Environmental Impact of Industrialization: A Study on Balasore Alloys Industry, Odisha

(SUMMARY)
DISSERTATION

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SUMMARY

1.0 Introduction

Industrialization has come to be regarded as synonymous with economic growth and development. No country desirous of rapid economic progress can afford to neglect industrialization. Industrialization can help the progress of agriculture, trade, transport and all other economic activities. Industrialization is the key to economic development. All advanced countries of the world are industrialized. It will make the best possible use of our human and physical resource. Therefore, the industrialization is regarded as a total process, impact on society through an unprecedented increase in goods and services. For this reason, it is often assumed that there is a close link between industrialization and development. Development theory in the 1950s and 1960s often implicitly defined developments and increase in GNP, and assumed that the increase in wealth associated with industrialization would trickle down to the bulk of the population. Definitions of development now often includes attention to basic needs such as decent healthcare, education, income for all and environmental sustainability. For instance, the Human Development Index (HDI) measures development according to life expectancy, educational attainment and real GDP per capita **(**UNDP 1995; p.12).Industrialization can be defined in three ways, such as, Firstly production of all material goods not grown directly on the land. Secondly, as the economic sectors are comprising mining, manufacturing and energy. Third, as a particular way of organizing production and assumes a constant process of technical and social change which continually increases society's capacity to produce a wide range of goods (Hewitt et al. 1992; p.36).

Industrialization plays a major role in the economic development through rising income, changing the structure of the economy, meeting high-income demands, raise in capital formation, and optimal use of economic resources, generating more employment, solving BOP problem, agricultural improvement, stable economic growth and alleviation of poverty. Economic development of any nation is depending on industrial development. Without industries, economic development is not possible. A growing industrial sector is crucial to greater economic development and takes in a number of areas as a country develops. A well-developed industrial sector, covering various different areas is vital to the economic development of a country. It also keeps in view the integrated development of all other sectors, viz., agriculture, power, transport and other services. Industrialization not only provides better employment opportunities to the people, it also leads to

expansion of infrastructural facilities and stimulus growth of other sectors (Chenery, H. B., 1955, p.40). Industrialization is a process that happens in countries when they start to use machines to do work that was once done by people. Industrialization is part of a process where people adopt easier and cheaper ways to make things using better technology; it becomes possible to produce more goods in a shorter amount of time (Maddish. A., 2007, p. 382). The first industrial revolution stated in United Kingdom and the second industrial revolution was started 100 years later in Germany and USA. It involved new products and processes. The countries did not start industrialization, until the 20^{th} century tended to generate neither new products nor processes. These late industrialization, raised their income and transformed their productive structures using borrowed technology (Amsden, A, 1989; p.379; Gerchenkron, Alexander, 1962; p.354). Our concern with industrialization in general and manufacturing specifically is based on the recognition with the traditions of endogenous growth theory, evolutionary economics and institutional economics that manufacturing sector is important for economic development (Szirmai, 2012; pp.1-50). Further, technological progress is in turn, necessary for successful industrialization (T. Von 1997; p.37, Cornwell, 1977, p.68). The great aim of programmes of industrial development is to provide more and more of the goods and good things of life. The citizens of an industrialized community will have different values, different ways of thought, and living their everyday lives (Walter.C. Neale, 1956; pp. 353-354). Industry induces productivity growth the industrial structure towards the activities that will ensure sustainable economic development and social well-being (Rodrik, 2009; Wade, 2012; Aiginger, 2014; pp.15-32). However, the process of industrialization has side-effects, by products which change the whole tenure of life and thought.

2.0 Objectives of the Study

Keeping the above issues in mind, the following two broad objectives have been developed.

1. To assess the changes in agricultural productivity of the affected villages to those of non-affected villages by Alloys Industry.

2. To measure the impact of industrial pollution on health of people living in the surrounding areas.

3.0 Research Question

On the basis of above mentioned objectives, following hypotheses have been designed.

1. Due to establishment of Alloy Industry agricultural productivity has declined the affected villages.
2. The impact of Alloys industry on health of people became serious.

