IMPACT OF IRON ORE MINING INDUSTRY ON THE HOUSEHOLDS IN THE MINING AREAS OF GOA: A STUDY

Submitted to the

Goa University

for the award of the Degree of

DOCTOR OF PHILOSOPHY

in

COMMERCE

by

SHEETAL SHIVRAM NAIK

Department of Commerce, Goa University
Taleigao-Goa

August 2017

IMPACT OF IRON ORE MINING INDUSTRY ON THE HOUSEHOLDS IN THE MINING AREAS OF GOA: A STUDY

Submitted to

Goa University

for the award of the Degree of

DOCTOR OF PHILOSOPHY

in

COMMERCE

by

SHEETAL SHIVRAM NAIK

Under the guidance of

Dr. I. Bhanu Murthy
Ex-Principal, VVM's Shreee Damodar College of
Commerce & Economics,
Margao-Goa

August 2017

Dedicated to my beloved father

Late Shri Shivram Narahari Naik

DECLARATION

I, *Sheetal Shivram Naik*, hereby declare that this thesis for Ph.D. degree in Commerce titled "**Impact of Iron Ore Mining Industry on the households in the Mining Areas of Goa: A Study**" is a record of original research work done by me under the guidance of Dr. I Bhanu Murthy, Ex-Principal, VVM's Shree Damodar College of Commerce & Economics, Margao-Goa and that the same has not been previously formed the basis for the award of any degree, diploma or any certificate or similar title of Goa University or any other universities.

Place: Taleigao
Date:

Sheetal Shivram Naik
Research Scholar
Department of Commerce
Goa University- Goa

CERTIFICATE

This is to certify that the Ph.D. thesis titled "**Impact of Iron Ore Mining Industry on the households in the Mining Areas of Goa: A Study**" is a record of original research work carried out by ***Ms. Sheetal Shivram Naik*** under my guidance, at the Department of Commerce, Goa University and the same has not been previously formed the basis for the award of any degree, diploma, or any certificate or similar title of Goa University or any other Universities.

Place: Taleigao
Date:

Dr. I. Bhanu Murthy
Research Guide
Ex-Principal,
VVM's Shree Damodar College
of Commerce & Economics,
Margao-Goa

ACKNOWLEDGEMENT

I express my gratitude to all those who have directly or indirectly contributed towards completion of my research work.

First and foremost, I am greatly indebted to my guide, Dr. I. Bhanu Murthy, Former Principal, VVM's Shree Damodar College of Commerce & Economics, Margao-Goa for his constant support and guidance from the beginning till the completion of this research.

I am grateful to Prof Y. V. Reddy for his encouragement and motivation that has boosted my confidence level. I also thank Prof. B. Ramesh as well as my co-guide and Dean, Dept. of Commerce and Management, Prof. Subhash K. B. for their assistance in completion of the research and also giving valuable inputs.

I wholeheartedly thank Prof. Anjana Raju, HOD, Department of Commerce whose valuable comments has helped build analytical thinking in me and improved my research work.

I owe my gratitude to Dr. M. R. Patil, for offering his expert advice and suggestions and Prof. Nandkumar Mekoth, Department of Management for his help in framing questionnaire for the study.

I am also thankful to the Librarian, Dr. Gopakumar V. and his staff for providing timely assistance in completing my formalities.

I sincerely thank my Principal, Dr. Prita Mallya for her co-operation and support as well as the management of the college for granting me permission to pursue Ph.D.

I also wish to thank Mr. Ramesh Gawas, social activist who gave me necessary inputs for the conduct of my study as well as Mr. Rama Velip, Rivona for sharing his understanding about the impacts of mining on the environment.

I earnestly thank Dr. Gervasio Mendes, Principal, Government College, Virnoda for providing necessary inputs in conduct of my work as well as to Dr. G. N Nayak, Department of Marine Science, Mr. Parag Nagarshekar, Deputy Director of Mines and Geology, Mr. Karkhanis, Deputy Conservator, Department of Forest, Mr. Govind Parab, Valpoi, Department of Agriculture, Mr. S. Sreedhar, Mineral Foundation of Goa (MFG) for providing necessary data.

My special thanks to Mr. Rajendra Faldessai, Sarpanch, Cauvrem Panchayat, Ms. Vaishali Naik, Sarpanch Rivona Panchayat, and Mr. Neelu Gaonkar, Sarpanch Morpirla Panchayat for rendering necessary assistance in conduct of survey in their respective villages.

I also profusely like to thank my colleagues, especially Dr. Sanjay Sawant Dessai, Vice Principal for motivating me to take up research; Dr. Sarath Chandran and Mr. Vishal Chari for assisting me in analyzing the data. I also thank Mrunal Parsekar, Asst. Professor at DM's College, Mapusa for the same. I also owe my gratitude to Dr. Suraj Popker and Dr. Avinash Raikar for extending their help in analyzing data without which the research would not have been completed as per the requirements.

I thank Ms. Palia Gaonkar, English Expert for her proof reading services and Mr. Dilip Chari for making time to format my thesis.

My gratitude to my sincere students Abdul Shaik, Melissa Fernandes, Sailee, Siddesh Naik, Stacy, Samip, Hussein, Gauraksh, Leanne and others who have spent two months assisting me in my adventurous data collection process.

I thank my colleagues and good friends Ms. Anjali Sajilal and Ms. Ulpa Waigankar for their encouragement and support throughout the period of study. I also thank all my senior and junior colleagues for their valuable advice and moral support.

This research would not have been possible without my husband, Mr. Dnyandeep P. Arondekar willingly taking over my share of household responsibilities, and also without sacrificing the time my children Dipshita and Ishita needed in their early childhood. I also thank my mother, my mother-in-law, all my family members, and my close friends for their encouragement and blessings that has helped me complete my work though with great difficulty yet with a peaceful mind.

May God bless you all.

