100.00

Note: Figures in parentheses show percentage of respective column total Source: Calculated from http://ori.nic.in/diOdisha/fdiOdisha.htm

Table-6

Investment with 'Foreign Direct Investment' (FDI) projects approved by government in Odisha from August 1991 to September 2003 (in Rs. million)

				Components of	f Investmer	nt		
Catagorian	Foreig	n Equity	Priva	ate Sect. aslment	Public Se	ect. Investment	Total Ir	nvestment
of Projects	In Rs million	% of respective Total Investment	In Rs million	% of respective Total Investment	In Rs million	% of respective Total Investment	In Rs million	% of respective Total Investment
Mining & Mineral Based projects	74890.62 (91.00)	51.98	61260.08 (93.68)	42.52	7933.78 (100.00)	5.51	144084.48 (92.59)	100.00
Other Projects	7402.53 (9.00)	64.18	4132.12 (6.32)	35.82	-	-	11534.65 (7.41)	100.00
All Projects	82293.15 (100.00)	52.88	65392.2 (100.00)	42.02	7933.78 (100.00)	5.10	155619.13 (100.00)	100.00

Note: Figures in parentheses show percentage of respective column total. Source: Calculated from http://ori.nic.in/diOdisha/fdiOdisha.htm

Companies like Hindalco (Birla group), Alcan (Canada), Vedanta (UK), BHP Billiton (UK), Rio Tinto (UK) etc. are entering into the State for Bauxite project. Similarly, Tisco, BHP Billiton (UK), Vedanta/ Sterlite, Posco (South Korea), Rio Tinto (UK), Bhusan, Jindal,

Mittal, Essar companies are being entered into the State for Iron ore projects. All these projects would displace nearly 2.5 lakh families or 10,00,000 people (Sarengi unpublished). Recently the state government has declared a state level resettlement policy after Kalinga Nagar firing⁴. As per provision the 'consultation', not 'consent' of gramsabha is binding, but it is silent about the amendment of Odisha Gram Panchayat Act in the same light. It speaks about direct negotiation by land losers with the company, but again with certain bureaucratic procedures. It has no provision for land against land or at least job against land for land losers; also no provision for landless families and for old oustees. The provisions in the policy never deny that police force would be used in any case. The Kalinga Nagar and Maikanch⁵ firing and many more of the kind may happen in future.

As mentioned earlier, Odisha has more than 98 per cent of India's Chromite, 60 per cent of Bauxite and 24 per cent of Iron ore. No other State has such abundance of natural resources with port facilities. The multinational and private houses have no other state in India to go to other than Odisha, to set up steel, aluminium and coal-based power projects. Besides, the State is providing unusually huge subsidies to investors in different forms such as guarantees, tax concessions and investment subsidy. Moreover, the abundance of cheap labour makes it an investor-friendly state.

Besides, the economy of Odisha has always faced the problem of 'capital flight', as the returns of the industry and the service sectors went to other states and were not ploughed back into the State. This problem, especially, during post-reform period is further going to be accentuated as these new projects have substantial investments by multinational companies and 'capital flight' will not be only restricted to other states within India, but will also move out of the country. Thus, the long-term economic benefits of these investments are very much in doubt.

Moreover, new power projects in Odisha have been coming up. But Odisha is already a power surplus state in India, even though more than half of its population do not have access to electricity. However, power as a commodity that cannot be stored, has to be distributed immediately. As the present national grid system is not suited to import power from Odisha, it makes no sense to have more plants to generate extra power without being able to use it. There are adverse environmental consequences as well, which has been analysed in the following section.

5. Forest Area Diverted to Non-Forest Use

From 1947 to October 1980, total 1,99,348 hectare of forest land had been diverted for other development projects. Similarly, from December 1980 to 2004-05, total 34,264.3

^{4.} The police shot dead 12 tribals on January 2, 2006 at Kalinga Nagar, Odisha, who along with hundred others were protesting against the beginning of constriction work by Tata-Steel. A policeman was also killed in the clash.

^{5.} Three tribal people were shot and killed by police in Maikanck villahe of Rayagada district on 16th December 2000.

hectare of forest land has been deforested for different projects such as mining, industry, irrigation, railways, etc. During 1980 and 1991, the extent of deforestation, due to the above projects (88 nos.), was around 13,733 hectare. This deforestation has increased to 17,255 hectare during 1992 and 2001 due to 150 projects. Interestingly, the percentage of deforestation due to mining, and power and transmission has been increasing over the years.

The percentage of deforestation due to mining when compared to the total projects was 11.20 per cent during 1980 an 1991, which has increased to 45.75 per cent during 1992 and 2001, and further increased to 48.94 per cent during 202-03 and 2004-05. It shows that mining alone is responsible for nearly 50 per cent of the total deforestation in the State. Besides, as on first January 1983, a total of 74,383 hectare of forest land was encroached. The extent of this encroached forest land has increased to 78,505 hectare by 2003-04 (PCCF 1981-1990; PCCF 2003-04). In turn, the devastation caused to the economy by continued and excessive deforestation is indeed enormous. Deforestation is responsible for greater frequencies and intensities of floods, soil erosion, heavy siltation of rivers, and for the frequent changes in climatic conditions. How the deforestation is affecting the life and livelihood of people is explained in the last sub-section of this section.

6. Environmental Impact of Mining in Odisha:

Mining operations frequently involve a high degree of environmental impacts, which can extend well beyond the extent of mineralised areas, depending on the nature of the operation being followed. The impacts of a mining operation commence with exploration activities, extend up through extraction and processing of minerals, and it may continue well beyond post-closure of the operation. The nature and extent of impacts vary during various stages of the project life.

Environmental degradation in Odisha, especially in the mining areas is caused by methods of mining, ore beneficiation, soil/sub-soil/slope destabilisation, pollution of water resources, air pollution, noise pollution, harm to vegetation and solid waste.

6.1 Opencast mining

The opencast mining system is mostly being followed in all the mines except in fourteen coal mines, i.e. five in Talcher coalfields and nine in Ibb valley coalfields in the State. Opencast coal mines cover 60 per cent of the total coal mining area in the State.

The opencast mining on hills has to be governed by well organised bench systems and on the plains by well planned surface trenches. The size, specifications and height/ depth of the benches and trenches are to be governed by Mines Act, 1952 and Metalliferous Mines Regulations, 1961. The quarry owners rarely conform to the bench and trench specifications layed down in the Acts. Except Damanjodi and few others such as TISCO mines at Joda and the Bolani mine near Bolani, most of the mines do not have systematic quarrying procedures. One can observe the gross violation of the mines and environment related Acts⁶ in these sites. Often overburden and top soil are pushed down slope damaging vegetation, altering course of streams/*nalas* and blocking channels due to sliding of the volumes of the materials. Besides, the lose materials are washed by rain water into the low-lying lands, are spread over croplands and add particulates and chemical implies to surface water bodies.

Moreover, trench cutting results in deforestation, loss of topsoil, surface water pollution, lowering of water table and encroachment of adjacent productive areas by dumping of tailing. This is common to all the non-hilly tracts where mining is being undertaken on the surface, e.g. Coal fields of Ibb and Talcher, Manganese areas of Banei-Keonjhar belt, Limestone belt of Biramitrapur, Graphite areas of south and west Odisha.

6.2 Underground mining

As mentioned above, fourteen coal mines are underground by operation. Talcher underground mines are spread under the Talcher and surrounding township areas over 5161.34 hectare. The normal practice laid down in mining related activities is to cut an underground trench and fill it duly. The people in Talcher live in constant fear that some day their houses and land will subside or sink creating water bodies or low land, which may displace them altogether. It addition, it has been observed after discussion that draining out of the mine water, reduction in surface soil moisture and lowering of ground water table leads to drying up of wells.

6.3 Mechanised mines and the environment

Mechanisation not only reduces the employment opportunities in the mining operation, but also creates adverse environmental impacts. It enhances speed of despoliation, causes noise pollution, and contributes a lot of dust (SPM) and auto exhaust into the atmosphere. Mechanisation also enhances the incident of fire accidents and disasters⁷ and causes optical irritation.

The adverse effects of mechanised mines in the Iron ore belt at Joda and Bolani are more prominent. Anyone approaching Joda east iron mine, Bolani mines, Ibb and Talcher coalfields will be beset with dust and noise.

6.4 Air and water pollution, and climate change

The actual rainfall in mineral producing districts, especially, in the non-coastal regions has been well below the normal rainfall. Similarly, the temperature and the extent of air pollution

The Mines and Minerals (Development and Regulation) Act, 1957; the Mines Act, 1952; the Mineral Conservation and Development Rules, 1988; the Environment Protection (Forest Conservation) Act, 1980 (Amended in May 1992);; the Environment Protection Act and Rules, 1986; and the Environmental Impact Assessment Notification, 1994.

^{7.} Disaster: where more than five people die due to fire accident.

were found to be higher in the monitoring points located in the proximity of the mining areas. It has been studied that Odisha is already emitting one per cent of the world's green house gases. This will rise to five per cent by 2008 (Dash 2004). In addition, Odisha's industrialisation, especially, mineral based industries will release toxic and potent global warming agents equivalent to eight million ton of carbon dioxide emission.

6.5 Impact on natural vegetation and agricultural crops

The Talcher-Anugul industrial area is one of the warmest spots in India due to high level of pollution. The soil in the area is generally loamy-sand with low nitrogen content and is slightly acidic in nature. Potassium, Phosphorus and sodium contents are high in the areas. Thorny and hardy species are more prevalent in the area as the natural soil-content is unfit for agricultural crops. Disappearance of wild and indigenous species is also an indication of environmental stress.

Conclusion

From the above analysis of mining operation in Odisha, the following important things can be concluded: (i) the prevailing process of mining operation gives more importance to revenue generation by neglecting its employment aspect; (ii) value addition of the minerals produced in the State need to be increased; (iii) a fixed proportion of the value of minerals produced need to be invested in physical capital, so that the State will maintain the total capital stock – natural plus physical capital; (iv) subsidy to the mine owners needs to be reduced; (v) implementation of environment and mines related Acts need to be more strict, any laxity needs to punished; (vi) project affected households need to be ensured with sustainable livelihood opportunities, which would be suitable to them; and (vii) there should be no discrimination in fixing royalty in different states in India.

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Is sustainable mining possible in Odisha? An analysis of Keonjhar district of Odisha Minati Sahoo'

The Present paper attempts to analyze the sustainability of mining as a source of livelihood for the inhabitants of the Keonjhar district in Odisha. It highlights the contribution of mining sector to the development of the economy and analyzes the welfare of people due to development generated by mining in Keonjhar district. Attempt has also been made to assess the large scale depletion of mineral resources and to exmine some of the recent issues relating to illegal mining so as to indicate the feasibility of sustainable mining in the district. It has been found that though mining is substantially contributing to the development of Keonjhar district, it has not benefited people much in terms of direct employment. Being a mineral rich district, though it enjoys a higher income index, it suffers a very low health index compared to the average index of Odisha. Confronting with the allegation of overproduction and environmental degradation, sustainability of mining industry in Keonjhar district is a serious issue. Therefore judicious regulatory and enforcement mechanisms should be taken up to minimize the negative effects of mining industry. A focused approach is the need of the hour if sustainability issues for mining and metals industry are to be addressed.

I. Introduction

According to conventional wisdom, countries that possess rich mineral deposits are fortunate. Such deposits are assets and so are parts of a country's natural capital. Generally, the more capital a country possesses, the greater its output and the higher its per capita income. This is not necessarily the case, however, for natural capital in the form of mineral deposits. As long as such deposits lie dormant in the ground, they remain unproductive. For their potential to be realized, mineral deposits have to be extracted. So, according to the traditional view, mining plays an important role in the development process by converting mineral resources into a form of capital that contributes to a nation's output (Davis and Tilton, 2005). Thus exploration of mineral resources is an essential condition for successful economic development of an economy (Bogdetsky et al., 2005; Ofosu-Mensah, 2011). It generates employment opportunities for the people, income for the state

exchequer and foreign exchange for the mineral producing country (Akabzaa and Darimani, 2001; Bogdetsky et al., 2005; Ofosu-Mensah, 2011). A number of studies are there which substantiate the argument that mining is an important economic activity and provides a major structure upon which development of any economy gifted with rich natural resources rests (Ejdemo and Soderholm, 2011;Ye, 2008; Brunnschweiler, 2006; McMohan and Remy, 2001; Stilwell et al., 2000; Clements et al., 1996). Mining projects have also generated non-mining related employment through estimated multiplier effects which have often been more than direct employment created by new mines (McMohan and Remy, 2001).

Odisha is a very rich mineral bearing state of India. It is the leading producer of chromites, graphite, bauxite, manganese ore, iron ore, sillimanite, quartzite, pyroxenite and dolomite. In terms of mineral deposits and production, the state occupies a prominent position in the country (Economic Survey of Odisha, 2012-13) and has attained the distinction of being the largest mineral producing state in the country. A robust performance of the metals and mining sector, in terms of production capacity, actual production and value has resulted in a significant growth of the state's average GSDP (IBEF, 2010). The mining and quarrying sector has been contributing about 7.5 percent to the state's 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. The government of Odisha earned Rs. 1029 million in 2010-11 as royalty collection in minerals (Indian Bureau of Mines, 2013 a). 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). The investment share of the state's total outstanding investments in the mining sector is presently such that it makes Odisha the fifteenth highest recipient of FDI among all Indian states (Misra and Hota, 2010). Mining sector has been providing employment to large sections of people including the tribal mass (Economic Survey of Odisha, 2012-13).