4.0 Methodology of the Study

4.1 Data Sources

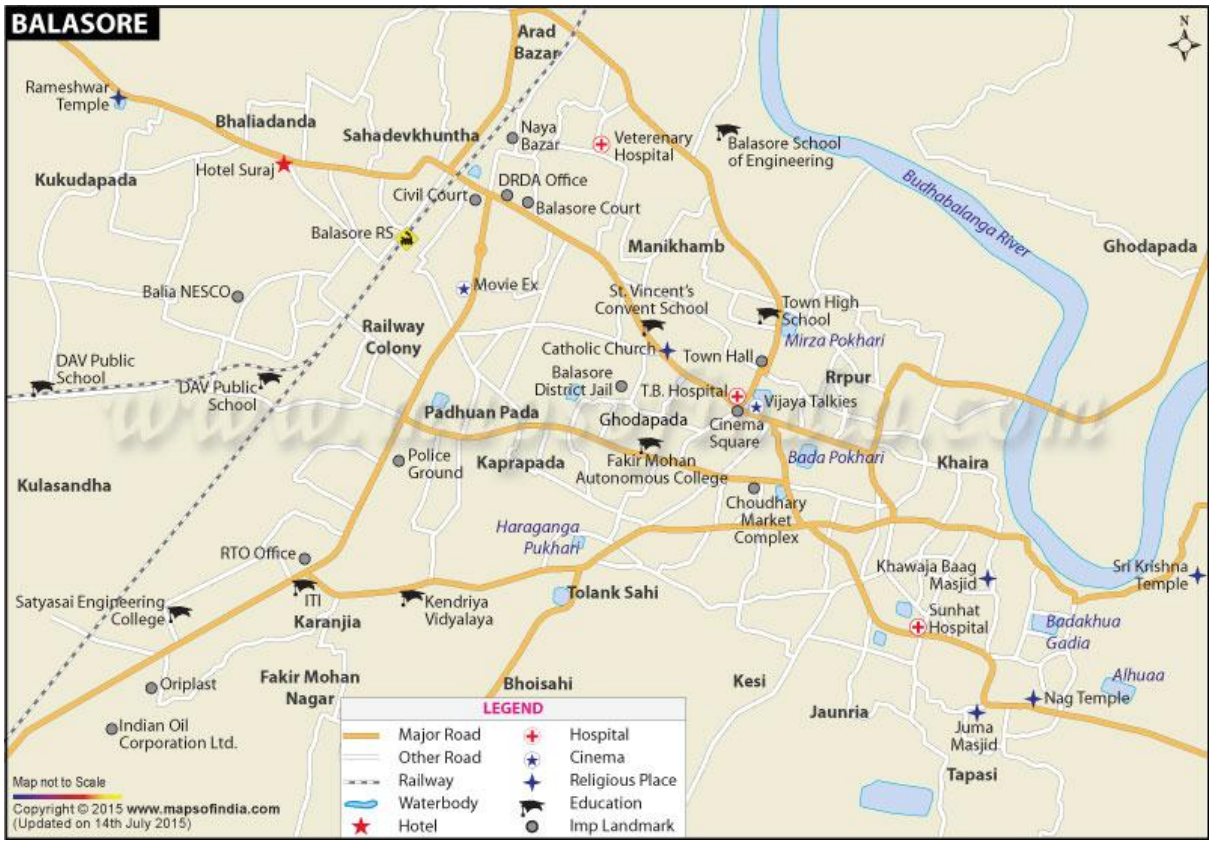
The study is based on both primary and secondary data. Secondary data are collected from Central Pollution Control Board, Statistical Handbook of Balasore, State Pollution Control Board, Odisha, Indian Ferro Alloy Producer Association, and World Banks Reports. Reports collected from various Ministries of Government India and State, Government. Literature obtained from various books, journals, and online data sources. Primary Data are collected through a field survey in Balasore district in Odisha.