Ms. Sheetal Shivram Naik

Impact of Iron Ore Mining Industry on the Households in the Mining Areas of Goa: A Study

By: Sheetal Shivram Naik

Supervisor: **Dr. I. Bhanu Murthy,** Ex-Principal VVM's Shree Damodar College of Commerce & Economics, Margao-Goa

ABSTRACT

Iron ore is one of the most important resource used world over for the infrastructural development and hence is in great demand. Mining brings in foreign exchange for the economy, provides employment opportunities and leads to local infrastructural development. But in the name of development, the natural resources are exploited on which the households in the mining areas are dependent on for their livelihoods. In the Goan context, the state has seen two phases: one a drastic increase in the mining operations to meet the rising demand from China in the last decade; and second a sudden ban in the mining operations following Supreme Court Order in September 2012. Thus, this has an impact on the socio-economic characteristics of the households in the mining areas. With this background, the study here aims to meet the following objectives: firstly, to compare the socio-economic characteristics of the households in the mining areas with the non-mining areas within the same talukas; secondly, to study the economic status of the households in the mining areas; thirdly, to know household perception on the quality of environment in the mining areas and lastly, to assess the impact of mining ban on the socio-economic characteristics of the households in the mining areas. To achieve these objectives, primary and secondary data was used. The primary data collection was done using

interview schedule. The study was carried out in the mining belt of Goa. Prior to this a pilot study was undertaken, after which a full-fledged survey was conducted in 12 mining villages and 8 non-mining villages were selected from within the same talukas. Households were selected using systematic random sampling method. 256 schedules in the mining areas and 191 schedules in the non-mining areas were found suitable for the purpose of study. Discussions were also held with Panchayat members, NGOs, environmentalists, social activists, government department and mining company officials. Further secondary information was collected from various government reports, publications, newspaper articles, online data sources and books and journals. SPSS software was used to analyse the data.

The study revealed that the mining industry has brought economic benefits for the households in the mining areas by creating business opportunities, at the same time the mining operations had affected the traditional occupations of the households in the areas. There were huge disparities in households' incomes within the areas. The most remarkable finding was that though mining provided the households with lucrative incomes there was no contribution of this income towards higher education. The daily food items were expensive and the local markets were not well developed. The benefits provided by the mining companies were not extended to all the affected in the area but only to those involved into mining related activities. The industry also brought along many problems like traffic congestion, road accidents, damage to agricultural land and water problems. Air pollution and associated problems have not been sufficiently addressed by the industry and needs attention. Business, participation rate and loan taken were significant contributors to per capita income in the mining areas. The post mining ban period however led to the decline in the benefits offered by the mining industry. The mining ban affected the economic status

of the households in the mining areas such that the households that had huge loan installments' could not meet the same as they lost their source of income. The most affected were those directly involved into mining related activities and other trade/business activities. This was coupled with some positive socio-economic impacts like the households reverting to their traditional activities like agriculture and secondly, an improvement in health of the people in the mining areas.

Keywords: Impacts, Mining, Socio-economic, Characteristics

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Sr. No.	Abbreviations	Full Form
1	GDP	Gross Domestic Product
2	CVRD	Companhia Vale do Rio Doce
3	BHP	Broken Hill Proprietary Company Limited
4	SIA	Social Impact Assessment
5	EIA	Environmental Impact Assessment
6	MMSD	Mines, Minerals and Sustainable Development
7	IIED	International Institute for Environment and Development
8	CSR	Corporate Social Responsibility
9	ICMM	International Council on Mining and Metals
10	USA	United States of America
11	TERI	The Energy and Resources Institute
12	FDI	Foreign Development Investment
13	TNC	Transnational Countries
14	BHQ	Banded Hematite Quartzite
15	MMTC	Metals and Minerals Trading Corporation of India
16	MMRD	Mines and Minerals (Development and Regulation) Act
17	MOEF	Ministry of Environment and Forests
18	GSDP	Gross State Domestic Product
19	HDI	Human Development Index
20	MPT	Mormugao Port Trust
21	QOL	Quality of Life
22	ANOVA	Analysis of variance
23	FIFO	Fly-in fly-out
24	SEM	Structural Equation modeling
25	EBRD	European Bank for Reconstruction and Development
26	SPSS	Statistical package for social Sciences
27	NALCO	National Aluminium Company Limited
28	ALP	Alternate livelihood programme
29	IBM	Indian Bureau of Mines
30	EIS	Environmental Impact study

Sr. No.	Abbreviations	Full Form
31	IBA	Impact and Benefit Agreements
32	GMOEA	Goa Mineral Ore Export Association
33	NGO	Non-Governmental Organisation
34	PCA	Principal Component Analysis
35	KMO	Kaiser –Meyer- Oklin
36	DMG	Directorate of Mines and Geology
37	GCCI	Goa Chamber of Commerce & Industry
38	MFG	Mineral Foundation of Goa
39	GIDC	Goa Industrial Development Corporation
40	ISM	Indian School of Mines
41	GSPCB	Goa State Pollution Control Board
42	SPM	Suspended Particulate Matter
43	RPM	Respirable Particulate Matter
44	db	Decibels
45	NBWL	National Board of Wildlife
46	PAC	Public Accounts Committee
47	PWD	Public Works Department
48	NEERI	National Environmental Engineering Research Institute
49	NMDC	National Mineral Development Corporation

CHAPTER 1

INTRODUCTION TO MINING

1.1 INTRODUCTION TO IRON ORE MINING:

Minerals are important for the growth, development and survival of every economy. This is evident from the use of minerals since the pre-historic times. Further, the industrialization and technological advancements have necessitated the need for minerals. The rising population has put a pressure on the mineral-rich countries to increase their production. Thus, countries rich in minerals resort to take advantage of the natural resources to achieve economic development. The mineral-rich countries are at a gain in terms of trade, increase in Gross Domestic Product (GDP) and foreign exchange earnings.

Iron ore mining industry is one of the oldest industries that has immensely contributed towards the growth of countries and brought economic prosperity. Iron ore is the most widely used minerals. It is one of the most abundant rock elements and constitutes about 5 percent of the Earth's crust. Iron ore is mined in around 50 countries across the globe. It is the largest non-fuel mineral in the world, having an estimated production of over 1.8 billion tons in 2006 (Export-Import Bank of India, 2008). According to Federal Government's Australian Mines Atlas, about 98 percent of the world's iron ore production is used to make iron in the form of steel. The major producers of iron ore are China, Australia, Brazil, India and Russia. These nations account for about 85 percent of the world production of iron ore. According to the United States Geological Survey 2013 Minerals Yearbook, Australia stands first with 35 billion metric tons of iron ore reserves, followed by Brazil with 29 billion metric tons, China with 23 billion metric tons and India with 7 billion metric tons. Three largest companies viz., Companhia Vale do Rio Doce (CVRD), Rio Tinto and BHP-Billiton together control about 30 percent of global production. Amongst the importers, China is the major importer followed by Japan, Korea, United States and the European Union.