Keonjhar district occupies an important place in the mineral resources map of India and produces the maximum quantity of iron ore in the country. 549 lakh tonnes or 27% of the country's production during 2010-11 and 761 lakh tonnes or 72 percent of the state's production of iron ore are from Keonjhar district (Indian Bureau of Mines ,2013 b). The district has abundant high grade iron ore; and additionally, manganese and chromites ore are also available along with other minerals like limestone, dolomite, nickel, quartz and vanadium. Iron ore mining is the main mineral production activity in the district which has provided iron ore resources of more than 1000 million tones. The Singhbhum – Keonjhar – Bonai – mining belt passing through Keonjhar and the Joda – Barbil region of the district is the main hub of iron ore (and manganese) production. Chromite, a strategic mineral, is also produced in another part (eastern) of the district (Anandpur Block). As we know that Keonjhar is rich in minerals, hence their exploration is necessary so that they can contribute towards the development of the district. Further sustainability of mining activities is an important issue given the non renewal nature of the minerals. Rapid extraction, exports without value addition on one hand and illegal mining, corruption and huge rent seeking on the other are the important criticisms against the industry. With this background the paper makes an attempt to analyze the possibility of sustainability of mining as a source of livelihood for the inhabitants of the Keonjhar district of Odisha. The present study has the following objectives:

- 1. To assess the extent to which mining sector contributes to the development of the economy of Keonjhar district.
- 2. To examine whether the development generated by mining has led to increased welfare of people in the district.
- To analyze the large scale depletion of mineral resources and some of the recent issues relating to illegal mining and thereby to assess its sustainability in Keonjhar district of Odisha.

The paper is divided into five sections. Section-II discusses the contribution of mining sector to the development of the Keonjhar district. We analyze whether the people in Keonjhar district of Odisha have been benefited due to mining led development in Section-III. Section-IV makes a critical appraisal of large scale depletion of mineral resources and some of the recent issues relating to illegal mining and thereby to examine its sustainability in Keonjhar district of Odisha. Section-V concludes the paper with some possible policy directions towards sustainability of mining sector in Odisha.

II. Mining sector in Keonjhar district-some facts

The contribution of mining to income, production, export and employment of the district highlights its importance.

a) Contribution of mining to GDDP of Keonjhar

Table-1 shows the contribution of mining to the Gross District Domestic Product (GDDP) of Keonjhar over a period of ten years at 2004-05 prices. It can be seen from the table that GDDP of Keonjhar is having an increasing trend. If we look at annual growth rate of GDDP, it can be seen that from 2000-01 to 2003-04, there has been an increase in growth rate but after that there has been a decline, then again the rate took an upward trend and after that again we notice a declining trend in annual growth rate of GDDP (Figure-1). It can be seen from the table that the contribution of mining to district income is increasing and more than 50 percent of income was derived from mining during 2006-07 to 2009-10. On an average mining contributed 50.2 percent to GDDP of Keonjhar from 2000-01 to 2009-10.

Year	Value of minerals in Keonjhar (in Rs cr)	Gross district domestic product (in Rs cr) at	Minerals contribution to GDDP(%)
		2004-05 prices	
2000-01	259	3056.1	8.5
2001-02	278	3241.0	8.6
2002-03	583	3522.2	16.6
2003-04	1175	4310.6	27.3
2004-05	1711	4839.3	35.4
2005-06	1180	5164.7	22.8
2006-07	3052	5916.9	51.6
2007-08	4423	6642.7	66.6
2008-09	7062	7132.2	99.0
2009-10	5909	7246.8	81.5
Average	2563.2	5107.2	50.2

Table-1: Contribution of mining to GDDP of Keonjhar district from 2000-01 to 2009-10

Source: Various issues of Economic Survey of Odisha.

Figure - 1: Annual growth rate of Gross District Domestic Product of Keonjhar from 2000-01 to 2009-10



Source: compiled by author

b) Contribution of mining to production and value of minerals in Keonjhar district

The district is basically rich in iron ore, manganese ore and chromites. The production and value of these three minerals in the district are shown in Table-2. The district is having an average production of 388.9 lakh MT in iron ore, 0.9 lakh MT in chromites and 4.8 lakh MT in manganese ore from 2000-01 to 2011-12. The average value for Iron ore, manganese ore and chromites over the period has been Rs. 3126 cr, Rs. 147.2 cr and Rs.44.6 cr respectively. Due to the sharp rise in prices and demand for a number of mineral

commodities, the production of many minerals has shown a steady increase, both in quantity and value, since 2004-05. The annual growth rates of production of iron ore, chromites and manganese ore have been shown in Figure-2. It can be seen that in case of iron ore, the rate has been declining over the years and during the last four years it has assumed a negative growth rate. For chromites and manganese ore the growth rate of production has been more or less fluctuating in nature. In case of value of iron ore, not only a declining trend is noticed but also a negative growth rate has been registered in 2011-12. Even annual growth rate of value of chromites and manganese has been negative in 2011-12. The growth rate of value for all the three minerals has reached its highest in 2010-11 (Figure-3). A combination of procedural delays, administrative inefficiency and political and administrative corruption against the background of rising mineral prices (since 2004) has led to a sudden spurt in illegal mining in mineral-rich states. Justice M B Shah Commission confirmed the existence of illegal mining in Odisha and is probing the alleged Rs. 3 lakh crore Mining scam in Keonjhar district of Odisha. Even Indian Bureau of Mines had found considerable illegal mining of manganese and iron ore in Keonjhar district. The state government has suspended 128 mining leases for various minerals, including iron ore, manganese, chromites, and limestone. This has led to the closure of a number of iron ore mines in Keonjhar in recent times as a result of which production of iron ore in the district has declined.

Year	Iron	ore	Chror	nites	Mangan	ese ore
	Quantity	Value	Quantity	Value	Quantity	Value
	(in lakh MT)	(in Rs cr)	(in lakh MT)	(in Rs cr)	(in lakh MT)	(in Rs cr)
2000-01	103.19	208.74	0.62	8.86	4.2	41.46
2001-02	123.84	227.9	0.63	9.31	3.93	41.2
2002-03	176.83	495.12	0.71	14.48	4.77	73.5
2003-04	257.39	1083.4	0.57	8.39	5	83.7
2004-05	367.93	1548.68	0.76	11.19	9	150.66
2005-06	429.32	1807.08	0.93	13.69	4.7	78.68
2006-07	474.73	2934.11	1.03	29.31	5.27	89.11
2007-08	588.49	4298	1.17	32.22	4.79	93.72
2008-09	597.59	6824.48	1.27	69.87	4.61	168.32
2009-10	577.01	5776	0.72	25	3.07	108
2010-11	518.15	10938.28	0.34	126.59	3.72	478.91
2011-12	452.08	1369.63	1.51	185.86	4.37	359.25

Table-2: Mineral production in Keonjhar district from 2000-01 to 2011-12

Source: Various issues of Economic Survey of Odisha





Source: Author's estimation

Figure-3: Annual growth rate in value of minerals in Keonjhar district from 2001-02 to 2011-12



Source: Author's estimation

It can be seen from Table-3 that of all the mining districts in Odisha Keonjhar is contributing on an average 394 lakh MT of minerals from 2000-01 to 2011-12. About 28 percent of the production of major minerals in Odisha is from Keonihar district and it is the second highest after Angul (Figure-4). In respect of total value of minerals, Keonjhar is contributing the highest average value of minerals (Rs. 3258 crore) from 2000-01 to 2011-12 (Table-4). It is having the share of 33 percent in total average value of minerals in Odisha in the same period (Figure-5).

Table-3	: District	: wise ex	ploitation	of mai	or mine	erals in	Odisha	from	2001-02	to 2011-12
					••••••					

	Angul	Dhenkanal	Jajpur	Jharsuguda	Keonjhar	Mayurbhanj	Sundargarh	Korsput	Sambalpur	Balangir	Rayagada
2000-01	312	0.4	21	130	108	1	45	28	0	0	0
2001-02	331	0.1	24	140	128	1	44	35	0	0	0
2002-03	368	0.1	39	147	182	2	43	48	0	0	0
2003-04	421	0.1	28	171	263	2	91	48	0	0	0
2004-05	446	0.1	44	201	377	4	97	49	5	0	0
2005-06	455	4	503	220	435	4	21	48	9	0.09	0.01
2006-07	506	0.2	55	252	480	2.3	209	46	11	0.09	0.04
2007-08	536	0.28	39	278	593	10	208	47	15	0.02	0.04
2008-09	575	0.21	41	302	602	47	8.4	234.4	21	0.15	0.02
2009-10	588.28	0.2	50	342.41	580.72	48.79	2.99	304	23.38	0.09	0.01
2010-11	520.96	0.21	49	436.74	522	48.57	7.45	403.5	29.07	0	0
2011-12	538.59	0.24	56.06	366.59	457.96	10.78	303.04	50.03	22.59	0	0
average production	466.49	0.51	79.09	248.90	394.06	15.12	89.99	111.7 4	12.37	0.04	0.01

Source: Various issues of Economic Survey of Odisha





Source: Author's estimation

Table-4: District-wise value of major minerals in Odisha from

	Angul	Dhenkanal	Jajpur	Jharsuguda	Keonjhar	Mayurbha nj	Sundargar h	Koraput	Sambalpur	Balangir	Rayagada
2000-01	1177	5	367	576	259	2	142	64	0	0	0
2001-02	1234	3	375	636	278	3	136	79	0	0	0
2002-03	1465	4	640	587	583	4	146	107	0	0	0
2003-04	2025	2	414	822	1175	10	416	128	0	0	0
2004-05	1213	1.8	520	969	1711	15	435	129	25	0	0
2005-06	2188	3.6	503	1058	1180	4	21	49	45	0.09	0.01
2006-07	2205	6	1143	1103	3052	14.5	1224	117	49	1.52	0.67
2007-08	2264	7.71	918	1172	4423	73.4	208	137.5	63.4	3.3	0.89
2008-09	2370	11.72	1637. 5	1245	7062.4	168.5	95.92	2213. 03	85.13	5.48	0.73
2009-10	3094	7	1300	1801	5909	190	30	2636	123	3.21	0.46
2010-11	2740.2 5	19.84	4083. 3	2297.25	11544	189.38	157.27	6852	152.91	0	0
2011-12	2832.9 8	29.54	5028. 63	1928.26	1914.74	311.65	5887.52	194.8 4	118.82	0	0
average value	2067.3 5	8.43	1410. 79	1182.88	3257.60	82.12	741.56	1058. 86	73.58	1.70	0.35

Source: Various issues of Economic Survey of Odisha





Source: Author's estimation

c) Contribution of mining to the export of minerals from Keonjhar district

A state 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. Table-5 shows the quantity of minerals exported from Keonjhar which of an average comes to 11,30,73 000 MT of iron ore,4578000 MT of chromites and 175000 MT of manganese ore from 1993-94 to 2010-11. Thus it is the iron ore which is mostly exported from the district. This may be due to increase in demand for iron ore in the international market. In some years chromites and manganese are also exported from the district but in small quantity.

year	chromites	iron ores	manganese
1993-94	0	830	1
1995-96	0	473805	0
1996-97	0	500056	0
1997-98	0	189	0
1998-99	150	8022	348
2000-01	0	0	0
2002-03	542	0	0
2005-06	0	10609	0
2006-07	0	12213	0
2008-09	13043	0	0
2010-11	0	11940	0

Table-5: Quantity of minerals exported from Keonjhar dis	trict of Odisha
from 1993-94 to 2010-11 (in '000 MT)	

Source: Various issues of District statistical handbook, Keonjhar

The performance of mining districts in export of minerals from Odisha can be viewed from Table-6. It can be seen that of all the mining districts, Keonjhar exports the maximum amount of minerals and helps the district in earning foreign exchange. The district has the advantage of being the largest exporter of minerals in the state with the share of 33 percentage of total mineral exports from Odisha (Figure-6).

Table-6: Quantity of minerals exported from all mining districts of Odisha

Mining Districts	1997-98	1998-99	2000-01	2002-03	2005-06	2010-11	average
Angul	0	27584	0	0	0	0	4597.3
Jajpur	543	1175	987	1338	1527	470	1006.7
Jharsuguda	0	13641	0	0	0	0	2273.5
Keonjhar	189	8557	0	542	10609	11975	5312.0
Koraput	0	2893	0	0	0	0	482.2
Mayurbhanj	0	221	0	0	27	159	67.8
Sundargarh	37	5934	260	1854	3726	3994	2634.2
Dhenkanal	0	36	0	0	0	0	6.0
Sambalpur	0	0	0	0	0	0	0.0
Balangir	0	50	0	0	0	0	8.3
Rayagada	0	5	0	0	0	0	0.8

from 1997-98 to 2010-11

(in '000 MT)

Source: Various issues of District statistical handbook, Keonjhar





Source: Author's estimation

The above section shows the importance of mining to the economy of Keonjhar district. It can be seen that on an average around 50 percent of district income is from minerals. The district enjoys the second highest rank in production of major minerals in the state and makes the highest contribution to the value of minerals of the state. The district also contributes the highest to the total export of minerals from Odisha. This shows that mining sector has paramount importance in the economic development of the district. But the question is whether mining has provided any benefit to the people in Keonjhar district? How the district has fared in terms of human development indicators? This requires a detailed understanding of the impact of mining on human well being and its sustainability.