4.2 Study Area and Sample Design

Balsore is a smart city situated on the bank of the river Budha Balang and her distributary, the river Sona. It is situated between the parallels of longitude 20^0 $43^!$ to 20^0 $48^!$ N and latitude 86^0 $16^{'}$ to 86^0 $29^!$E. Geographical area of the district is 3634 square kms. The districts is surrounded by the Bay of Bengal about 25 km towards south and where Chandipur sea beach is situated. Balasore is one of the coastal district of Odisha lies on the northern part of the state. This is very famous for not only one industry but also major industries in this district. Balasore is one the major industrial zone of Odisha and also one of the major alloys industries in East region because of its diversified product range. The product range includes are semi-finished and finished metallic or Non-metallic allied goods. The area has well developed roads with a high traffic density, but the condition of other roads is very poor in this area. Balasore district is in the coastal area and it means "Town in the Sea". Balasore Alloys Limited is engaged in the manufacturing and mining of Ferro alloys. The Company is also engaged in the manufacturing and selling of Ferro Chrome of various grades. It has over five furnaces with a total capacity of approximately 60 megavolt ampere (MVA) to produce approximately 95,000 million tons (MT) of Ferro alloys per annum. Its products include High Carbon Ferro Chrome (FeCr60) and Low Silicon Ferro Chrome (FeCr65). It has a captive chrome ore mine in Sukinda Valley in Jajpur district in the state of Odisha. Its Manganese Ore Mine is located at Joda in the Keonjhar district in the state of Odisha, and Hathoda in Balaghat district in the state of Madhya Pradesh. Its metal recovery plants are used to recover the entrapped metal

(ferrochrome) from the slag generated during the production of Ferro chrome and charge chrome. It focuses on the production of products, such as low and medium-silicon, low phosphorous, medium-carbon and high-chromium (Balasore Alloys Ltd. Report, 2014-15).The study is conducted on the household residing in Balasore Alloys industrial area of Balasore. Primary data has been collected from three villages of Balasore Alloys constituency, viz., Balgopalpur, Sireipur and Gourpur villages. Forty households have been selected from each village for the study and survey was conducted in August, 2016. Both Purposive and random sampling method is used for selection of households for primary survey.

Figure 1.1 Location Map of Balasore City



Source: www.mapsofindia.com

4.3 Methods of Estimation

Cost of Illness method is used to measure the economic burden of health hazards on the people. It is the procedure that 'costs' of the diseases are calculated under direct and indirect basis. The direct costs for an illness are represented by the value of tangible goods and services actually delivered to address consequences of that illness. Indirect costs are represented by the value of productive services that are not performed due to

consequences of the illness (Gunatilak, H.M., 2003, p.99). Further**,** productivity change methods, also referred to as the production function approach or derived value method, is used to estimate the economic value of ecosystem products or services that contribute to the production of commercially marketed goods. It is applied in cases where the products or services of an ecosystem are used, along with other inputs, to produce marketed goods. The productivity changes attributed to environmental quality changes. The monetary values thus obtained are then incorporated into the economic analysis of the project (Gunatilak, H.M, 2003; p.99).

4.4 Analytical Tools

Various statistical tools such as descriptive statistics, dummy regression models and chi-square test, have been used for the study.

5.0 Outline of the Study

The first chapter deals with the Relevance of Industrialization for Economic Development, while describing the various states of industrialization. It also deals with economic development and environment. The second chapter entitled socio-economic profile of households in Alloys Industrial area of assesses the Balasore, while third chapter measure the change of agriculture productivity in the affected villages by Alloys Industry. The fourth chapter measures the impact of industrial pollution on health of people living in the surrounding areas, whereas fifth chapter deals with summary and conclusion of the study.

6.0 Major Findings of the Study

The first chapter entitled **"Relevance of the Industrialization and Economic Development"** has discussed the Economic development is very essential for the country and industrialization is a key to it. But unplanned industrialization leads to various infrastructural as well as environmental problems. Such environmental problems can be classified into two categories viz., those arising as negative effects of the very process of development and those arising from condition of poverty and under development. Increase in economic activities requires larger inputs of natural resources and generates larger quantities of waste by products and residues. Alloys industry is one such industry which generates various hazardous effluents. Balasore Alloys industrial area holds a prominent position in Indian Alloys industry. Various phytoremedial studies have been conducted in the area to know the effect of pollution due to Alloys industry on the change of agriculture productivity and health cost of illness of the area. Thus, an attempt has been

made to assess the economic burden of the health hazards of the people in the area. Also, the environmental impact of pollution such as the change of agriculture productivity and health cost measurement of the area has been done by using productivity change method and cost of illness method in the study.

The second chapter entitled "**Socio-Economic Profile of Households in Balasore Alloys Industrial Area"** is an attempt to analyze how Alloys industry in Balasore affects the socio-economic status of the people in the area. It is generally believed that industrialization leads to economic development of people and helps in raising their socio-economic status. Housing patterns, educational level, income level and occupational structure provide a clear picture of the socio-economic status of an area. Thus, an analysis of the housing conditions, education level, family size and income level of the households has been discussed in this chapter. In order to understand the positive impact of alloys industry on the households, occupational pattern has also been studied.