Table 1.1

Major countries in iron ore mine production worldwide from 2004 to 2015

(in million metric tons)

Countries	Production in million metric tons											
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
China	310	421	588	707	NA	880	1070	1330	1310	1450	309	264
Australia	234	262	275	299	NA	394	433	488	521	609	774	824
Brazil	262	281	318	355	NA	331	370	373	398	317	411	428
India	146	165	181	204	NA	219	230	240	144	150	129	129
Russia	95	97	104	105	NA	92	101	100	105	105	102	112
Ukraine	66	69	74	78	NA	66	78	81	82	82	68	68
South Africa	39	40	41	42	NA	55	59	60	63	72	81	80
United States	55	54	53	52	NA	27	50	55	54	53	56	43
Iran	18	26	32	35	NA	28	28	28	37	50	33	33
Canada	29	28	34	33	NA	32	37	34	39	43	44	39
Kazakhstan	20	19	18	20	NA	46	24	25	26	26	25	25
Sweden	22	23	23	25	NA	18	25	25	23	26	37	37

Source: World mineral production 2003-07 and www.statista.com

Table 1.1 gives the production of iron ore in million metric tons in the major iron ore producing countries of the world. Mining is practiced in the developed as well as the developing countries across the globe. The production of iron ore is concentrated in the hands of few major players as the industry is highly capital intensive. It requires a lot of investment in rail infrastructure, to get it from the place of production to the place of consumption.

It is observed that large global producers, like Arcelor Mittal and others in the developed nations, undertake mining projects in the most responsible and sustainable manner. The adverse impact it has on the environment and the local communities is well-managed. Another biggest producer of iron ore, Vale, has been heavily investing into technology to minimize the environmental impact of mining. The developed nations have concern for their environment and are always willing to forego any developmental activity that may have adverse impact on the environment. This aspect is not given serious consideration by the developing nations, who are more into economic development at the cost of the environment.

1.1.1 Iron Ore Mining Operations:

Mining means extracting ore from the earth. Iron ore is a rock from which metallic iron is extracted. It is found in the form of magnetite, haematite, goethite, limonite or siderite. Ores with high quantities of haematite and magnetite can be directly used for making steel, while the ores with less ferrous content requires undergoing the process of beneficiation to separate the ore from the impurities. Mining passes through five stages: prospecting of ore, exploration, development, exploitation and reclamation. Basically, the exploitation of mines falls into two categories: surface and underground mining.

Iron ore is mined using surface mining. Under surface mining there are two methods: open pit mining and open cast mining. These are supposed to be the less costly techniques of mining. Iron ore mining may further be done manually or mechanically, depending upon whether the mine is small or large, respectively. The mining process involves removal of a lot of soil, vegetation and rock to get the ore from the deposits. Open pit mines are typically enlarged until either the mineral resource is exhausted, or an increasing ratio of overburden to ore makes further mining uneconomic (Wikipedia).

Manually mining is done using picks, spades and crow bars. Holes are made by blasting, and the blasted ore is then screened and loaded in the dumpers for the dispatch purposes. The mechanized mining is done through systematic formation of benches. Benches are developed by drilling and blasting. A particular pattern is followed while drilling, and then blasting is performed using explosives, in order to break the ore. The broken ore is loaded by shovels or excavators into the trucks for transportation to the crushing and washing plant. Here the ore is further processed to remove the impurities and to upgrade the quality. The waste material generated as a result includes overburden, waste rock and mine water containing suspended solids, dissolved materials and small quantities of oil and grease spilled during extraction. All these processes need to be properly monitored so as to minimise the environmental hazards that come along with it.

1.1.2 Sustainability Development:

World Commission on Environment and Development, 1987(also known as the Brundtland Commission) has defined Sustainable Development as: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The three pillars of sustainable development are: social, economic and environmental factors, also known as the triple bottom line.

The most significant sustainability issues related to mining industry are social and environmental concerns. Studies have shown that mining can never be sustainable, due to the fact that it involves exploration and development of nonrenewable resources. However, the Social Impact Assessment (SIA) and Environmental Impact Assessment (EIA) have been suggested as tools that would direct the efforts towards sustainability. Its enforcement, though, depends largely on the strict monitoring of the government bodies.

Many international bodies have come up with various tools with the intention of making mining industry a sustainable one. Lot of serious work is carried out by world organisations like Mining, Minerals and Sustainable Development (MMSD), International Institute for Environment and Development (IIED), etc. for aiding the mining companies towards sustainable business to protect the interests of the people in the areas. The Corporate Social Responsibility (CSR) activities of the mining companies are also specifically directed towards attaining sustainability. However, it is observed that the developed nations are keener in protecting their people and their environment, but the spirit is lacking in the developing nations, in the name of development. The SIA and EIA have been added just as part of formalities in the documents, with little or no attention given to its actual processes.

In the mining context, since mines are located in the remote areas and the locals in those areas are dependent very much on the natural resources for their livelihoods, it is very important for the mining companies to involve them for the smooth functioning and success of their mining operations. They are the ones who are most affected by the mining operations. In the ICMM checklist of possible stakeholders, the local communities are the first stakeholders. In fact, informing and obtaining consent is a requirement in some regions like Peru under the Law of the Right of Consultation of Indigenous Peoples 2011, while not so in case of United States of America (USA) where only public participation is required during EIA. Obtaining consent of the locals denotes their acceptance to operate or as put in formal terms, they get a 'social license to operate'. The studies confirm that sustainability is closely related to local participation of the neighbouring communities in the decisions affecting them (Remy & MacMahon, Large Mines and Local Communities: Forging Partnerships, Building sustainability, 2002).

MMSD has chalked out the means for attaining sustainability at the local community level in the projects undertaken. According to the study done by MMSD, an interaction between the mine and community should add to the physical, financial, human and information resources available and not detract from them. The current study includes physical resources (land, access to natural resources like water and firewood and education) and financial resources (income, savings, investment and credit). Countries all across have been working towards making mining a sustainable activity.

Researchers and experts are coming up with models to achieve sustainability. Abdala (2010) proposed a model to promote an agenda of sustainability to Juruti City in view of the installation of an Alcoa Bauxite Mine. The model is based upon a tripod of intervention, and includes: The Sustainable Juruti Council, Sustainability Indicators and Sustainable Juruti Fund. The model would not only be a strategy towards improvement of socio-environmental and economic impacts of mining development, but would also generate mutual benefits for all social, public and private sector stakeholders.