III. Impact of mining on human well-being: An analysis in Keonjhar district of Odisha

It has been clear that mining has contributed a lot to the district in terms of production, export earning and domestic product and has resulted in development of the district. The extent to which mining has impacted the human well-being can be assessed by analyzing the status in terms of employment and human development indicators (infant mortality rate, literacy rate, and gross enrolment ratio).

a) Mining and employment in Keonjhar district

The efficiency of a particular sector in an economy is assessed, besides other things, on the basis of its employment generating capacity. Table-7 depicts the number of workers employed in mining sector in Keonjhar district of Odisha. On an average 10,649 people are directly employed in iron ore mining, 2850 in chromites mining and 2676 in manganese mining from 1993-94 to 2010-11. Thus maximum number of people are engaged in iron ore mining in Keonjhar district.

year	chromites	iron ores	manganese	
1993-94	5203	10684	5221	
1995-96	4249	10358	NA	
1996-97	4368	10040	4678	
1997-98	2928	11111	4265	
1998-99	2893	11191	2773	
2000-01	1208	9285	2722	
2002-03	786	7737	2732	
2005-06	4178	14956	725	
2006-07	4564	10578	1782	
2008-09	153	10843	1529	
2010-11	813	10349	3016	

Table-7: No. of workers employed in Keonjhar districts of Odisha

from 1993-94 to 2010-11

Source: Various issues of District statistical handbook, Keonjhar

It can be seen from Table-8 that mining sector in Keonjhar district gives employment to maximum number of people in Odisha. On an average 15838 people were engaged in mining sector in Keonjhar district from 1997-98 to 2010-11. Of the total number of people employed in mining sector in Odisha, 31 per cent is from Keonjhar district which is the highest among all mining districts (Figure-7).

1101111997-98 to 2010-11							
Mining Districts	1997-98	1998-99	2000-01	2002-03	2005-06	2010-11	average
Angul	9273	9358	8699	8456	9115	9710	9101.8
Jajpur	4698	4972	5638	4749	4929	7186	5362.0
Jharsuguda	11008	10674	10681	8913	4766	4293	8389.2
Keonjhar	18498	17068	13435	11406	20405	14213	15837.5
Koraput	473	372	466	528	788	659	547.7
Mayurbhanj	1126	923	503	737	1748	1238	1045.8
Sundargarh	10406	11951	9779	9675	8337	12479	10437.8
Dhenkanal	210	671	681	329	120	221	372.0
Sambalpur	23	23	8	9	79	91	38.8
Balangir	1112	949	774	427	232	20	585.7
Rayagada	79	25	52	48	52	53	51.5

Table-8: No. of workers employed in mining districts of Odisha from toop of to pote to

Source: Various issues of District statistical handbook, Keonjhar





Source: Author's estimation

b) Mining and Human development in Keonjhar district

Human Development Index, a summary indicator of human development, brings together the twin objectives of economic progress and social development. It is widely used as a measure of human development based on life expectancy, literacy level and income level. Table-9 shows Human Development indicators across the eleven mining districts of Odisha. It is observed that some of the mining districts have performed poorly in terms of various indicators of human development vis a vis other mining districts of the state. Keonjhar, Koraput and Jajpur show very poor performance in terms of health index than all Odisha aggregate. These three districts have also fared very 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. Keonjhar district, despite its high per capita income, is ranked the 24th among the thirty districts in Odisha. This is because of the poor performance of the district in case of health status and average performance in case of education status. While the HDI measures average achievement, the GDI adjusts the average achievement to reflect the inequalities between men and women in respect of the same dimensions as reflected in the HDI. Gender disparity is less in Keonjhar district as GDI value is less than Odisha average.

mining district	HI	infant mortality rate	II	LRI	CGERI	EI	HDI value	HDI rank	GDI value
Angul	0.481	95	0.748	0.694	0.891	0.76	0.663	6	0.637
Jajpur	0.333	118	0.499	0.722	0.914	0.786	0.54	22	0.386
Jharsuguda	0.635	71	0.757	0.715	0.89	0.773	0.722	2	0.687
Keonjhar	0.34	117	0.547	0.598	0.917	0.704	0.53	24	0.504
Koraput	0.218	136	0.539	0.362	0.881	0.535	0.431	27	0.415
Mayurbhanj	0.782	48	0.489	0.524	0.892	0.647	0.639	9	0.621
Sundargarh	0.692	62	0.618	0.652	0.915	0.74	0.683	4	0.659
Dhenkanal	0.468	97	0.534	0.701	0.916	0.773	0.591	12	0.531
Sambalpur	0.436	102	0.59	0.67	0.887	0.742	0.589	13	0.56
Balangir	0.468	97	0.504	0.549	0.898	0.666	0.546	21	0.518
Rayagada	0.25	131	0.547	0.356	0.882	0.531	0.443	25	0.428
Odisha	0.468	97	0.545	0.636	0.896	0.723	0.579		0.546

Table-9: Human Development indicators of mining districts of Odisha

Note: HI – Health Index, II – Income Index, EI – Education Index, HDI – Human Development Index, GDI-Gender Disparity Index.

Source: Human Development Report 2004, Odisha

It can thus be inferred that mining sector has not benefited the people much in terms of direct employment. Keonjhar as a mining district though enjoys a higher income index but suffers a very low health index than average value of Odisha. It seems that income generated from mining are not well distributed among the inhabitants of mining region and the Infant Mortality Rate is very high in Keonjhar district vis-a-vis other mining districts in Odisha. But from gender disparity point of view, Keonjhar district is in much better position compared to the other mining districts of the state. While it has provided the trigger to boost the state economy in general and Keonjhar district in particular, it has also created a degraded environment and is therefore a matter of great concern. The next section discusses some of these issues.

IV. Is Mining in Odisha Sustainable? Environmental and Illegal mining issues

While the index of mineral production (base 2004-05=100) for all minerals (excluding atomic minerals) stood at 128.45points in 2011-12 at all India level, the same for Odisha is 147.53 in 2011-12(Indian Bureau of mines,2013b). This clearly reflects a very high rate of depletion of natural resources in the state as 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 the previous decade as depicted in Table-10. This steady rise in production of minerals in the state is mainly attributed to massive extraction and a very sharp rise in the price of iron ore because of economic boom stoked demand for it, particularly after 2004, in the international market.

	1990-91 to	2000-01 to	1990-91 to
	1999-00	2011-12	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

Table-10: Average annual production and value and Average annual growth rate of production and value of minerals in Odisha

Source: Author's estimation

Mining cannot be done without degrading land and without disturbing the existing environment. It is one such activity that has highly adverse consequences not only on the natural ecosystem but also on the local communities dependent on them (Vagholikar et al., 2003). The impacts of mining are felt at every stage of the mining cycle from exploration to mine disclosure. The adverse consequences can be assessed in the form of pollution of air, water and land degradation. Keonjhar district is experiencing degradation in environmental resources due to rapid extraction of minerals and growth of mineral based industries in the recent years.

a) Impact on Water

Odisha is fortunate to have abundant water resources, both surface and ground water, compared to its size and population vis-a-vis the national level (State of Environment Report Orissa, 2006). In recent years, rapid industrialization has started in the State. The Government, in order to encourage the industrial growth, has allocated sufficient quantity of water for the industrial purpose (State of Environment Report, Odisha, 2007). The rapid industrialization through large mineral based industries is putting excess pressure on the water resources both quantitatively as well as qualitatively. In mines areas, mining operations causing heavy pollution of surface and ground water. Many of the perennial streams have disappeared. In many areas in Keonjhar, the tube wells are going dry or have started yielding poor quality water (CSE, 2008). Mining also impacts rivers, but in other ways: overburden is dumped into valley, filling streams and rivers. Consumption of mineral based industries adds to the stress, due to the presence of minerals and water in the same area, most such industries prefer to set up along or near the rivers. These not only consume large quantity of water, but also discharge their effluents into the river, causing water pollution.

b) Impact on Land and Forest

One of the most severe impacts of mining is that it causes changes in land use pattern. Land is lost due to mining both directly and indirectly. Land taken for mining in Odisha has either been forest land, agricultural land or common property resources. A total of 43,320.6 ha of forest land has been diverted to mining over the period from 2000-01 to 2011-12 .On an average 3610 ha of forest land has been diverted to mining during 2000-2011.Mining alone accounts for more than one third (36%) of diversion of forest land which is the highest of total diversion of forest for development projects in Odisha. Thus the mining sector is the largest forest consumer (Table-11).

categories	average forest land	% to total average	
	diverted (in ha)	forest land diverted	
Irrigation	2308	23	
Industries	815.6	8.1	
Mining	3610.1	36.1	
Transmission Line	939	9.4	
Road And Bridges	81.3	0.8	
Railway Line	650.7	6.5	
Defence, Human Habitation and Others	1454	14.5	
Miscellaneous	155	1.5	
Total	10013.7	100	

Table-11: Diversion of average forest land to non forest use by categories wise inOdisha during 2000-01 to 2011-12

Source: Author's estimation

Table-12 shows the existence of mineral deposits in forest areas of Odisha. It can be seen from the table that while 37 % of land area is forested in Keonjhar but of all mining districts it is having maximum area of land under mining. Not only this, land under mining in Keonjhar district is also increasing (Figure-8).

Mining Districts	geographical area (in sq km)	forest area (in sq km)	% under forest area	mining area (in hec)
Angul	6375	2716.82	43	10502.58
Jajpur	2899	725.27	25	5927.18
Jharsuguda	2081	202.44	10	7774.5
Keonjhar	8303	3097.18	37	32069.81
Koraput	8807	1879.53	21	6616.73
Mayurbhanj	10418	4392.13	42	1597.77
Sundargarh	9712	4957.32	51	17986.12
Dhenkanal	4452	1737.62	39	128.06
Sambalpur	6657	3631.77	55	280.29
Balangir	6575	1543.85	23	298.01
Rayagada	7073	2812.33	40	2638.27

Table-12: Mining in forest areas of Odisha

Source: Economic Survey of Odisha 2012-13 and District Statistical Handbook, Keonjhar, 2011



Figure-8: Area under mining in hectares in Keonjhar district from 1993-94 to 2010-11

Source: Various issues of District Statistical Handbook, Keonjhar

c) Impact on Air

The Orissa State Pollution Control Board has acknowledged air pollution as a major problem in almost all mines are in Odisha. One of the biggest reasons for fugitive dust generation is the condition of roads in mining areas. Major mining activities contribute directly or indirectly to air pollution (Kumar et al., 1994; CMRI, 1998). Some activities (drilling, blasting, loading-unloading of materials, overburden etc.) in mines area create some fine particles which can be suspended in air and result in air pollution. SPM (Suspended Particulate Matter) and RPM (Respirable Particulate Matter) were the major sources of emission from various open pit mining activities and concentration of one type of particulate matter can be known by knowing the level of the other (Chaulya, 2004). Pollution due to PM is very high in working areas of open cast mines (Gautam et al., 2012).

d) Impact on Climate

Because of increasing climate change caused by greenhouse gas emissions from mining and associated industries, Odisha has been frequently disturbed by natural disasters including cyclones, heat waves, droughts and floods that are a regular feature of the western districts of the state. In the recent decades climate of Odisha has been changing for the worse due to a number of factors such as deforestation, extensive construction activities, uncontrolled mining, elimination of water bodies and extensive carbon consumption. The average as well as maximum and minimum temperature of the state is gradually increasing. The impact is more severe in the mining districts of Odisha. It can be seen from Table-13 that the district was having more rainfall in 1993 (1534.5) but it has decreased to 1321.6 in 2009. Even maximum and minimum temperatures have increased during the same period in the district. Now summers are more hot and winter are less cold. This may be due to increased industrialization in general and mining and mining based industrial activities in particular in the district.

year	average annual	maximum temperature	minimum temperature
	rainfall (in m.m)	(degree in c)	(degree in c)
1993	1534.5	41.2	6.4
2001	1389.9	41.7	6.7
2009	1321.6	43.6	9.5

Table-13: Changes in Average annual rainfall, maximum and minimum temperature in Keonjhar district from 1993 to 2009

Source: Various issues of District Statistical Handbook, Keonjhar

As Keonjhar district is considered to be the mining hub of iron ore in Odisha, a sharp rise in the price of iron ore in the international market has resulted in rampant illegal mining in the district as a considerable percentage of mineral, especially iron ore, is exported. Illegal excess iron ore and chromites mining amounting to Rs.679 billion violating the rule of law are being investigated by vigilance and Saha commissions (Joda, Barbil in Keonjhar district and Kaliapani Sukinda of Jajpur). The nexus between private firms and corrupt bureaucrats and political leaders looted Odisha. It is no secret, due to lack of supervision of officials of the pollution control Board, Indian Bureau of Mines, state mines department, district collectors and ministry of environment and forest. When environment clearance is granted to any mine, the maximum amount of ore which can be mined per year is specified. The quantity of ore that is to be extracted every year is specified in the mining plan which is approved by IBM. Forest and environment laws have been violated installing screening plants without statutory clearance. No action has been taken by any of the authorities for excess mining beyond the specified limit violating operating conditions, assessing impact on the local environment and grabbing unauthorized forest land.

The Central Bureau of Investigation has found considerable illegal mining of manganese and iron ore in Keonjhar district. The state government has suspended 128 mining leases for various minerals, including iron ore, manganese, chromites and limestone while 482 licenses granted for trading and storage of minerals have been cancelled to stop illegal mining. Ninety-four of the 192 iron ore mining leases in Odisha do not have the mandatory environmental clearances. And of the 96 that have them, 75 have mined far beyond their permitted levels over the past several years, says the Justice M.B. Shah Commission Report. The exhaustive five-volume report by Shah commission lays bare

how the mines have continued to use a loophole in the law for years and blatantly violate environmental and other norms to pump out iron ore at a time when international prices of the metal are booming. The report says 56 mining leases operated close to identified wildlife areas without adequate protection to the animals. The mandatory forest clearances had not been obtained in several cases. Water bodies in and around 55 mines have been polluted. Water has depleted in natural streams in some cases and forest land impacted adversely in several others. A mining-project within a 10-kilometre vicinity of a protected wildlife area requires mandatory clearance from the National Board of Wildlife, which too was not obtained in several cases. The Shah Commission held both the Central government authorities and the Odisha government responsible for the wide-ranging illegal mining that has continued unchecked for years. It has recommended that the entire extraction in all cases, where leases are operated without mandatory environmental clearances, be treated as illegal and the market value — domestic or export — recovered from the defaulting miners. The Commission said action must be taken against State and Central government officers who allowed the illegal mining for years in violation of various laws. The Commission, which has been told to wind up before it reports on illegal mining in Chhattisgarh, has warned that there was an absolute lack of monitoring in Odisha and miners were fearlessly violating provisions of the law as if they did not exist. It also warned that the practice of merely asking violators to plant more trees than was normally required is not a legitimate alternative to prosecution under the penal provisions of the Forest Conservation Act which attract punishment that includes imprisonment. This practice — which has no legal backing - has rendered the Act toothless and ineffective. According to the Shah Commission, illegal mining in Odisha could have cost the exchequer close to Rs. 600 billion. Odisha has some of the country's largest Iron ore mines, several Steel projects and various works and has been demanding the Centre to completely ban iron ore export. The state government, which was pushed to the corner over the mega mining scam followed by the Centre instituting the Shah commission for investigation, has since put in place a series of measures to discourage iron ore export. It also decided making mines to supply 50 per cent of their produce to domestic industries. Sources said, the government measures led to drastic fall in iron ore export from the state from about 24 million ton to 12 million ton by the close of last fiscal. Any partial or complete ban on Odisha mining could have far-reaching consequences on the Indian iron ore market. If commercial mining, other than captive mining, is banned, it could lead to a shortage of around 40 million of iron ore within the state, says a report authored by Anjani K Agrawal, Partner and Sector Leader - Mining & Metals, EY (Report, 2013). Further, The Commission advocates limiting production in Odisha to 50-55 MT per annum with an annual increase of 7.5 per cent to have room for the projected rise in the domestic steel sector's requirement with a view to preserving mineral resources for the next 50-60 years.