First, the demographic features of the sample district are slightly different from the state level. The literacy rate in Balasore is better than the state average. But the child sex ratio in Balasore is very less as compared to the state average.

Second, majority of the population in the survey area is Hindu. Out of the 120 households, 97.05 per cent are from Hindu community and rest is 1.67 per cent and 0.83 per cent belong to Muslim and Christian community.

Third, the housing conditions in a community reflect the social and economic status of the community and it also an important determinant of health status of a household. Nearly 62 per cent households surveyed live in kachha or semipucca houses.

Fourth, education is one of the most basic parameters in determining socio-economic status. The level of education for females is far lower than that of males in the area. the gender based education level of the households, which is nearly 39 per cent are illiterate and about 43.75 per cent are educated up to primary level of males in the households. The per cent of educated individuals decreases with further increase in the level of education. The 67.74 per cent are educated up to secondary and higher secondary level and only 82.05 per cent is educated up to graduate level. There is very low per cent of education level in post-graduation i.e., 83.33 per cent. Thus, low rate education is one of the key determinants in the level of education for females is far lower compared to males in alloys

industrial areas and its peripherals. In compared to 39.39 per cent illiterate males, the percentage of females with zero education is nearly 60.61 per cent.

Fifth, income level of households also plays an important role in determination of socio-economic status of a community. The mean monthly income of the household is Rs.12993.33, the maximum income is Rs.120000.00 and minimum income level is Rs.3000. The mean per capita income and expenditure of the general category is highest. The mean per capita income of OBC is 3125.78 and per capita expenditure is Rs.2264.15. Scheduled Caste of the populations are coming under the low level earning is Rs.2493.75, per capita expenditure Rs.2422.08 and also low income earning monthly expenditure i.e., Rs.2104.17 and Rs. 2092.78 respectively.

Sixth, occupational structure is a significant and powerful instrument aspect of social life. Out of the total working population, nearly 14 per cent are male and 45 per cent are females. Majority of the total working population, i.e. 47.21 per cent is directly or indirectly employed in Alloys industry. Nearly 54 per cent works are self-employed and nearly 14 per cent are business. The mean wages per day for Alloys industry is Rs. 498.4, which are highest, followed by Rs. 190.36, are compared to lowest wages per days in working wages labour in the area.

Third chapter entitled **"Industrial Pollution and Change of Agricultural Productivity"** is an attempt to analyze the impact of industrial pollution on change of agricultural productivity of the households in the area.

We find the agricultural productivity is adversely affected due to the industry. Most of the people are lost their cultivated land due to establishment of Alloys industry in the area. The average land size of the area is 3.20 acres. The size of land in Balgopalpur and Sireipur village is 2.84 and 3.03 acres respectively. These two villages are affected by the Balasore Alloys industry. On the other hand Gourpur is non-affected village, whose mean operational land holdings size is 3.54. In Balgopalpur and Sireipur village, total production of paddy is 15.70 in quintals and 18.33 in quintals. There is highest total production of agriculture of Gourpur village i.e., 29.05 quintals in the area. However, their productivity is also lower in two villages which are 5.37 quintals and 6.20 quintals in per acre compare 8.11 quintals per acre in Gourpur. In the same way, their total value cost of agriculture production is low the Rs.8108.7 and Rs.9362.00 in per acre in the area. The Gourpur village of agricultural production is higher in Rs. 12246.1 the total value of cost in per acre in the area. The net profits are receiving in Balgopalpur and Sireipur is Rs.

5496.58 and Rs. 6527.88. The Gourpur village is highest net benefit from agricultural productivity in the area i.e., Rs.9039.65.

Fourth chapter entitled **"Industrial Pollution and Health Cost Measurement"** is an attempt to analyze the environmental impact of Industrial pollution on health of the households in the area. The economic burden of health hazards has been calculated by estimating cost of illness for the households. Major reason for health hazards was contaminated water and air pollution.

First, nearly 30.83 per cent of respondents believe that the reason for their ill health due to contaminated water, where the 35 per cent of due to air pollution are affected their health Alloys industry and other factories in peripherals in the Balasore. It shows that the quality of water in the area is very poor. Nearly, 66.03 per cent individuals suffer from waterborne diseases like cholera, dysentery and frequent fever in the area. Also 47.22 per cent from neurological disorders such as joint pain, eye infection and kidney related problems, 65.83 per cent suffer from skin diseases, 64.69 per cent suffer from respiratory diseases like asthma, tuberculosis etc., which are generated due to direct contact with health hazardous chemicals like manganese, iron ore, slag, nickel and chromium in Alloys products.