1.1.3 Rural livelihood diversification:

Rural livelihood diversification is a mechanism by which people create a highly varied collection of activities and assets, in order to maintain survival and promote living standards. The diversification takes place due to necessity or choice. The poor households pursue diversification mainly due to necessity. However, the question arises whether these new activities give better opportunities and better incomes and improves their socio-economic characteristics or not. Mining affects the agricultural lands as well as forestlands on which people depend for their livelihood and which provides them with productive opportunities. When the land is given to the mining companies, the inhabitants lose productive asset that can be a means of diversified livelihoods in times of vulnerability. Moreover, when the lands are given up for a one-time compensation, there cannot be a productive investment as the same is used for immediate consumption.

1.1.4 Impacts of Mining:

Mining has direct and indirect impacts on the environment in which it operates. The economy as a whole is affected with the positive and negative impacts that it comes along with. Some of the socio-economic and environmental impacts of mining experienced world over are given here.

a. Socio-economic Impacts of Mining:

'Mining can be a powerful engine for socio-economic growth' **(Osewe P, 2015)**

Minerals are normally located in remote areas where very little or no infrastructural development takes place. Most of the mining concessions are given in regions where poor people live, not only because minerals are found in those areas but also because the locals there do not have the power to stop the project (Vandenbroucke, 2008). The local communities in the resource-rich areas are dependent on the natural products for their food and source of livelihood. The commencement, expansion as well as the closure of mining activities has a lot of impact on these communities.

A prevalent argument in favour of mining is that economic benefits gained from it enables the wellbeing of local communities (Tiainen, 2012). Mining brings economic benefits to the people in the areas. Due to the creation of job opportunities, there is inflow of migrants into these areas. Rural centres closest to developing and approved mines experience faster population growth due to workers choosing to settle in towns and drive to the mine site (O'Neil, Kaye, & Trevithick, 2013). More often than not migrants come with their families, and hence they need to accommodate themselves along with their families.

However, migration also leads to social problems. As the population density increases, there are issues such as increase in social conflicts and social evils, change in culture, congestion in the areas and inflation in prices of mainly consumed items. Evidences have shown inequitable distribution and concentration of wealth, which is well illustrated in the case of Guatemala, wherein almost 5.6 percent of the richest households control 50 percent of the total income (Vandenbroucke, 2008). After a lot of destruction and damage to the natural wealth and peace of locals, there is no fair distribution of wealth or the benefits that the industry gains at the cost of the communities.

Mining is seen all over as a gender-driven industry. The traditional activities in which the women were shoulder-to-shoulder with men in adding to the family income, has to be given up due to the mining operations. As a result, there is loss of income to the family and the women become highly dependent on men.

Mining business is highly dependent on transportation and infrastructure facilities (Kumar P. N., et al 2015). Thus it is only when such projects come up into these areas that the infrastructure develops. But it is also true that as mining operations are scaled down, the maintenance and upkeep of the infrastructure may also be affected.

Mining operations lead to dislocation and displacement of the residents in the areas of operation. This is seen especially in the case of Asian countries wherein there is higher occurrence of displacement. A significant number of the displaced people are the tribal and economically marginal rural population who depend on natural resources such as forests and rivers for their livelihood (Singh, 2015). When people are displaced and located in new places, they may or may not be able to carry on with their traditional activities. It becomes difficult for them to cope up with these situations. The mining companies do provide monetary compensation for any loss caused due to displacement or loss of traditional activities to the local communities. But since the land markets in these areas are not well-developed, the price paid to them for their land may be far less than the standard rate in that particular time.. They do not get a fair share in the compensation.

Thus, it will not be inappropriate to say that although mining seems to bring huge incomes for the inhabitants in the area, it is also responsible in bringing about disruption to the social fabric of the area.

Environmental Impacts of Mining:

'Mining cannot occur without an impact on the surrounding natural environment and communities. Responsible mine operators strive to limit negative environmental and social impacts.'

— PLACER DOME SUSTAINABILITY POLICY

A lot of overburden has to be removed in order to get the actual ore. This leads to storage problem, which, in the absence of prior provision, creates havoc for the people in the vicinity, and the environment is badly affected. Inadequate landscape management and improper rehabilitation of wastes and overburden dumps has direct impact on the vegetation in the mining areas on which the communities are dependent for their livelihoods. In most of the mines, the overburden and tailings are not properly stored and managed The Energy and Resources Institute (TERI). Be it the pre-mining phase or the latter ones, the removal of vegetation and resettlement of displaced population has significant impacts on the land use. There is soil erosion, loss of top soil, creation of waste dumps, deforestation, etc. that badly affects the traditional livelihoods of the dependent locals. The destruction of natural resources and farm lands on which the communities are dependent compels them to take over mining jobs even though they lack skills, and hence they may not be able to earn good income.

Along with having adverse impact on land, air and water, mining activities also affect the peace in the vicinity. The severity of the impacts has been shown to vary with the distance between the mine and the community (Kahn, 2003). The residents living close to mines and near the overburden dumps inhale dust particles and thus suffer from health problems. The blasting and drilling processes that take place in the mines lead to unbearable noise for the communities in the areas and also for the wildlife. The resultant vibrations cause damage to people's properties that are in close proximity to mines. Huge quantities of water used by mining companies affect the availability of water in and around the mining regions, drying up the rivers, springs and wells. The iron ore is associated with unwanted gangue material which has to be washed out before use for production of steel; hence the ore needs to undergo beneficiation process. The waste that needs to be washed out depends on the grade of the ore. Lower the grade, higher is the unwanted waste material. The water in the regions thus gets polluted due to erosion of these waste dumps. Apart from this oil and grease, contamination of water bodies due to discharge of mine effluents, solid waste disposal, etc. the water resources are affected adversely.

The adverse mining effects are more commonly found in the developing countries; the developed countries practice cleaner technologies and follow stringent environmental regulations, giving due consideration to the environment and the local communities.

The mining region lacks essential services. There is also a lack of support from the local governments to mediate between mining companies and local communities. Another fact that cannot be ignored is that there is no Foreign Development Investment (FDI) flowing into the countries that impose/follow strict environmental regulations, as it adds to the total cost of the transnational countries (TNCs). The TNCs invest into those countries which follow lesser environmental regulations.

These social, economic and environmental impacts can, to a large extent, change the dynamics of community living. The environmental impacts become the social and economic issues when they disrupt the livelihoods of the people. The way these impacts are managed by the communities and the mining company involved can either further worsen or make lives better for the community and its residents (Opoku-Ware, J, 2010).