In this context, the question that remains to be answered is what will happen to Odisha if these recommendations are strictly accepted? If there is a decision to suspend activity for a momentary period, it would be unfortunate because a large part of the economy and all that is spent on this activity will be hurt. One thing is almost sure, mining industry in the near future is going to face critical tests of its sustainability commitments as it is confronted with ever greater pressure from various stakeholders in the society.

V. Conclusion

Exploration of mineral resources is an essential condition for successful economic development of an economy. Mining activities in Keonjhar district is substantially contributing to the district as reflected in its share in gross domestic district poduct, production and value of minerals and earning through export of minerals and has resulted in development of the district. From the present study it can be inferred that Mining sector has not much benefited people in terms of direct employment. Keonjhar as a mining district though enjoys a higher income index, suffers a very low health index compared to the average for Odisha. It seems that income generated from mining are not well distributed among the inhabitants of mining region and Infant Mortality Rate is very high in Keonjhar district vis-a-vis other mining districts in the state. But from gender disparity point of view, Keonjhar district is in a much better position than other mining districts. Keonjhar mining industry now is confronted with allegations of overproduction and environmental degradation. After all this is an industry whose core business depends on the depletion of mineral resources. This is also the industry that consumes vast amount of energy and produces massive quantities of waste. Therefore judicious regulatory and enforcement mechanisms should be undertaken to minimize the negative effects of mining. A focused approach is the need of the hour if sustainability issues for mining and metals industry are to be addressed. Management has to play a key role in adopting sustainability into their overall business strategies. Additionally, with government recommending the component of profit to be spent on corporate social responsibility, an overall sustainability plan needs to be put in place to ensure that a company meets its sustainability objectives.

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Coal Mining Activities and Health Hazards in Odisha: A critical review

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Coal is one of the core minerals which plays an important role in the industrial development of almost all the countries in the world. Coal mining contributes to the economic development of a country & undoubtedly brings wealth & employment opportunity in the area. It has the highest forward linkages effect with steel, cement, fertilizers, electrics, power & a number of other industries. But simultaneously it leads to extensive environmental degradation, which in turn, has an adverse & hazardous impact on the health condition of the workers who are working in the coal fields as well as the people who residing near the coal mining area. Many national and international studies argue that the local environmental quality is an important determinant of human health. And health is a state of complete physical, mental & social well-being & not merely the absence of disease or infirmity (WHO, 1948). Thus the health of human beings is intrinsically dependent on the surrounding environment.

However deteriorating environmental conditions due to the coal mining activities may be a major contributory factor to poor health & quality of life particularly in coal mine domain of Odisha that hinders the sustainable development. Here the study shows some critical reviews on the negative health externalities of coal mining activities in Odisha coal field. Using the secondary data from various Ministries of Government of India & Government of Odisha, it shows that despite the potential for economic growth, people who live close to mining areas may suffer the environmental health effects of degradation associated with coal mining activities. On the other hand mining workers in coal fields are daily exposed to various chemical hazards, high temperatures & humidity which may cause too many health diseases as we know under the occupational health hazards. In this situation while the benefits like –increasing income level & infrastructure, creation of employment opportunities seem to be for the short term, the cost of negative health externalities & environmental pollution are born over the long run.

Keywords: Odisha, Coal mining activities, Environmental health effect, Occupational health effect.

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1. Introduction

Mining in Odisha has an ancient origin and this industry has been occupying a special position in the state's economy. Specifically the development of coal mining is a milestone in the field of industrial development of the state. Among the minerals, coal-'the black diamond'- is viewed as one of the important natural resources which has the potential of contributing to the growth and development not only of the state economy but also of the nation. Opening of a mine has several economic, environmental and social consequences at the national, state and local levels. Similarly, exploitation of coal mining not only creates direct and indirect employment opportunities, but also generates foreign exchange earnings and tax revenues and includes business activities, basic facilities like roads, schools and health clinics to remote areas. At the same time, displacement, forest and land loss, environmental pollution and health impacts of coal mining activities on local communities have been major concerns for governments, the general public, stakeholders, organizations and individuals.

Environmental quality is an important determinant of human health. It is necessary to have mechanisms to establish linkages between environmental pollution and its health impact due to coal mining exploitation.

Everything to do with coal, from mining to combustion to waste disposal, and all the intervening processes, adversely affect public health and the environment. An increased reliance on coal will invariably result in the increased release of toxic chemicals into the environment. On the other hand the irreparable scarring of landscapes, soil degradation and the depletion of habitat and biodiversity as serious negative impacts of coal mining. Coal mining generates dust and noise from blasting and operations, particularly from open cast mining (Onder and Yigit, 2009). All major open cast mining operations produce dust as a result of blasting, drilling, loading/unloading and transporting.

On the other hand the working environment and working conditions of workers in coal mining are very hazardous. The conditions under which the coal mining workers perform their duty have a great bearing on their general health, efficiency & productivity. Their performance is affected by environmental problems such as exposed chemicals, temperature, noise, ventilation, humidity, work zone air quality and ambient air quality etc. The continuous exposure of the miners to such unhealthy atmosphere leads to many serious diseases.

Mining from a gender perspective is also a matter of serious concern in Odisha. The health hazards and degeneration of the health conditions of women and children are one of the most serious impacts of coal mining. Here, women's health has to be understood from a larger perspective of direct and indirect impacts-the exposure of women and children to mine disasters and mine pollution as well as to the reduction in quality of life due to denial of access to food security, natural resources and livelihoods. Despite people suffering from several forms of ill health, physical and mental deformities and constant exposure to toxic wastes and chronic diseases as a result of mining, there is a tragic gap in the availability of 'scientific' studies and data on the health hazards of coal mining in India and more so on the women in mining affected communities. Since women's health has important implications for human growth and development, coal mining has to be looked at from a broader perspective.

It is no gainsaying that coal mining can have some beneficial local impacts in terms of economic expansion and decreasing poverty. And it creates ample employment opportunities for rural people and attracts investment from abroad. Despite these short term benefits, all the stages of coal mining activities pose potential risks to human health and well-being in the coal mining belt. Externalities such as disruption in community life, growth of alcoholism, destruction of indigenous communities and cultural values, growth of dust pollution, deterioration in water quality and land degradation are arising largely due to coal mining activities. So in this context, the economic development through coal mining is challenging for the State government, policy makers and local people. Although coal mining activities can provide the foundation for an economy in terms of creating value added, boosting employment and generating personal income, it almost always has adverse environmental impacts and eventually health impacts. The paper focuses specifically on the local health problems of coal mining in Odisha particularly by focusing on the Angul-Talcher coal belt.

2. Review of Literature

Health is termed as a major determinant of human and economic development. Good health is not only merely free from diseases but also correlated with healthy environment. Health problems have been arising mainly because of malnutrition, environmental pollution and degradation, ecological imbalance, work place conditions and indoor air pollution. It is very evident that the quality of human health and well-being of a community is intrinsically linked with the local environmental quality (Karnjan, 2010). The exploitation of natural resources like minerals has several environmental, economic and social consequences on the local communities in the mining belt. Among all minerals, the coal mine and its activities are unhealthier as they lead to more negative health externalities in comparison to their positive value to the local communities. The income and employment creation, infrastructure development, foreign exchange earning etc. are the benefits which can be extracted from coal mining industries in the short term while the negative externalities like health hazards due to environmental degradation, displacement, forest and bio-diversity loss are borne over the long period of time which cannot be compensated properly over time (Mishra, 2009; Singh et al., 2010).

The quality of life of the local communities in the coal mining area and the environmental status everywhere near the coal field are very hostile and unsustainable (Murthy and Patra, 2006). It is evident that each stage of coal mining, starting from extraction to transportation and processing to combustion creates multiple hazards for health and the environment. These costs are external to the coal industry as we know under the term externalities (Epstein et al., 2011; Finkelman et al., 1999). Undoubtedly, it can be said that coal mining areas are characterized by greater socio-economic disadvantage, risky health behaviors and environmental pollution that are associated with reduced health related quality of life(HRQOL) (Julling and Hendryx, 2010). However, these are not enough as the consequences of coal mining activities today are the biggest environmental challenge facing the coal mining areas in terms of the issue of greenhouse gases and acid rain which indirectly lead to the climate change problem. Another problem of coal mining –induced displacement and resettlement is that it creates risks to societal sustainability (Singh, 2007; Goswami et al., 2010).

The environmental degradation is not only the main impact of coal mining activities in coal belt but also the extreme air pollution, particulate matters, contaminant water, forest loss, landscape change and sound pollution near coal field may be the causes of many serious health diseases for local people. Higher incidence of neural tube deficits, a high prevalence of low birth weight (a risk factor for future obesity), diabetes and heart diseases are very common health problems in coal mining areas. Heavy metals such as lead, cadmium and high chemical contaminations in water and air tend to increase the risk of many skin diseases. Besides these, the acute respiratory infection, malaria, dysentery etc. are also the common serious diseases in these areas. It has been proved with international and national evidence that coal mines impair foetal and child growth, neurological ailments and DNA damage. Moreover, the exploitation of coal mining leads to poor self-rated health and reduced quality of life of the community in coal mining belt (Hendryx, 2008; Zulling and Hendryx, 2010; Tang et al. 2008; Epstein et al., 2011; Colagiuri et al., 2012; Pattanayak et al., 2010; Wallace M., 1987).

In case of Odisha, coal mining activities and health hazards problem are very alarming and hence they should be properly highlighted. The Odisha State Pollution Control Board (OSPCB) has described all the coal belt of the state as the most hazardous zones for health and living conditions which exceed the concentration of SPM (Suspended Particulate Matter) and RPM (Respirable Particulate Matter) beyond the prescribed regulatory standard (Hota and Mishra, 2010). In Odisha , the Angul-Tachaer region is one of the most polluted coal mining region . About 86.26 million cubic meter/annum are drawn from the river Brahmni for mining/industrial activities. The major water pollution problems in the area included acid mine drainage, heavy metal contamination, chemical pollution and erosion sedimentation. The ground water has also been severally contaminated. Potable water is transported to this area by trucks and tankers while the livestock and local community suffer painful life including loss of teeth, suffering from various epidemic diseases like acute respiratory infection and blood dysentery, malaria and skin diseases etc., which ultimately lead to death due to drinking the polluted water (Hota and Mishra, 2010; Das, 1995; Reza et al., 2009). Mining and its allied industrial activities in Angul-Talcher region are detrimental to land use pattern. There are decreases in forest cover(from 696.04 km to 503.2 km) and agricultural land (from 758.43 km to 520.96 km) due to mining and industrial activities in the region from 1978 to 2007 (Hota and Mishra, 2010). Angul-Talcher coal belt is undergoing a rapid change from its "culture of ecology" to the "culture of pollution" because coal mining operations have not simply disrupted the local peasants' access to agro-economy and their common property resources (CPRs) i.e., village forests, fresh air, clear water sources etc. but also have detached them from their earlier environmental ethics and green thinking (Garada, 2013).

3. Overview of Angul-talcher District Profile

As we know, Odisha is rich with large varieties of minerals which include coal, iron ore, chromite, bauxite, graphite, copper, lead and many precious stones. The state has been occupying a vital place in the mineral map of India. Within the state, coal constitutes the lions share (88%) of all mineral deposits followed by iron ore and bauxite. It may be observed that about 51% of coal has been extracted from Angul-Talcher coal field and the rest from Jharsuguda, Sundergarh and Sambalpur districts (Economic Survey, Odisha, 2012-13). Many coal mining based industries like thermal power plant, fertilizer factory and heavy water projects are established here.

Even though this district is blessed with plenty of greenery and forestry, it is considered as one of the hottest places in India, where the maximum temperature goes up to 50° c during summer. The reason could be unprecedented mining and its allied related pollution and deforestation. Besides air pollution, the river Brahmani passing through this area also gets polluted through coal mining and other industrial activities (State of Environment Report, Odisha, 2011-12). Due to enormous environmental pollution like water pollution, air pollution, forest and agricultural land loss and ecosystem imbalance, many epidemic diseases are highly prevalent which hamper the health related well-being of common people in this district. Epidemic diseases like gastroenteritis, acute respiratory infection and blood dysentery, malaria, blindness, leprosy, tuberculosis and skin diseases are the major public health problems of this area. The prevalence of malaria is very high even throughout the years. The other diseases like joint pain are highly prevalent among children due to uses of polluted water and exposure to polluted air. Water borne diseases are very common in this region (32.88%). A large section of population (53.15%) suffers from malaria & acute respiratory infection (The Community Health Fellowship Programme (CHF), 2009).