Second, the direct and indirect cost of illness is calculated to assess the economic burden of health hazards on people. The mean direct cost of illness for the households is Rs.777.24 and indirect cost is Rs.1872.28. The mean total health cost of illness for households is Rs.2650.04.

Third, differences in cost of illness on the basis of household characters like gender are also estimated. Mean cost of illness for male is nearly ten times higher than that for female in the area. In case of working days, the annual loss in working days for men is about 29.59 days, whereas for females, it is nearly 3.38 days. Also another difference is based on age group, whereas the working and old age group, the loss of work days is 28.74 and 30.00 respectively. Furthermore, study the differences in cost of illness on the basis of occupational category is analyzed. Mean total health cost of illness is Rs. 2865.48 for those employed in Alloys industry and their total annual loss in work days is nearly 46.91 days. The mean direct cost of illness for those employed in Alloys industry is nearly Rs.872.68 and indirect cost of illness is Rs.1992.80.

Fourth, impact of gender and occupational pattern on cost of illness is also analyzed using dummy regression analysis. The cost of illness for male is significantly higher than that for females. The cost of illness for working and old-age group is significantly higher than the school going and children age group. The cost of illness for the people employed in Alloys industry is significantly higher than the cost of illness for other occupational category of the households in the area.

7.0 Conclusions of the Study

Economic development is very crucial for a country and industrialization is a key factor for development. It not only provides better employment opportunities to the people, but also leads to expansion of infrastructural facilities and stimulates growth of other sectors. However, unplanned industrialization leads to over exploitation of natural resources, which further leads to environmental externalities. When the scale of economic activities increases, it brings boost to the economy, but the over utilization of resources also takes place. As a result, industrial pollution increases. This results in creation of environmental externalities. Alloys industry is one of such industry, which provides ample amount of employment opportunities. But, it also one of the most hazardous industries in the area of Balasore district of Odisha. There are two villages near by the Alloys industry. The total agricultural production and productivity has declined by the industry. Further, another factor which is raising the health cost of illness in the area. Also, they are become struggles in economic burden in the area.

8.0 Policy Recommendations

Some of the recommendations which can be useful in improving the problems of low productivity in agriculture and health in such areas are as follows.

1. The installation of new sewage treatment plants is required in industrial zone like Balasore due to the exiting STPs are not able to treat all of the domestic and industrial waste generated. The working of the exiting STPs also needs to be monitored, as they hardly function to their full capacity. If untreated waste will not be discharged in the soil, canal, rivers, the quality of soil and water will improve. Ultimately, this step will be increased of agricultural productivity and better environment in this area. The Green Belt Development should develop and the Common Effluent Treatment Plants are proper functioning in the area.

2. The level of education in the area is not very high. The female literacy is also very low. This results to their less contribution in the economic activities and their low income level. Also, many school-going children have to work in Alloys industry and other factories nearby the area because of the poor economic conditions of their families. This leads to child labour problem in this area. The government should take step to more education facilities and proper implementation of educational policy and to stop the child labour in the area.

3. The cost of illness in the area is very high. Most of the people in this area do not get for better treatment facilities due to budgetary constraints. This is because no government medical facilities are available in the area. The nearest government hospital is about 10 kms from the area. There should be facilities of primary diagnosis and treatment of the frequent diseases like fever, cholera, skin and eye infections. The frequency of the vaccination camps should be increased.

4. The wage rates of the people employed in Alloys industry are much lower compare to those in organized sector. This is lack of labour union in the unorganized sectors. Thus, legislation is required to ensure better wages rates in the unorganized sector in the area.

9.0 Further Scope of the Study

This study has not attempted to answer all the questions that have emerged during the research process. However, some of them are worth mentioning which can be addressed by cotemporary studies. The use of heavy metals in the Alloys industry, there will be resulted in depletion of soil quality in the area. Most of the people have lost their land due to establishment of Alloys industry and also the willingness to pay for better water quality. Thus, there is a need of separate study to analyze the environmental impact on industrialization on ground water quality and displacement and rehabilitation effects in the area. Water samples can also be drawn for measuring the heavy metal content in the area.