Conflicts in mining areas are widespread and are the result of a number of factors mostly relating to land use, water related environmental damage, neglect of host communities by the mining companies, unfulfilled promises, non-payment of appropriate compensation, poor co-ordination between mines and communities by local and central governments, among others (Twerefou, et al 2015).

Jenkins (2004) argues that historically, mining companies have employed what he terms ‘devil may care’ attitude towards the effect of their operations on communities, and admits that mining companies have now resorted to CSR measures as a means of dealing with most of these conflicts. The locals are consoled by means of a temporary monetary compensation, but may not help them meet the circumstances in the long run. Especially when the mine is either abandoned or stopped, the people will end up losing their lands as well as the compensatory packages. Experts agree that in many countries, the compensations to host communities are insufficient to address local depletion of environmental assets and other social impacts of projects (C.P Sajan).

Mining is not a permanent activity, hence it is difficult to sustain the direct benefits that the communities temporarily enjoy in terms of direct income and improved welfare activities. After the mines close, there is an issue with regard to sustainability of income.

Mining is the most destructive as well as the most profit-generating industry. As a result, the mining companies in general convince people about their business being carried out in the most sustainable manner. But a serious issue is that the destruction caused by them is often irreversible and hence cannot be sustainable. Mining comes with many promises of wealth and jobs for the communities but at a high social and environmental cost.

1.1.5 Mining in Indian context:

India's exports are largely confined to few minerals, with iron ore occupying a significant share (Export-Import Bank of India, 2008). The country is endowed with some of the richest iron ore deposits and is one of the leading producers and exporters of iron ore in the world. The minerals are unevenly distributed, and vary regionally. The iron ore deposits are distributed into four zones: the Eastern, Central, Western and Southern zone. Of these, the Eastern, Central and Southern zones do not contain much overburden material except laterite and some low grade ferruginous shales and Banded Hematite Quartzite (BHQ) patches, whereas in Western zone (that includes Goa region) a lot of waste is excavated as overburden.

The quality of the ore differs with respect to the presence of Fe (iron) content in the ore. The most prominent ores found in India are haematite and magnetite. According to the Mineral Yearbook 2012, India has total resources of over 28.52 billion tonnes of haematite and magnetite. The major haematite resources in the order of quantity are located in Orissa-4761 million tons (33 percent), Jharkhand with 4036 million tons (28 percent), Chattisgarh with 2731 million tons (19 percent), Karnataka with 1676 million tons (11 percent) and Goa having 713 million tons (5 percent). The balance resources are spread over the states of Andhra Pradesh, Rajasthan, Maharashtra, Madhya Pradesh, Uttar Pradesh and Assam and altogether contain around 4 percent of haematite.

The magnetite resources are placed at 10,619 million tonnes of which only 58 million tonnes constitute reserves, located mainly in Goa. A major share of magnetite resources is located in the following states: Karnataka having 7812 million tons (74 percent of the total), Andhra Pradesh with 1464 million tons (i.e. 14 percent), Rajasthan with 527 million tons and Tamil Nadu with 482 million tons (5 percent each), and Goa having 214 million tons (2 percent). Jharkhand, Assam, Nagaland, Bihar, Maharashtra and Madhya Pradesh together account for a meager share of magnetite resources.

India has been ranked fifth in the production of iron ore with 155 million tonnes in 2005-06 as well as in 2006-07 for producing 181 million tonnes of ore. In 2010-11, the country stood fourth with a production of 167 million tonnes and fifth with 136 million tonnes in 2011-12.

Table 1.2

State-wise production of iron ore from 2002-03 upto 2012-13

(in million tonnes)

Year	Chattisgarh	Jharkhand	Orissa	Karnataka	Goa	Others	Total
2002-03	19.78	13.70	22.08	24.80	17.89	0.83	99.07
2003-04	23.36	14.68	31.29	31.64	20.25	1.63	122.84
2004-05	23.12	16.09	40.57	37.18	22.31	3.45	142.71
2005-06	24.75	17.44	49.88	33.67	23.74	4.96	154.44
2006-07	NA	NA	NA	NA	NA	NA	172.30
2007-08	30.99	20.75	69.89	48.99	30.53	12.11	213.25
2008-09	30.00	21.33	72.63	46.97	31.20	10.83	212.96
2009-10	26.52	23.01	79.28	43.02	39.32	7.54	218.64
2010-11	31.60	23.20	74.96	37.67	36.48	4.24	208.11
2011-12	30.46	18.94	67.01	14.9	33.37	4.32	167.29
2012-13	27.94	18.01	64.31	11.23	10.58	3.94	136.02

Source: IBM, Nagpur

The iron ore mines are in public as well as private hands in India. In India, the private exporters do not require government's permission to export iron ore with iron content less than 64 percent. The ore with 64 percent and above iron content is allowed to be exported after meeting the requirements of the domestic consumers and the Metals and Minerals Trading Corporation of India (MMTC) Ltd. Around 85 percent of the country's iron ore export is consumed by China.

The mining industry is regulated by the following Acts:

i. The Environment (Protection) Act 1986,

ii. The Forest Conservation Act 1980,

iii. The MMRD Act 1957,

iv. Wildlife Act 1972,

v. Water(Prevention & Control of Pollution) Act 1974 and

vi. Air (Prevention & Control of Pollution) Act 1981, etc.

But the laws need to be clear with respect to the environmental regulations. EIA and SIA have become a mere paperwork requirement. Also, the institutions lack sufficient manpower as well as technical and legal knowledge to enforce the regulations. The ambiguity that exists in the regulations has made way for the mining industries to venture into forests, protected areas and ecologically sensitive regions, affecting the local communities in the regions as well as the flora and fauna.

Table 1.3

No. of reporting iron ore mines in India from 2000-01 upto 2011-12

Year	No. of reporting mines
2000-01	208
2001-02	215
2002-03	242
2003-04	266
2004-05	270
2005-06	261
2010-11	336
2011-12	294

Source: IBM, Nagpur and Mineral year book 2012

The iron ore deposits are located in the country's dense forests and hill tops, which are watershed of important river valleys. Table 1.3 gives the number of reporting mines in the country from 2000-01 upto 2011-12. In India, iron ore mining is done by opencast method, which may be manual or mechanized. The method varies from place to place, the scale of mining and the characteristics of iron ore. Majority of the large mines are in the public sector and hence follow mechanized mining, whereas the private sector mines, being mainly small scale, do it manually. Most of the mines are allotted to the small mining enterprises that operate within a small area, and thus do not have the capacity to set up their own infrastructure. This results in excessive pressure on the existing infrastructure, thereby causing damage and increasing transportation costs.