4. Coal Mining Activities and Health Hazards: A Critical Review

Health is a state of complete physical, mental and social well-being and not merely the absence of diseases (WHO, 1948). Human health is therefore closely correlated with and intimately dependent on the surrounded environment and its quality. From the pollution point of view, coal mining area has been considered as the most polluted and "hot spot" area (Orissa State Pollution Control Board, 2012-13). Generally coal is mined by two methods i.e., by surface or opencast and underground mining methods. Both these methods are usually associated with enormous degradation of environment and destruction of habitat and affecting adversely the health status of local people who are residing near coal fields (Zullig and Hendryx, 2010; Morrice and Colagiuri, 2012). But from the safety point of view underground methods of coal mining have very serious health effects on coal mining workers. Being away from the ray of sun and with limited air availability, exposure by gas, chemicals and coal dust, working with unhygienic temperature and humidity and fear of accident of hazards have been making the underground situation no better than death hole for coal workers.

4.1 Conceptual Framework



Source: modification from Pattanayak et al., 2006

4.2 Environmental Health

It is no doubt that the quality of environment contributes to quality of health. Almost every health disease is caused by environmental exposure i.e., the direct human contact with a pollutant (e.g., through breathing contaminated air, drinking and using contaminated water or eating a contaminant). Factors such as particulate matter in the air, water pollution and other environmental degradation damage the health of local people in mining area. Particularly in a developing economy, environmental hazards and pollution have a major contribution to childhood deaths, illnesses and acute respiratory diseases, diarrhoeal diseases, physical injuries, poisoning, insect-borne diseases and perinatal infections (WHO, 2005). The following are the environmental health hazards.

4.2.1 Health impacts of Air pollution

People living in coal mining areas are exposed to the dust generated from surface mining operation, coal preparation, clearing plants and coal loading facilities (Epstein et al., 2011; Colagiuri et al., 2012). Coal dust creates particulate matters. Particulate matter is nothing but the tiny particles of solid or liquid suspended in a gas or liquid such as coal and mineral's dusts in the atmosphere. This coal dust can be picked up by wind at the mine site or from trucks and rail cars and settle on nearby houses, yards and in local surface water.

Coal as a mineral, contains many trace elements such as metals including nickel, mercury, arsenic, chromium, lead & cadmium. Other contaminants within the coal are sulfur, nitrogen, chlorine & fluorine (State of Environment Report, Odisha,2011-12). The large amount of coal burned each year (nearly 900 million tons) releases all these pollutants enormously (State of Environment Report, Odisha, 2011-12).

4.2.2 Table-1

Toxic Chemicals	Health impacts
Sulfur Dioxide:	Aggravates heart and lung disease. Increases risk of chronic bronchitis asthma, pulmonary dysfunctions, emphysema., Increase risk of cancer.
Oxides of nitrogen:	Increase risk of viral infection, Pulmonary Fibrosis and emphysema, Airway resistance, chest tightness and discomfort. Eye burning, headache.
Particulate Matters:	Respiratory disease like chronic bronchitis, bronchial asthma, emphysema. Aggravate heart disease.
Lead	Kidney damage. Reproductive system damage. Brain dysfunction and altered neurophysical behaviors. Anorexia, abdominal colic, vomiting, constipation.

Toxic Gaseous Chemicals and its Health Impacts

Source: State of Environment Report, Odisha, 2011-12

It is clear from the above table that the toxic gaseous chemicals like sulphur dioxide, oxides of nitrogen, particulate matters and lead and other pollutants, those coal as a mineral contain directly or indirectly create many serious health diseases (mentioned in the above table). The local people who are residing near the Angul-Talcher coal field have been suffering from these serious health hazards. However, after being collected by pollution control devices to prevent emissions to the air, those pollutants are merely shifted to another waste stream as either liquid or solid wastes. These pollutants and their derivatives can cause adverse effects by interacting with and impairing molecules crucial to the biochemical or physiological process of the human body. These factors influence the risk of toxic injury related to these substances, their chemical and physical properties, and the dose of the material that reaches the critical tissue sites and the responsiveness of these sites to the substances (State of Environment Report, Odisha, 2011-12). The adverse health effects of air pollution may also vary across population groups, in particular the young and elderly may be more susceptible to deleterious effects. Persons with asthma or other preexisting respiratory problems may experience aggravated symptoms due to exposure (WHO, 1987, 2008).

4.2.3 Health impacts of water pollution

At the time of coal preparation and transportation, the impurities directly or indirectly are removed from the c oal and enter into water bodies. People living in coal mining area are openly exposed to this chemically treated water (Murthy and Patra, 2006). Many coal contain pyrite and when this pyrite is exposed to water at the time of coal screening and washing, it forms sulfuric acid & iron which can get into water supplies causing acid mine drainage. This acid frequently is toxic as battery acid and directly harms or kills aquatic life. It also dissolves toxic metals like copper, aluminum cadmium, arsenic, lead and mercury from the surrounding rock into surface and ground water. These substances are harmful to people who are living near the coal mining area (Report of Alaska community action on toxics, 2013; Review in the journal Environmental Health Perspectives, 2011).

The surface and groundwater in coal mining area are highly associated with microbial pollution. It is estimated that 80% of all the diseases and over one third of deaths in developing countries are caused by consumption of contaminated water and an average one tenth of each person's productive time is sacrificed due to water related diseases (UNICEF, 1992; State of Environment Report- Orissa, 2011-12; WHO, 2008). The chemicals like nitrates and cyanides can cause adverse health effects at certain threshold concentration. According to present scientific thinking, there is no threshold level which could be considered safe in case of synthetic organics, chlorinated organic micro pollutants, pesticides etc. Any amount of the substance ingested contributes to increase in cancer and other serious health problems like gastroenteritis, infections, skin diseases and

diarrhoea etc. (Community Health Fellowship Programme , Odisha, 2009; State of Environment Report- Orissa, 2011-12).

4.3. Other Impacts of Coal Mining Activities on Human Health

4.3.1 Noise Induced Health Impacts

At the time of coal blasting in coal mining area, the local people residing near the coal field are highly exposed to noise pollution (Colagiuri et al., 2012). The machines used in the surface coal extraction methods also create large amount of noise pollution. Considering the impact of noise pollution on human health and quality of life, it is estimated that continuous noise level in excess of 90 dB (decibel) can cause loss of hearing and irreversible changes in nervous system (State of Environment Report, Odisha, 2011-12)

4.3.2 The Impacts of Forest loss on Human Health

Deforestation and related forest degradation can have harmful and even deadly consequences for both people and the environment. Forest has served as important and dependable source of food, nutrition, medicine and fuel for surrounding communities while it is widely known that forests play a key role in mitigating climate change and in conserving soil and water quality.

Coal mining requires large areas of land. So large scale deforestation is to be carried out in Angul-Talcher region. Besides this, vegetation in the adjoining areas also need to be cut in order to construct roads and residential facilities for the mine workers.

Forest species contribute to balanced diets, and are a major component of traditional healthcare systems which provide the primary healthcare. Moreover, chemicals and genes harbored by forest plants in this area which have provided drugs for treating diseases such as malaria and leukoemia (Pattanayak and Riesco, 2005) are now lost for coal mining proposes.

4.3.3 Climate change and its impacts on Health

The world Health Organization states that climate change is the greatest emerging threat to public health and to the environment. Coal fired power stations are main contributors to greenhouse gases and climate change. The combustion of coal is the largest contributor to the human made increase of co_2 in the atmosphere. The process of coal mining can release a large amount of methane and methane has a global warming potential 21 times greater than that of co_2 over a 100 year timeline (Intergovernmental Panel on Climate change). According to World Health Organization, the heart and respiratory diseases are vulnerable to the increase in heat waves due to the climate change.

4.3.4 Economic costs

The externalities such as damage to the environment and human health due to the coal extraction activities not only lead to increase the costs of treatments of disease burdens

but also cause loss of productivity including work days loss. In India, there was about 73 million work days loss due to primary disabling diseases caused by using polluted water(WHO).

4.4 Occupational Health

Occupational Health mainly arises due to working environment and unhygienic working condition for workers. The conditions under which the workers perform their duty have a great bearing on their general health, efficiency and productivity. In modern mining, especially in coal mining, occupational health hazards are especially associated with chemicals. Chemicals posing a physical or health hazard can enter the body via contact, ingestion and inhalation (Pattanaik, 1999; Karnjana, 2010; NIOSH, 2000) and concentration of gases in coal mines such as methane, co₂ and other airborne and waterborne contaminants can poison mine workers.

Apart from chemical hazards, their performance is affected by environmental problems such as high temperatures and humidity, noise etc. which may cause heat-related illness, especially heat stroke that can result in death. The continuous exposure of the miners to heat stress is unhealthy for health and productivity (MSHA, 2007).

The occupational health hazards are a very serious problem specially in developing countries (MSHA, 2007), where well established methods of hazard control are less likely to be applied because of limited public awareness, low political priority of health and environment maters, limited resources or lack of appropriate occupational and environmental health management (State of Environment Report, 2011-12). The World Health Organization estimated occupational health risk as the 10th leading cause of morbidity and mortality.

4.4.1 Occupational Factors and	d their impact on health
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1) Physical

Physical Agents	Hazards
Heat	Heat Reduced mental alertness increases errors, absenteeism, accidents, heat exhausters, cramps and heat stroke, heart, kidney and brain diseases
Light	Accidents increased refractive errors, miners nystagms, cataract due to infrared radiation
Noise	Noise induced hearing loss, chronic headache, high blood Pressure, heart diseases, impotency etc.
Ionizing Radiation	Acute: radiation sickness, apalstic anemia etc, Chronic: Cancer of skin, blood, bone etc.
Vibration	Raynaud's phenomenon(uncommon in tropical countries)

Source: State Environment Report, Orissa, 2011-12

Type of Dust	Main Health Impact	Target Organ	
Free crystalline Silica	Silicosis (Lung fibrosis) COPD, Lung Cancer	Lungs	
Coal Dust	Coal workers pneumoconiosis, Restrictive lung disease, Heart failure.	Lungs, Bronchial tree and alveoli	
Lead Dust	Systemic intoxication, blood, CNS problems, Gastric problems, Anaemia	CNS, Circulatory system	

(ii) Chemical Coal Dust and its health Impacts

Source: State of Environment Report, Orissa, 2011-12

Odisha is witnessing rapid industrialization and urbanization and increase in demand for mineral resources like coal and iron ore have attracted many industrialists around the globe which is termed as the correct burden of occupational health diseases.

Occupational health is a major determinant which influences workers' productivity and efficiency and highly correlated with the quality of output. So working condition should be compatible with an employee's physical and mental comfort, which can contributes to enhance the job satisfaction by maintaining the normal temperature combating humidity, proper ventilation and workplace etc.

5. Conclusion and Policy Implication

Clean coal is a dream. Everything we do with coal, starting from coal combustion to waste disposal and all the preparation and transportation process, adversely affect local health and environment.

While government advocates that a given mining project will result in positive economic benefit for a region and will bring in X number of foreign exchange, at the same time government should take into account the real cost for health deterioration and environmental degradation. While economic benefits of a mining project are short term the costs regarding health hazards and environmental pollution may be a long term problem. In this situation the sustainable development is required. As citizens, we have to become aware of the externalities that could result from a mining project and ensure that externalities should be considered by government before they grant a permit for a project to go ahead.

It has been seen that the coal mining activities are associated with serious local environmental challenges and hence monitoring of environmental parameters in local area

is required. Though the environmental monitoring system is not an easy task first the problem of environmental degradation affecting the mining cluster will be identified at micro level and then a robust environmental monitoring system will be established there.

In a coal mining region, training on the clean development mechanism, cleaner production, low carbon efficient technologies and pollution abatement measures should be organized by the government of odisha (Steel and Mines, Directorate of Mines & State Pollution Control Board) and with the associated stake holders (Indian Bureau of Mines and Mining lease holders).

Creation and maintenance of green zones in coal mining clusters should be a regular activity by the government of Odisha and mining companies. The green zone will serve as additional carbon sink and can contribute towards building local environmental benefits. In order to avoid occupational health hazards and diseases, education and appropriate training etc. should be provided to the illiterate miners regarding the environment and working conditions.

Lastly, the government should create adequate industrial environment and conducive working conditions for the workers in the coal mines so that those who produce "black diamonds" are benefited and help strengthen the country's economy.

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Economic and Working Conditions of Mining Labourers in Keonjhar District of Odisha

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Mining is a non-sustainable activity linked to non-renewable natural resourses. Exploitation of mineral resources is significant from the point of view of employment opportunity and living status of workers, growth of mineral-based industries, earning of foreign exchange etc. as prerequisites for economic development. Keonjhar district in Odisha has 83 working iron ore, manganese and chromite mines in the Joda and Keonjhar Mining Circles. Out of total minerals obtained in Odisha, Keonjhar district provides 75.72% of iron ore, 80.91% of manganese and 2.35% of the chromite of the State occupying a significant place in the mineral map of the country. The mining and quarrying sub-sector contributes 7.5% towards Odisha's real GSDP at 2004-05 prices (Economics Survey of Odisha 2012-13). Some major sites of mining activities of the district are Thakurani, Joda East, Banspani, Gandhamardan, Bhadrasahi, Joda West and Bolani covered under both public and private sectors. Percentage of tribal population in the district is 44.52. Compiled data from mining circles and published sources show that the daily average employment of the lobourers in the working mines is 16799 out of which 81% are males and 19% are females (District Statistical Handbook -2009). The present paper examines various issues such as the structure of the labour market, methods of recruitment, picture under departmental and contract system, working and living conditions and labour welfare measures. Local labourers constitute about three-fourths of the total labourers. The percentage of women workers is lower in comparision to the male workers. Contract labourers and casual workers those who are unorganized are more than two-thirds of the total labourers in the private mines. They work under exploitative and unscrupulous practices of the middlemen, with long working hours, underpayment of wage, irregularity in payment, wage disparity between male and female workers and insecurity of job. They are excluded from labour legislations and social security measures. Provision of the labour welfare measures relating to congenial working environment, housing facilities, drinking water, hospital, crèche etc. are better in TISCO mines at Joda and SAIL mines at Bolani compared to many private sector mines. Hence, the paper focuses on the need for policy measures such as a standardized wage

structure, statutory labour welfare measures, decasualization of workers, taking care of occupational hazards and productivity linked welfare approach for the amelioration of the socio-economic standard of mine workers.