In general, iron ore mining in India is done by developing benches from the top of the hill and carried downwards as the ore at the top gets exhausted. In case of mechanized iron ore mining the shovel-dumper combination is adopted. The bench height ranges from 6m to 14m, and the slope of the benches ranges from 450m to 600m depending on the consistency of the rock, as no standardized geophysical conditions exist across the world. Table 1.4 shows the depths attained by the mining sector with respect to the extraction of iron ore in the country.

Table 1.4

Mining Experience in India: Depths Attained

Sector	Depths attained
Goa sector	+ 80 mtrs, few mines have gone even gone (-) 50 mtrs below the sea level.
NMDC	+ 150 mtrs
Commercial miners in Eastern sector	+ 60 mtrs
Commercial miners in Bellary sector	+ 70 mtrs
Captive miners in Eastern Sector	+80 mtrs

Source: Industry

Major environmental damages with Indian context resulting from iron ore mining are as follows:

i. Transformation in the land form
ii. Air pollution due to drilling, blasting and transportation activities
iii. Pollution of water due to discharge of mining effluent
iv. Low water table
v. Soil erosion
vi. Noise and vibration problems in the mine and surrounding areas
vii. Deforestation affecting flora and fauna
viii. Spoiling surroundings with waste dumps

In absence of effective regulations for controlled mining operations, the communities located near the mining projects are affected the most. The positive impact of iron ore mining industry that India has seen is the social and economic upliftment. Mining comes with better medical facilities, educational support, and improved roads and communication facilities; hence the standard of living is improved. But there are also serious unresolved issues for the communities. The most common issue is the unfulfilled promises in terms of settlement of remunerations in return for their lands. There is no uniformity with regards to settlement of remuneration.

Management and rehabilitation of the wastes and overburden dumps are of particular concern as it has a direct impact on the vegetation on which the communities depend for their livelihoods. Unless the environmental and social impacts of mining are managed, the considerable disruption to livelihoods and the social fabric of communities adjacent to mines can negate any positive contribution that mining makes (Mining in Africa: Managing the Impacts, 2011).

1.1.6 Mining in Goan Context:

A glimpse of mining in Goa is presented in this chapter while a detail scenario of the same is displayed in chapter no. 4. In Goa, mining has been taking place since the Portuguese era. The Portuguese have ruled the Goa for over 450 years and was liberated in the year 1961. The mining activity during those times was in their initial stages and the extraction process was done manually. In the early 1947, just 100 tonnes of ore were exported that touched one mnt in 1954, 7 mnt in 1968, 10mnt in 1971, 13-15mnt in1980s and 15.16 mnt in the year 1993-94 (www.downtoearth.org.in/node/25419). However, the mining sector has witnessed a rapid growth in exports during the last decade, following the huge demand from China for iron ore. The exports went up from 17.09 mnts in 2001-02 to 33.38 mnts in 2006-07 and the highest recorded was in the year 2010-11 to the tune of 52.29 mnts (table 4.4, chapter 4). The state followed open cast method of extraction that has serious effects on the environment. To obtain 1 mnt of iron ore around 2.5 to 3mnts of overburden has to be excavated resulting in problems of storage of dumps. This waste occupies more space than allotted to the mining companies for their operations. This accumulated silt enters the fields during rains making the lands unfit for cultivation. The mining industry requires water in huge quantities for backwashing of the ore. Mining is one of the major concerns causing land degradation. TERI, 2010 revealed that 12,000 hectares have been rendered wastelands due to mining which is 3 percent of total geographical area.

The Goan ore has ferrous content ranging between 58 percent to 62 percent, while the domestic steel industries requires iron ore with higher ferrous content, thus the Goan ore has no domestic buyers. The rising demand for iron ore by China led to digging of land with even less ferrous content in the ore, as China accepted the low grade Goan ore. This led to rampant mining and illegalities in the sector in this small state. The result of this was seen in the Supreme Court Order to ban the mining operations in September 2012 to investigate into the illegalities in the mining industry.

Although the mining sector contributed significantly to the states GDP from 9.36 percent in 2006-07 to 19.87 percent in 2010-11 it had also had adverse implications on the environment in the areas of operation. From 25/10/1980 to 30/09/2008 around 1453.64 ha of land has been diverted for the purpose (**Ministry of Mines, 2008).** Out of 105 mines under operation in 2011, 60 percent of the mines were operating below the ground water level as per the Regional Office, MOEF Bangalore stated in a joint meeting with people affected by mining (http://www.indiawaterportal.org/post/18440).

Table 4.2 (see chapter no. 4) shows the contribution of mining sector and agricultural sector in the state's GDP. With an increase in the mining activities, there is a decline in the share of agriculture sector i.e. from 9.36 percent in 2006-07 the mining sector showed an increase in the contribution to GSDP upto 14.73 percent in 2011-12; while the agricultural sector showed a simultaneous decline from 4.61 percent in 2006-07 to 2.91 percent in 2011-12. But with a decline in the mining sector to 4.8 percent in 2012-13 and further 4.16 percent in 2013-14, the agricultural sector has shown an improvement to 3.21 percent in 2012-13 and 3.74 percent in 2013-14.

1.2 SIGNIFICANCE OF THE STUDY

Goa is a small state covering an area of 3,102 km^2 and known for its scenic beauty world over. The state has high literacy rate of 87.50 percent as per 2011 Census Survey and was ranked third in terms of quality of life in 2005 HDI ranking. 40 percent of the state population is made up of migrants. Though an agrarian economy, Goa has seen a shift to other sectors like manufacturing and tertiary as founded by TERI 2012. This is due to the fact that agriculture is time consuming, requires more efforts as well as labour and thus turns out to be an expensive process. Under this scenario the rationale for selecting the state of Goa for the study is as follows:

i. The state has seen a drastic growth in the mining industry during the last decade due to the rising demand mainly from China even though the Goan iron ore has less ferrous content in it. Mining is said to be the backbone of the state that contributed 4.23 percent to the State's GDP in 2005-06 and seen an increase of upto 19.87 percent in 2010-11 with simultaneous increase in the mining operations.

ii. 1/5th of the area of the state that is 700km^2 lies in the mining belt that is located in the remote areas rich in biodiversity.