Keywords : Employment status, Labour welfare measures, Working Conditions.

1. Introduction

Development of mining industry is a milestone in the field of industrial development of the country. Mining is a non sustainable activity linked to non-renewable natural resources. Exploitation and exploration of the mineral resources are of great significance from the point of view of revenue raised in the form of royalities, employment opportunities and livelihood status of workers, growth of mineral based industries and earning foreign foreign exchange, those are pre-requisites for economic development. In recent years the mining and quarrying sub-sector has been contributing about 7.5% towards Odisha's real GSDP at 2004-05 prices in 2012-13. In terms of value of minerals, Odisha ranks the highest in India, 11.89% and the share has been increasing. Mines Act 1952 defines a mine as "any excavation where any operation for the purpose of searching or obtaining minerals has been or being carried on". Excavation may be open cast or under ground including all processes. As per the Mines Act 1952 a person is said to be employed in a mine who works under appointment by or with the knowledge of the manager, whether for wages or any other mining related operation.

Keonjhar district in Odisha is enriched with intensive deposits and abundance of mineral resources like iron ore, manganese and chromite of superior quality. The total number of mining leases granted in the district is to 108 mines for iron ore, manganese and chromite of which 83 are working and 25 are non-working mines covering a total lease area of 29753.45 hectares, providing employment opportunities in the tribal belt. Out of this 19173.44 hectares are forest land and 10580.00 hectares are non forest lands. Among all the mines in the district iron ore mines are the highest consisting of 62 mines (District Statistical Handbook 2009). The district occupies an important place in the mineral map of the country for its intensive deposits of iron ore, manganese and chromite. Out of the total minerals obtained in Odisha Keonjhar district provides 75.72% of the iron ore, 80.91% of manganese and 2.35% of the chromites. Some of the sites of important iron ore deposits are Thakurani, Joda East, Banspani and Gandhamardan hills. Manganese ores are abundantly found at Nalda, Barbil, Bhadrasahi, Joda, Kolimati and Raida. Abundance of Chromite is found at Baula. Bolani Ore mines under SAIL and Gandhamardan Ore mines under Odisha Mining Corporation in the Public Sector and Joda East Iron Ore and Joda West Manganese under TISCO and a large number of private mines are working in the district. There is a high concentration of tribal population in the district which is 44.5% of the total population

of the district. Tribal women constitute 44.9% of the total female population of the district. Out of 13 blocks in the district, 10 blocks have the incidence of tribal population which is more than 50%. The block with the highest tribal population is Banspal (78.59%).Compiled data from the mining circles and published sources show that the daily average employment of labourers in the working mines is 16799 out of which 81% are males and 19% are females with larger concentration in the Iron Ore Mines (District Statistical Handbook, Keonjhar, 2009, Economic Survey of Odisha 2013-14).

Table-1 states the Tribal population, Literacy Rate and the Human Development Index of the mining districts of Odisha.

District	Tribal population	HDI		Literacy Rate
	as percentage total	ValueRange (0-1)	Rank	
Keonjhar	44.52	0.53	24	69.00
Sundargarh	50.74	0.683	4	74.13
Koraput	50.67	0.431	27	49.87
Mayurbhanj	57.87	0.639	9	63.98
Odisha	23	0.579		73.45

Table-I: Tribal Population, Literacy and HDI of Mining Districts of Odisha

Source : 1. Economics Survey of Odisha, 2010 -11. 2. Districts at a Glance, Odisha, 2012.

Keonjhar district is the mining belt of Odisha covering about 31% of the total mining lease area which is highest among the districts. Though its percapita income is above the state average it is ranked 24th among the 30 districts in Odisha according to Human Development Index (Odisha Human Development Report 2004).Percentage of Tribal Population in the district is 44.52 and literacy rate 69.00.

In this context the paper pursues the following objectives :

- (i) To analyse the structure of the labour market and composition of mining workers and show a comparative picture of the mine workers under departmental and contract system of recruitment.
- (ii) To examine the working and living conditions of the miners in the public and private sector mines.
- (iii) To discuss the labour welfare measures adopted to protect the interest of the miners.
- (iv) To investigate the principal causes of absenteeism, labour turn over and the fluctuating character of the miners.

1. Composition of the Miners

The Keonjhar District has broadly two mining circles, Keonjhar and Joda. The

composition shows that male workers are higher than female workers and local labourers are predominant in most of the mines compared to the outside labourers. The percentage of women has been going down in mechanized and semi-mechanised mines like Joda East Iron Ore, Joda West Manganese under TISCO and Bolani Iron Ore Mines under SAIL. Women are not employed in the Baula Chromite underground mine because of the ban made by Mines Act 1952. While semi-skilled and unskilled workers are more in the open cast mines, skilled workers constitute larger proportion in the mechanized and semi-mechanized mines.

Employment of different categories of labourers in some major Iron Ore and Manganese Mines is shown in Table-2.

Name of	Name of		Ski	led			Unsk	ilied			Senia	skilled		
the Lessee	Mines	Los	cal	Outs	ider	Loc	al l	Out	sider	Lo	cal	0.0	sider	Total
		M	F	M	F	M	F	M	F	M	F	M	F	
Sarada Mines (P) Ltd.	Thakurani Iron Ore Mines Block(B)	300	5	365		438	-		-					1108
Mis M.L. Rungta	Slijoda- Kalinati Mangarese Mines	180	-	56	-	34	6	38	-	253	167	85	70	889
Mis Rungta Mines Ltd.	Jajang Iron & Manganese Mines	268	1	64		54	10	13		371	11	25		817
R.P.Rao	Gual Iron Mines	239		221		136		32			•			628
Mis Tata Steel Ltd.	Joda West Manganese Mines	35	1	74	-	94	65	4	-	-		-	-	273
MB OMDC Ltd.	Bhadrasahi Iron & Manganese Mines	58	3	21		24	41	5	21	-		-	-	173
Mis B.P.M.E. Ltd.	Thakurani Iron & Manganese Mines	108	6	84	-	33	7	84	8	-		-	-	330
Mis Essel Mining & Industries Ltd.	Jilling Longalata Iron & Manganese Mines	559	2	228		706	207	353	40	-		-	-	2095
Mis SAIL	Bolani Iron Ore Mines	402	10	173	2	105	17	45	10					765
Mis Tata Steel Ltd.	Joda East Iron Mines	305	-	115	-	5	-	2	-	-		-	-	427
Mis. MESCO Steel	Roida-1 Iron Mines	154	-	44		165	6	53	-	-		-	-	422
Mis K.J.S. Ahluwali	Nuagaon Iron Mines	58	-			271	36		-				-	363
Total		12684 (32.13)	28 (0.33)	1445 (17.45)	2 (0.02)	2065 (24.90)	395 (4.78)	630 (7.59)	79 (0.95)	624 (7.54)	178 (2.14)	110 (1.33)	70 (0.84)	8290 (100.00)
Total in 45 Mines of Joda Circle		3161 (29.47)	105 (0.98)	1922 (17.92)	119 (1.10)	2477 (23.08)	693 (6.40)	689 (6.42)	79 (0.73)	1002 (9.34)	259 (2.42)	149 (1.38)	74 (0.69)	10729 (100.00)

Table-2: Employment of Different Categories of Labourers in Some Major Iron and Manganese Mines

Figures in the parentheses show percentages of total

Source: Deputy Director of Mines, Joda Mining Circle, Joda, Keonjhar 2011-12.

It is evident from Table-2 that local labourers constitute 71.74% and the outside or migrant labourers 28.6% in 45 mines in the Joda Mining Circle. Similarly, the male mining workers are significantly higher (87.61%) than the female workers (12.39%). Among the 12 major mines the skilled workers constitute 50.05% males and only 0.35% females. Further, the local workers constitute 71.9% and outsiders are significantly low constituting 18% in 12 major mines. The male workers are dominant constituting 91.02%.

The labour status in the Keonjhar Mining Circle from 2003-04 to 2008-09 is shown in Table-3.

Year	Skilled	Semi-skilled	Unskilled	Total
2003-04	1315	3861	401	5613
2004-05	1525	4471	907	6903
2005-06	1130	6330	1113	8573
2006-07	1188	6805	1080	9073
2007-08	1154	6868	1212	9234
2008-09	1517	5595	1781	8893

Table-3: Labour Status in Keonjhar Mining Circle

Source : Keonjhar Mining Circle 2009-10.

Table-3 reveals that there is a fluctuation of the skilled, semi-skilled and unskilled workers over the years. The semi-skilled workers in the latest available year 2008-09 is the highest (62.91%) followed by unskilled labourers (20.04%) and skilled (17.05%). In the Keonjhar circle some major Iron Ore Mines operating are Gandhamardan Iron Ore under OMC and Putulpani Mines under M/s GSI (P) Ltd. in the Banspal block. The Chromite Mines are at Baula under FACOR, Nuasahi Mines under IMFA and Bangur Mines under OMC.

1. Working and Living Conditions

Most of the tribal mine workers are engaged in collecting various forest products like firewood, timber, mushroom, muhua flower, sal leaves, tamarind etc. as a source of livelihood. Forest resources and grazing lands have shrinked due to mining activities adversely affecting their dependence on collecting NTFP and agriculture. While the regular or departmental workers consider mining work as their principal occupation the contract or unorganized labourers consider it as their subsidiary occupation. They are also engaged in agriculture, poultry, goatery and various supplementary occupational activities.

In the mines the contractual labourers work under insecurity of job, irregularity of employment and exploitative malpractices of the middlemen. However, in case of departmental workers the contravention of the labour legislations is rare and they work under better conditions. Working in mines involves physical danger, muscular and nervous strain, monotony, noise, unhealthy dust and air conditions which dampen their efficiency (Behera, 1997). The regular open cast mine workers get leave facilities if worked at least 240 days during the preceding calendar year. As gathered from Field Study reports 90% of the Joda households report income benefit from mines compared to only 36% in Keonjhar Sadar. On an average one person per household is employed as daily labourers in mines (Vasundara,2008). The prevailing minimum wage rates are Rs.150/- for the unskilled, Rs.170/- for the semi-skilled and Rs.190/- for the skilled workers. The average monthly earnings of the contractual workers varies from Rs.3000/- to Rs.6000/-. However, the departmental workers have monthly income from wages and bonus ranging from Rs.15000/- to Rs.18000/- varying in different mines. Gross reduction in Forest land due to mine and associated activities has led to reduction of income in collection of NTFPs from the local forest (Vasundara, 2008, Sahoo, 2013).

In the income expenditure pattern the regular workers have less indebtedness and more savings than contractual workers. A substantial portion of the wage income and bonus is spent on food items, clothing, beverages like smoking and drinking etc. The contractual and irregular workers live in growing debt and distress because of inadequate earnings and pressing family expenditure. The standard of living and livelihood of the departmental workers are better than contractual and casual workers. The miners live in 'bustees' or 'huttings' which are filthy, congested, insanitary, gloomy and ill-ventilated. But in TISCO and SAIL more than 80% of workers are provided with quarters. The conditions are considerably improving in Jhillong, Thakurani and Banspani Mines. Hence, the standard of living of the mine workers in large number of small private sector mines is not satisfactory and their livelihood need improvement. 'Joda mining region belongs to the 'high mine exposure' category with average work place distance of 2 kms and Keonjhar region 'low mine exposure' category with average distance to work place of 12 kms. In the former 90% of the households and the latter 36% of the households get income benefits from employment in mines' (Vasundara, 2008).

2. Labour Welfare Measures

Labour welfare measures in the context of socio-economic conditions of the miners include facilities and amenities as adequate drinking water, canteen, rest and recreational facilities, sanitary and medical facilities, first aid, accommodation, educational facilities for their children, crèche facilities for the women workers etc. The labour welfare facilities are financed from different sources such as employer,

state, levy of cess on production etc. In the Keonjhar district hospital facilities for the miners are available at Gandhamardan OMC Hospital, Dubuna Dispensary, TISCO Hospital at Joda, Bolani Ore Mines Hospial, Boula Chromite Hospital etc. First aid facilities exist in large number of mines. Housing facilities are largely available for TISCO and SAIL mine workers and is also existent in many major mines of the district. Financial assistance is given to the miners children in the form of books, writing materials, dresses and scholarships. Provision for festival advance also exist, housing building advance, medical advance, mortorcycle advance etc. exist under OMC, TISCO, SAIL and many other bigger mines. Creche facilities are also available for the women workers.

Besides these, cooperative societies are also available for the benefit of the mine workers. In the peripheral developmental measures provision for community centres and playgrounds are available. The welfare measures provided by the mines under TISCO, SAIL, OMC and some other major private mines are satisfactory. However, many casual labourers are deprived of the scope of many social welfare legislations. Welfare differentiation and discrimination between monthly paid employees and casual workers are noticeable. Safety provisions at the place of work exist under TISCO, SAIL and bigger mines providing protecting safety appliances such as helmets, masks, boots, gloves, guggles and safety clothes. However, the contractual workers are deprived of the benefits of labour legislations such as Employees Provident Fund Act 1952, Maternity Benefit Act 1961, Workmen's Compensation Act 1923 and such other statutory provisions.

3. Absenteeism and Labour Turn Over

Absenteeism exists as voluntary absenteeism and involuntary absenteeism. The former arises due to sickness, habitual drinking, attending social and religious ceremonies, local hat, melas, rainy days, etc. while the later is due to accidents, strikes, lockouts etc. Labour turn over implies the extent to which the old workers leave and the new workers enter. It has two aspects, the separation rate, which depicts the proportions of workers who go out of employment to the total on the rolls, (2) The accession rate which shows the proportion of workers who enter the employment to the total on the rolls. These rates are higher in the mines managed by the contractors than under the departmental system. This creates high degree of instability of workers and floating character in the labour market. Factors attributing to this instability are insecurity of employment, unsatisfactory working conditions, variations of wage rate, non-implementation of labour welfare measures and lack of trade unions. Increased mechanization and semi-mechanisation in Joda East Iron Ore, Joda West Manganese, Bolani Iron Ore and Baula Chromite have adversely affected the employment position of the mines. Adoption of capital-intensive methods in miners has worsened the situation in a 'soft' labour market.

4. Findings and Policy Suggestions

Mine workers in a tribal setting are floating in character in the unorganized sector working as casual labourers and contract workers. This is more dominant in many private sector mines than in the public sector mines such as under OMC, SAIL etc. However in the private sector, some major mines like under TISCO Essel Rungta etc. situation is relatively a stable labour force. The labour market is characterized by greater volatile nature because of seasonal migration of the contract labourers. There is dearth of stable and committed labour force reflected in high rate of absenteeism and labour turn over and migratory nature of the workers. The unskilled labourers are more among contract labourers. Due to soft labour market the miners work in a disadvantageous situation with irregularity in employment, being deprived of the benefits of labour legislations. Among the miners the local labourers constitute 72% and the outside labourers about 28%. The women workers constitute an insignificant position among the departmental workers (about 13%) compared to the males which is 87%. Mechanised and semi-mechanised mines such as Joda East Iron Ore and under SAIL have more of skilled labourers than unskilled labourers. As a whole semi-skilled workers constitute the highest among all the mines workers. They provide better labour welfare facilities and labour welfare measures than many other private mines. So also the occupational safety measures are taken better for the departmental workers than contractual workers. The income expenditure pattern and standard of living of the TISCO and SAIL mines workers have undergone significant changes compared to other mining workers.

From the foregoing analysis following suggestions need to be imperative for amelioration of the conditions of the miners and improvement of their working and living conditions.

- (i) A standardized wage structure must be fixed taking into account the productivity of the workers and need-based minimum wage.
- (ii) There is an imperative need for proper control and regulation of contract and casual workers by regularization, decasualization and enlistment of such workers.
- (iii) Priority should be accorded on the development of rural infrastructure such as transport, communication, banking, power etc.
- (iv) Adequate provision of safety appliances such as safety drobes, leg guards, guggles, helments, boots nose masks etc need to be provided. Accidents and occupational diseases must be dealt with in both preventive and curative aspects.
- (v) Large number of mineral-based industries should be set up to widen the labour market with linkage effect on profitability and employment position.

- (vi) A separate statutory body ought to be set up to enquire into the problems of the miners such as employment conditions, work culture, health and safety of workers and welfare provisions such as education of their children, drinking water, first aid, rest shed, crèche etc.
- (vii) Public policy must ensure strict and effective implementation of the legal and constitutional provisions on wages, employment and labour welfare to protect the workers' interest.
- (viii) Mineral rights need to be granted to the investors having both technical and financial competency in adoption of sustainable development.
- (ix) Regional impact surveys need to be carried out in different mining sub-areas on economic, social and environmental issues.

Labour welfare in the mining sub-sector is not a charity. Workers contributing to productivity and profitability of the mines ought to be duly rewarded in terms of wages and various labour welfare measures. It requires an active and tripartite cooperation of the employers, Government and the workers for the amelioration of the standard of living of the 'men of the mines'. Recruitment of labourers through regular channels, providing them the benefits of constitutional labour legislations and workers involvement in the process of management will no doubt make the workers more committed to work for the benefits of the workers and the employers and the organization. Contributing to the social sector development like education, health, housing and drinking water as peripheral development measures and taking care of environmental hazards can make mining as a thrust area for economic and social development.

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Illegal Mining Activities in Odisha: A Critical Analysis

Gitanjali Panda¹

This paper examines various dimensions of irregularities in the mining sector and the cause behind such irregularities. The economic significance of mining sector in the context of Odisha Economy is given, based on the data of Odisha Economic Survey and data obtained from Directorate of Mines. It discusses the socio and economic impact of large-scale corruption in mining sector. The Karnataka model of streamlining mining activities is described briefly with the future possibility of such a model being replicated in the context of Odisha. At the concluding part suggestions for the future policy with regard to Forest Act to act as a deterrent and the role of the State are discussed.

Key words:, CEC, FDT, National Mineral Policy, Shah Commission Report

1. Introduction

Minerals have been major natural resource exploited by humans from times immemorial. The rapid industrialization and infrastructure development have resulted in increased demand and large scale exploitation of the mineral resources. In this regard, National Mineral Policy, 2008, recognizing minerals as vital raw material for infrastructure, capital goods and basic industries, emphasizes on the need for adoption and use of scientific methods for maximizing mineral exploration and prospecting for mining, and economic utilization. It also identifies key priority areas such as enhancing resource and reserve base through exploration and internal acquisition, reducing permit delays, putting in place core enablers (infrastructure, human capital, technology), ensuring sustainable mining and sustainable development around mining; creating information, education and communication strategy to achieve the goal.

The process of Globalisation, Privatisation and Liberalization and number of legislations after 1990's in the mineral sector have permitted (both domestic and foreign) investment in mineral sector. Indian mining sector was opened to foreign direct investment in 1993 and was further liberated in 1997 with automatic approval. Rampant mining activities took place in states like Odisha, Goa and Karnataka which can be ascribed to the spurt in the

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international prices of steel and iron ore which made export of high quality iron and ore very lucrative and also rise in demand for steel and aluminum caused by industrialization. There was a windfall profit margin due to low average cost of production of iron ore around Rs.150 per ton while the international price of ore was \$150 to \$200. The cost of extraction is only 10 % of total sales revenue, giving the profit margin as high as 90%. Royalities to be paid to the Government was abysmally low. So, it attracted large scale private as well as global investors, being the investment destination in the last two decades. High margin of profit is an incentive for growth of any sector, but profiteering needs to be discouraged for the larger welfare of the society.

2. Objectives and Methodology

The paper attempts to discuss the various aspects of violation of the rules and regulations relating to sustainable mining, based on an informal discussion with one of the members of Shah Commission. Data relating to employment generated in mining sector, revenues and value of extractions from minerals in Odisha are collected from Directorate of Mines, Bhubaneswar to portray the status of Odisha in the Mining Map. Compound growth rate of revenues and State Gross Domestic Production are calculated for the period 2001-2012 for analysis, using the data from Odisha Economic Survey, 2011-12. Views are obtained through informal interviews with Forest Officers.

3. Corruption in Mining Sector

The ramifications of rampant mining activities led to flow of soft money in the market which caused serious systemic distortions because it became easy for the mine owners to be involved in large scale corruption in the form of bribing politicians and bureaucrats. Complaints of profiteering through illegal mining with the complicity of the authorities in all levels of Government were brought to the light in Odisha as well as in other mineral rich states. The Shah Commission has brought into light the different forms of irregularities, comprising of following forms:

- 1) Grant of mining lease to the applicants on considerations other than merit: Irregularities are found concerning allotment of mining leases. In Orissa the allotment was done on first cum first served basis which has given a scope for the nexus between politicians, people and officials. The scope for nepotism was high. Central Government and the State Government have been indicted on illegal mining of iron and manganese ore by the Shah commission.
- 2) Illegalities involved subsequent to grant of leases are mining without necessary permits. Mining activities have taken place without necessary clearances like Forest Preservation Act and Environmental clearance of Pollution Control Board. There has

been large-scale violation of environment and forest laws, rules and notifications. Out of 192 mining leases of iron and manganese ores in the state, 130 leases were noted to be doing production without lawful authority in violation of Environmental Impact Assessment notifications 1994 and 2004.

- 3) Large-scale encroachments outside the permitted areas and also mining beyond permitted quantities, illegal transportation of minerals and overloading of iron and ore are the other forms of irregularity.
- 4) Illegalities involved in export of iron and ore. The Shah Commission has also traced freight evasion cases by iron ore exporters who move the mineral under domestic movement category by showing false excise certificates.

4. Sound socio-economic logic behind encouraging mining by private sector and its contradiction in reality

The ostensible rationale for allowing mining by private entities is as follows:

- Efficiency, better capacity utilization, more employment and higher rate of return to the country by way of various Taxes.
- Private sector, with its emphasis on process-efficiency and innovation, is expected to accomplish this rather naturally.
- With less expenditure and high turnover, profits for private miners would swell but so would be the gain to government by way of taxes which depend on such profits.

Thus, a commonly cited argument is that private mining can generate a lot of revenue to Government since such companies will be able to get higher turnover of Iron Ore with lesser expenditure (compared to a government mining company) resulting in higher accrual of corporate income tax which is around 30% of the taxable income of the state?. The reason behind inadequate collections of revenue came into light after the comparative analysis of the annual financial statements of Govt. and Private Companies. The comparative analysis of the financial statements (Balance Sheet, Profit and Loss Account, Directors Report) was done to assess the correctness of the logic in the context of Odisha mines. The turnover considered is the sales turnover and the expenditure incurred includes the cost borne towards ore extraction, transportation expense, employee salary and benefits, depreciation etc. Profit on which tax is to be imposed is the declared Profit Before Tax(PBT)

But the private mining companies do not appear to be half as efficient as Government mining company because they spend more than double amount in raising of iron ore as compared to a Government Company. On the other hand, they generate limited employment compared to Government Company. Thus the basic rationale of allowing private mining based on efficiency, better resource utilization, employment generation etc appears to be wrong. The real reason behind these enormous amount of tax-deductible expenses is due to padding up of 'expenditure 'by showing bogus business activities and making huge payments to sham Companies as a part of intricate veil for non-existent services that have been adopted as an instrument for Tax evasion. The NMCD(National Mining Development Corporation), a public sector company has reflected 16 % of total sales as expenditure and profit before tax as percentage of sale is 84% whereas Indrani Pattnaik's company reveals 55.01% of total sales as expenditure and 47.69% as profit with the objective of evading taxes. There has been an attempt on the part of the private players to hide up profits in the books of accounts to evade taxes by showing 80 % of their turnover as expenditure which deprives the state exchequer of its revenue.

5. Economic Significance of Mining Sector in terms of Revenue and Employment Generation in Odisha and the socio-economic impact of Corruption

Odisha is one of the mineral rich states of the country having a special distinction in the country's overall mining sector. The total value of minerals produced in Odisha is highest in the country. Its share in the all India total is 11.89% while it is 7.13% for Rajasthan and 6.74% for Gujarat. The contribution of other states like Madhya Pradesh, Assam, Andhra Pradesh, and Karnataka is 4.99%, 4.79%, 4.63% and 3.78% respectively. As per the Odisha Economic Survey 2011-12, state ranks highest in India in recent years in term of value of output of minerals and its share has been increasing. The mining sector contributes about 7.3% of the real GSDP of Odisha. Being a favored investment destination of global investors, this sector seems poised for rapid growth. In terms of value of mineral production, mineral production at national level had the share of 25.64%. It is indicated that though Orissa is having the highest resource base, the contribution of minerals to GSDP is not satisfactory. But the irony of the situation is that despite being the most mineral –rich state, it is one of the poorest state of the country, few people of the state are becoming rich capitalist at the cost of the state natural resources.

Mineral resources are linked to land, forest and water. Extraction of minerals causes damage to other resources like land, forest and water, which are sources of our lives, livelihoods, culture and civilization. These are as important as minerals for the growth and development of the state.

YEAR	No.of	Annual Growth	Total Organised	Annual Growth Rate of
	Employment	of Employment	Sector Employment	Employment in the
			in the State	Organised Sector
2004-2005	49837		7.46 (in lakhs)	
2005-06	55764	11.89	7.45	-0.13
2006-07	47376	-15.042	7.16	-3.89
2007-08	49176	3.801	6.88	-3.91
2008-09	44167	-10.19	7.00	1.74
2009-10	43705	-1.05	7-35	5.00
2010-11	51877	18.69	7.31	-0.54
2011-12	48263	-6.99	7.22	-1.23
2012-13	59417	23.11	7.13	-1.25

Table-1: Employment Generation in mining sector vis-à-vis employment in the State Organised Sector

Source: Directorate of Mines, Orissa; Odisha Economic Survey, 2013-14

Mining and Quarrying provides employment to different sections including tribal groups. Table 4.1 shows the number of workers directly engaged in various mining activities since 2004-05. There has been negative growth in some of the years because this sector has been increasingly employing labour-saving and capital-intensive production techniques and technology over the years. However, the employment has touched 51,877 by the end of 2010-11 showing an increase of 18.7% over 2009-10. From equity point of view the mining sector is not conducive for poverty alleviation through employment generation. During the period of the study i.e., 2004-13, there has been deceleration in the employment generation in the State as well, though the degree of variation in the annual growth rate of employment in the State as whole is less compared to that of mining sector.

The size of mining sector has grown at a compound rate of 26.69% (in terms of value of production) more than that of State GSDP which has grown at a rate of 17.8% during 2001-2011. Percentage of revenue from mining sector of total revenue was hovering around 5.35% to 5.60% during 2001-2008, it increased to 10.08% in 2011-2012. Revenue from mining sector has not shown satisfactory growth in consonance with the rising extractions. The expenditure for social sector and development work has faced downsizing due to lack of funds with state government whereas the low royalty paid by lease holders because of defective methodology adopted by IBM for determining the sale price has created inequalities and concentration of wealth in few hands.