iii. The entire ore that is produced by the state is exported directly through the major port, Mormugao Port Trust (MPT) and the minor port at Panaji. The state has liberal trade policies, favourable inland waterways and as mentioned a natural port that has favoured the mining operations. Mining is totally in the hands of the private companies that are of varied sizes that is small, medium and large. Mining areas have seen an improvement in the infrastructure and educational facilities that are provided by the mining companies. The mining companies claim that they have provided employment opportunities to the people in the areas.

iv. Readings from different online sources, comments made, and the discussions held with social activists and the respondents in the mining areas showed how the state was involved into rampant mining activities under the influence of political powers, inspite of several protests by the anti-mining activists and villagers. The result of the protests which though have been taking place for a long time was seen in the sudden ban of mines. Especially the last decade has seen a drastic increase in the mining activities following the Chinese demand for iron ore.

v. This rampant increase in the mining operations and further a sudden ban had a lot of impact on the mining dependents; as well as a direct impact on those who reside into the mining areas. Past studies dealt with from different inter-disciplinary angles have revealed serious direct and indirect impact the industry has on the socio-economic conditions of the households living in the mining areas. A study conducted by Mendes in 2001 covered only the Bicholim taluka and later the Quality of Life (QOL) was studied by TERI in 2005. No study was conducted thereafter to cover the impact of growth in mining on the socio-economic characteristics of the households in the area.

In such a scenario, there is a need to assess the impact of the mining industry on the socio-economic characteristics of the people living in those areas.

1.3 RESEARCH GAP

The research gap has been the result of the review of literature that is presented in chapter two. The literature that is presented in the next chapter discusses the impacts of mining from various perspectives though the nature of problems can be generalised. The current study also has its own perspectives and is not a replication of any work done before. However the current study aims at filling the gaps that exist in the Goan literature with respect to impact of mining industry. The following gaps with respect to the Goan literature were identified:

i. No in-depth study exists on the socio-economic impact of mining on the households in the mining areas in the recent years, especially after the increase in the demand for the Goan ore in the last decade.

ii. Past studies have shown high literacy rates in the areas where mining is active as well as instances of high income earning opportunities. However attainment of higher education into these areas still needs to be assessed.

iii. Though studies exist on the environmental impacts of mining in Goa, yet there is paucity of work on the perception of the people in the mining areas about the environment in which they live. Thus this needs to be uncovered.

iv. The impact of the sudden ban imposed by the Supreme Court on the economic status of the households in the mining areas is something that needs to be assessed seriously as no study has been dealt with by so far and will be an addition to the literature.

1.4 OBJECTIVES OF THE STUDY

The research titled, 'Impact of Iron Ore Mining Industry on the Households in the Mining Areas of Goa: A Study' is an attempt made to assess the impacts of mining industry on the households in the areas who are often neglected in the name of development. These households in the mining areas have to face the repercussions of the mining activities; on which over a period of time due to mining expansion they are compelled to depend on for their livelihoods. This is as a result of destruction that takes place owing to the mining operations in the area which affects the socio-economic status of these households. The household in the area has witnessed an increase in the mining operations from 2000 onwards and then a sudden ban in September 2012. These phases of mining have had a serious impact on the socio-economic characteristics of the households in the mining areas. With this background the study aims at covering the following objectives:

a. To compare the socio-economic characteristics of the households in the mining areas with the non-mining areas within the same talukas.

b. To study the economic status of the households in the mining areas.

c. To know household perception on the quality of environment in the mining areas.

d. To assess the impact of mining ban on the socio-economic characteristics of the households in the mining areas.

1.5 HYPOTHESIS

On the basis of the past studies the researcher has formulated the following null hypotheses:

H_0: There is no significant difference in the socio-economic characteristics of the households in the mining areas and non-mining areas within the same talukas.

H_0: There is no significant difference in the socio-economic characteristics of the households in the mining areas before and after mining ban.

1.6 SCOPE OF THE STUDY

Iron ore mining operations has been taking place in Goa since the Portuguese times. The ore is concentrated mainly in the following four talukas of Goa: Bicholim and Sattari in North Goa district and Sanguem and Quepem in South Goa district. The mining leases are spread across the villages of these four talukas. For the purpose of the current study, the researcher has selected 12 mining villages from across the four mining talukas mentioned above. The number of villages selected from each talukas includes: 6 villages from Bicholim, 1 village from Sattari, 4 villages from Sanguem and 1 village from Quepem taluka.

With respect to the ferrous content in the ore, the area is divided into three zones: northern zone, central zone and southern zone. The northern zone has high ferrous content followed by the central zone and then the southern zone. Thus iron ore mining was largely focussed in the northern zone that later spread on to the other zones owing to the rising demand for the ore from 2000 onwards. These areas lie in the Western Ghats that are rich in biodiversity. The people in the areas largely depend on the nature for their livelihoods.

1.7 LIMITATIONS OF THE STUDY

The study has the following limitations:

i. The analyses of the study are based on primary data which is confined to the four mining talukas in Goa, namely Bicholim, Sattari, Sanguem and Quepem.

ii. The data collection had to be done post mining ban as the same was announced by the Supreme Court whilst the study was under consideration.

iii. Since the study was conducted in the post-ban period, the impact on migration could not be covered though glimpses of the same could be noticed.

1.8 CHAPTERISATION SCHEME

The study covers nine chapters as follows:

Chapter 1: Introduction to Mining

This chapter mainly highlights the mining scenario over the globe and a glimpse of it in India and Goa. It also covers the significance of the study, the research gap, the objectives of the study and the chapterisation scheme.

Chapter 2: Review of Literature

This chapter basically covers various studies in different disciplines on the socio-economic and environmental impacts of mining in the first place; further, it also gives glimpses of sustainability development in mining.

Chapter 3: Data Methodology

This chapter describes the method in which data has been collected, the sampling procedure and techniques used. It also gives a brief description of the variables used and the tools used in the study.

Chapter 4: Mining in Goa

This chapter gives a brief background to mining in Goa specifically the history, growth and the mining operations. A brief report on the ban of mining industry and its impacts has also been covered.

Chapter 5: A Comparison of the Socio-economic Characteristics of Households in the Mining Areas with the Non-Mining Areas within the same Talukas in Goa

This chapter gives a demographic profile of the respondents in the mining and the non-mining areas and compares the socio-economic characteristics of the households in the two areas to bring out the influence of mining industry

Chapter 6: Economic Status of the households in the Mining Areas

This chapter determines the factors that affect the economic status of the household in the mining areas.