Dalits and Tribals comprise two fifths of Odisha's population. Increased mining activities and establishment of mining processing industries have generated a process of state supported expansion of corporate control over land and other resources. This has consequently dispossessed Dalits and Tribals of their land and livelihoods. Mining has adversely changed land utilization and ownership patterns, thereby increasing the hardship of landless agricultural workers, share croppers and different categories of farmers. Displacement, escalation of land price and inability of marginalized farmers to record encroached lands in their names have led to erosion of rights over agricultural land.

6. Steps taken by Karnataka Government for Streamlining Mining Activities

Streamlining of the mining sector has already been started in Karnataka recommended by CEC(Central Empowered Committee) which has been approved by Honorable Supreme Court. Mandatory e-Auction of iron ore/manganese under the supervision of the monitoring committee is being carried out. Out of the total sales revenue, 30 % of the revenue is to be given as income tax and 12 % is to be collected as Forest Development Tax and 4% as VAT and 10 % as Royalty. There is a proposal to create Special Purpose Vehicle (SPV) for infrastructure development and implementation of Comprehensive Environnent Management Plan (CEMP) of the three districts of Bellary, Chitradurga and Tumkur where 15 % of the total sales will be deposited.. Ten per cent, being the cost of production, the profit margin is reduced to 15 to 20% which is reasonable. Definitely, the present provisions implemented in Karnataka would generate more revenues for the state and will reduce the profit margin of private miners.

Presently Forest acts do not have enough deterrence to dissuade miscreants from committing offences with regard to illicit extraction and transportation of mineral resource from forest area Since most of the areas rich in mineral resource, including the iron ore leases, fall in forest area, following provisions need to be part of our Forest Acts:

- Mineral related offences including encroachments to be brought under the cognizable and non-bail able category.
- Section that provides for confiscation of tools, vehicles etc, used for committing certain category of forest offences should also include offences of illicit extraction and transportation of minerals from forest areas.
- In cases of serious offences committed by the lessees of mineral leases in forest land, provision should be incorporated for forfeiture as provisioned under Section 82 of Karnataka Forest Act.

7. Conclusion

There should be a credible system of check and balances in the process of extraction, transport, and trade and end-user point. The Information and Communication

Technology((IC&T) should be deployed for effective control and regulation over mining activities. Forest Development Tax should be collected meticulously for the restoration of affected forest areas due to mining activities. A special fund should be created for the social sector development of the mining affected areas.

The doctrine of public trust is the principle that certain resources are preserved for public use, and the government is required to maintain them for the public's reasonable use. So, government is the trustee and should conserve it on a sustainable basis. Since it is not the owner of the land, it has to carry out its responsibility of a responsible trustee.

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Royalty Rates and Revenue Accrual Across the States in India

Rajan Kumar Sahoo¹

Introduction

Royalty from public domain especially from minerals extracted from mines is an important source of revenue of State Government. State Governments like Chhattisgarh, Jharkhand, Karnataka, Odisha and Rajasthan who have Major Mineral resources are continuously demanding the Central Government for enhancing royalty rates to increase their public revenue. So in this context it is relevant to know the existing royalty rates, revenue accrual across the states and its future prospect for the revision of rates of royalty and dead rent.

Meaning of Royalty

A royalty is a payment made to the Government to compensate for the extraction of a resource owned by the community. A royalty is therefore a purchase price, not a tax, Royalties are paid by the holder of a mining tenement.

Provision of Revision of Royalty Rates

The Mines and Minerals (Development and Regulation) Act 1957 of the Central Government has provision to enhance or reduce the rate of royalty in respect of minerals with effect from the date of notification. The Central Government shall not enhance the rate of royalty in respect of any minerals more than once during any period of three years. Under section 94(2) of the Act the Central Government may amend the Third Schedule as to enhance or reduce the rate of which the dead rent shall be payable in respect of area shall be payable in respect of area covered by mining lease.

Existing Royalty Rate of Some Minerals

Minerals	Rates of Royalty
Bauxite and Laterite	a) Zero point five zero percent of London Metal Exchange
	Aluminium Metal price chargeable on the contained
	aluminium metal in ore produced for those despatched for
	use in alumina and aluminium metal extraction.

The existing royalty rates of some important industrial use minerals are given below:

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b) Twenty five percent of sale price on ad valorem ba					
	those despatched for use other than alumina and aluminium				
	metal extraction and for export.				
Chromite	Ten percent of sale price on ad valorem basis.				
Copper	Four point two percent of London Metal Exchange Copper				
	Metal price chargeable on the contained copper metal in ore				
	produced.				
Iron ore: Lumps fines	Ten percent of sale price on ad valorem basis.				
and concentrates					
all grades					
Lead	Seven percent of London Metal Exchange Lead Metal price				
	chargeable on the contained lead metal in ore produced. Twelve				
	point seven percent of London Metal Exchange Lead Metal				
	Price chargeable on the contained lead metal in concentrate				
	produced.				
Lime Stone	Seventy two rupees per tonne.				
a) L.D. Grade (less					
than one half percent					
silica content)					
b) Others	Sixty three rupees per tonne				
Manganese Ore					
a) Ore of all grades	Four point two percent of sale price on ad valorem basis				
b) Concent rates	One point four percent of sale price on ad valorem basis				
Zinc	Eight percent of London Metal Exchange Zinc Metal price on ad				
	valorem basis chargeable on contained Zinc Metal in ore pro-				
	duced. Eight point four percent of London Metal Exchange				
	Zinc metal price on ad valorem basis chargeable on contained				
	zinc metal in concentrate produced.				

Accrual of Revenue due to Royalty for Major Minerals

A revision of royalty rates has been made vide notification dated 13th August, 2009. The royalty collection for major minerals in the country has increased from Rs.2319.21 crore in 2008-09 to Rs.4463.75 crore in 2009-10 and to Rs.7279.49 crore in 2010-11. Till December 2011 the total royalty collection stood at Rs.5828.82. State wise increase in the royalty collection from 2009-10 till Dec. 2011 reveals that during 2010-11 the accrual of royalty has increased in case of Andhra Pradesh, Chhattishgarh, Gujarat, Goa, Jharkhand, Karnataka, Kerala, Maharashtra, Odisha, Rajasthan, Tamilnadu. Among these states Chhatishgarh, Goa, Jharkhand, Karnataka Odisha & Rajasthan are the states who earn major part of royalty from minerals. During the year 2011-12 though the figure for royalty accrual is given for 9 months of a year, we find out that the royalty accrual rate has decreased for all other states except Jharkhand, Odisha, Gujarat and Maharashtra.

Sl. No.	State	Royalty		
		2009-10	2010-11 (B)	April 2011 to Dec.2011(P)
1	Andhra Pradesh	370.92	381.91	245.73
2	Assam	0.94	0.73	0.67
3	Bihar	NA	Na	0.46
4	Chhatisgarh	474.39	1196.55	757.90
5	Gujarat	192.90	193.89	258.74
6	Goa	285.91	959.12	352.05
7	Himachal Pradesh	47.98	NA	43.62
8	Jammu & Kashmir	NA	NA	1.03
9	Jharkhand	202.33	440.24	248.88
10	Karnataka	430.10	708.44	288.01
11	Kerala	8.81	9.40	2.85
12	Madhya Pradesh	351.45	324.55	142.72
13	Maharashtra	84.85	132.70	151.14
14	Meghalaya	7.24	13.0	6.72
15	Odisha	894.44	1598.05	2365.43
16	Rajasthan	987.45	1182.23	774.89
17	Tamilnadu	130.56	138.56	87.02
18	Uttar Pradesh	NA	NA	0.20
19	Uttarakhand	NA	NA	0.64
20	West Bengal	NA	NA	0.14
	TOTAL	4469.75	7279.49	5828.84

Royalty Accrual For Major Minerals (Excluding coal & lignite)

Source: Annual Report 2011-12, Ministry of Mines, Government of India

Study Group on Revision of Rates of Royalty and Dead Rent

The Ministry of Mines has constituted a study Group under the chairmanship of Additional Secretary (Mines) for review and revision of royalty rates and rates of dead rent for minerals (other than coal lignite and sand for stowing) on 13th September, 2011. Other members of the study group are Ministries of Finance, Coal, Steel, Department of Atomic energy. Indian Bureau of Mines (IBM), state government of Jharkhand, Karnataka, Odisha, Chattisgarh and Rajastan representatives from FIMI, FICCI, ASSOCHAM and Confederation of Indian Industry.

Review of the existing rates and recommendation for revision of royalty rate will be on the basis of liabilities on the lease holder. The group will consider the feasibility of incentivized royalty rates for lease metals, noble metals REE and precious stones to encourage exploration. It may suggest incentivized royalty rates on ad-valorem basis for concentrated ore. The group may suggest for policies relevant to mineral development & administration of royalty regime and revision in existing rates of dead rent.

The Indian Bureau of Mines has set up separate Monitoring Committee taking into consideration grade wise production, Pit Mouth Value (PMV), sale value of minerals by the lessees.

Furure Prospect for the Revision of Royalty Rates

- i. The social cost of mining is very high, as environmental pollution of higher degree occurs due to mining activities, hence the rate of compensation for environment enrichment is to be enhanced.
- ii. The state government having huge mineral resources get revenue for their development from the royalty of minerals. But it is the central government who revises royalty rates on the recommendation of the study group of the Ministry of Mines. A comparative analysis of the existing royalty rates of India and Australia on few minerals is given in the table below.

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SI. No.	Name of the minerals	Royalty rates		
		India	Australia	
1	Chromite	10%	5.7	
2	Buxite	0.50	7.5	
3	Iron ore	10	7.5	
4	Lead	07	05	
5	Lime Stone	Rs. 72/- per tonne	Rs. 38.44 per tonne	
6	Manganese	4.2	7.5	
7	Zinc	8.4	5	
8	Copper	4.2	5	

#### Royalty Rates of Some Selected Minerals of India and Australia

(Rate in terms of percentage)

Source: 1. Annual Report 2011-12, Ministry of Mines, Government of India.

2. Western Australian royalties rate Mining Regulations 1981 / Agreement Acts royalties@dsd.wa.gov.au, visit-www.dsd.wa.gov.au/royaltyrates

#### Mineral royalty rate analysis consultation paper

From the table we find that the royalty rate of Buxite, Manganese and copper in India is low in comparison to Australia though India is ahead of Australia in respect of Chromite, Iron Ore, Lead, Lime Stone and Zinc. Hence the royalty rate of minerals like Buxite, Manganese and Copper will have to be enhanced as a consequence of which states like Odisha, Jharkhand, Chhatishgarh, Gujarat, Goa, Maharastra, who are rich is minerals will be benefited.

#### Conclusion

Extraction of mineral reserves has resulted in varying degrees of environmental resource degradation and social impacts including displacement. As the people of mining area are adversely affected on various fronts the enhancement of royalty rate is essential and a part of royalty should be earmarked for utilizing for the development of local people.

# Translating words into actions.



An insider view of NABARD's National Seminar on Rural Finance.

National Bank for Agriculture Rural Development and (NABARD), India's apex development financial institution. organised a National Seminar on Rural Finance at Vigyan Bhavan, New Delhi, Inaugurating the seminar on July 24, 2014, Union Finance Minister, Shri Arun Jaitley, lauded NABARD's "32 useful and productive years' spent in nurturing agriculture and rural development in the country.

Dr. Harsh Kumar Bhanwala, Chairman, NABARD, in his



Shri Arun Jaitley, Union Finance Minister, inaugurating the seminar. Also seen are Dr. Arvind Mayaram: US, Finance Secretary, Gost. of India; Dr. G. Sandhu: US, Secretary, Dept. of Financial Services, Gost. of India; Dr. Deepali Part Joshi, Executive Director, RBI: Dr. Harsh Kumar Bhanwala; Chairman, NABARD.

inaugural session outlined the role played by NABARD over the last 32 years and more importantly for project financing, development of SHG-BankLinkage Programme, wadi, watershed, rural infrastructure and Kisan Credit Cards.

The participants, which included illustrious names from the world of banking & finance, deliberated upon three major themes and arrived at the following key decisions:

#### Session 1: Capital Formation and Rural Infrastructure

In Chair: Smt. Arundhati Bhattacharya, Chairman, State Bank of India Go-Chair: Dr. Ashok Gulati, Chair Professor, Agriculture, ICRIER, New Delhi

- Declining share of public investment in total capital formation needs to be reversed
- Immediate thrust is required to raise share of investment credit, which is the main driver of capital formation in the total agriculture credit
- Micro infrastructure needs to be adequately addressed both in planning and funding by Government adopting a PPP approach
- Long Term perspective plan for rural infrastructure needs to be given a policy trust
- Sector-wise master plans by State Governments to facilitate implementation of rural infrastructure projects under emerging areas like 'Rurban'

#### Session 2: Rural Finance - State of the Sector

In Chair: Dr. Deepeli Pant Joshi, Executive Director, RBL Co-Chair: Shri S. R. Bansal, CMD, Corporation Bank

- Clear and definite need for real sector policies and risk mitigation mechanisms to protect farmers
- · Focus on viability, productivity and profitability of agriculture
- Value chain approaches to agri-tinance need to be strengthened restoration of project based lending disciplines in agriculture
- Access to markets and fair market practice to farmers

#### Session 3: Microfinance and Livelihood Approaches

In Chair: Padmashri Shri Aloysius Fernandez, Chairman, NABFINS Co-Chair: Smt. Aruna Sharma, IAS Additional Chief Secretary, Govt. of MP

- Identification of livelihood opportunities, motivating micro-entrepreneurs, business and technical training, establishing market linkages, common infrastructure etc.
- Resource-less poor may be offered micro-credit along with insurance products covering life, health, crop and livestock
- Self-Help Groups (SHGs) have to take their rightful role in financial inclusion
- All eligible rural households have to be covered under SHG programme by the end of the 12th Five Year Plan

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