Chapter 7: Environmental Quality Perception of the Households in the Mining Areas

This chapter brings out the perception of the respondents on the environmental quality with respect to air pollution, water pollution, noise pollution and land degradation in the mining areas.

Chapter 8: Impact of Mining Ban on the Socio-economic Characteristics of the Households in the Mining Areas

The chapter here points out the impact that the mining ban has had on the socio-economic characteristics of the households in the mining areas before and after mining ban.

Chapter 9: Conclusion and Suggestions

This chapter gives the main findings of each of the four objectives, the concluding remarks and suggestions for improvement.

1.9 SUMMARY

The chapter gives an overview of mining scenario over the globe that is the mining operations, the sustainability aspects and tools suggested in overcoming the sustainability issues of mining industry. Further the socio-economic and environmental impacts of mining on the people in the areas are discussed. A brief-up of mining in the Indian and the Goan context has also been given to throw light on the related issues. In addition to this, the chapter gives the significance of the study, the research gap, objectives and hypothesis, the scope of the study, the limitations, the chapterisation scheme and the summary of the chapter.

CHAPTER 2

REVIEW OF LITERATURE

By its very nature, the mining industry, just like the oil and gas industries, leaves behind a 'footprint' environmental, social and economic impact (Weber-Fahr, 2002)**.**

2.1 INTRODUCTION

The current study assesses the impacts of iron ore mining operations on the households in the mining areas of Goa. It mainly covers the socio-economic and environmental impacts that people in the areas have to bear because of the mining operations. Socio-economic studies help in assessing the positive and negative implications that any project leaves on the inhabitants in the area and thus is of great significance. Mining can bring socio-economic development in the area but there are lot many unresolved issues that need serious attention for attaining development in the area. Assessing the environmental pollution perceptions of the people in the affected areas is also significant in understanding inhabitants' problems and taking necessary steps in resolving them. There is a need for studies in this area, by researchers in different disciplines such that each contributes towards socio-economic development of the people in the areas.

For the purpose of the current study, the following literature has been reviewed. The same is presented objective-wise below.

2.1.1 Reviews based on socio-economic influences of mining on the households in the mining areas:

The first objective compares the socio-economic characteristics of the households in the mining areas with the households in the non-mining areas, within the same talukas in the state of Goa. This objective assesses the ways in which the socio-economic characteristics of the households in the mining areas are influenced by the mining industry when compared with the households in the non-mining areas. Though attempts were made in capturing literature meeting the above requirement, very few studies were available that compared the mining areas with the non-mining areas, however studies based on socio-economic impacts of mining on the households in the mining areas were available.

Priyanath (1999) conducted a study on the gem mining industry in Sri Lanka. For studying the socio-economic impact, he considered 20 mines. The study revealed that the mining industry had created employment opportunities and generated income for the people in the area. This was a good sign as it helped in improving the socio-economic status of the people. Nevertheless, the adverse socio-economic and environmental impacts were seen by way of water pollution, soil erosion and destruction of trees, a decline in the agriculture, seasonal unemployment, and inequality in income and a decline in the standard of living.

Akabzaa & Darimani (2001) studied the social, economic and environmental impacts of large-scale mining on the local communities in Tarkwa region in Ghana using primary and secondary data sources. For the purpose of data collection, the following methods were used: focus group discussions; and informal, structured and semi-structured interviews with institutions, chiefs, opinion leaders and individuals.

The interviewees were identified using 'snow ball sampling' method. In total, the researcher conducted 28 interviews. The study revealed that the increase in production had led to a simultaneous increase in the adverse social, economic and environmental impacts. There was in-migration of the people into the area. This further led to an increase in the following problems: housing, cost of living and rentals, displacement of the local communities, relocation and resettlement, reduced vegetation in the area, rise in the levels of pollutants in air and water and damage to property due to frequent blasts. The researcher further revealed that the women were the most affected amongst the others in the areas. The researcher witnessed an overdependence of the inhabitants on mining, and opined that this overdependence could make their lives vulnerable in future. The study also pointed out an inequality between mining and non-mining families leading to a social divide.

Asare & Darkoh (2001), assessed the socio-economic and environmental effects of Copper-Nickel mine on land, water, vegetation and air on the locals in Selebi-Phikwe. The researcher used primary and secondary data to analyse the impact of mines in the study area. The primary data was collected through questionnaire that was administered to 144 respondents. The study revealed that there was immigration in the area leading to the problems like housing and air pollution, which affected the health of the people living in the operational area. Further the study also found that there was an improvement in the infrastructure, commercial and public services, as well as increase in employment avenues. The study however concludes that there was no enhancement in the income level of the inhabitants in the study area.

Remy and MacMahon (2002) examined the economic, environmental and social effects of large and medium mines on neighbouring communities. The key social and economic variables considered for the study were land acquisition, employment, business creation and development, multiplier effects, infrastructure creation, effects on local prices, training and education, and social, cultural and environmental externalities. The researcher noted social problems such as land acquisition and cultural clash between immigrants and residents of the area. The study also revealed that there was no uniformity in the price received for the lands in these areas. Another key finding was that, the non-mine-related employment generated through the multiplier effects fetched much higher income than direct or indirect employment in the mines. The study reveals that the large mines extended their support services in the areas of health, training, education and creation of social capital, while the medium-scale mines limited their services to their own workforce. The study also noted that though most of the mines followed the environmental norms, the adverse effects could not be fully controlled. The study suggests a need for collaboration amongst the mining companies, government and the local communities for meeting the needs of the local.

Kahn (2003) discussed the commonalities between two indigenous communities in Australia in close proximity to mines during the exploration, mining and post-mining phase. The study revealed that mining brought benefits in the form of increase in employment and business opportunities, increase in income, improved roads and community assistance; at the same time, it also led to a change in lifestyle, increased demand on resources, and anxiety amongst the communities. The author suggests a continuous social and economic planning, and a need for consultation throughout the life of the project with the stakeholders in order to minimise the negative impacts. Further, the researcher recommended a communication between the mining companies and the communities in the area to help them reduce their anxiety.

Mwaipopo, Mutagwaba, Nyange, & Fisher (2004) examined the role of small scale mines in reducing the poverty of individuals and households in Tanzania. The study revealed that the small scale mines fare better in terms of poverty alleviation than others. The study opined that these mines have the potential to increase the security of people's livelihood by way of wealth creation, asset accummulation and investment that consequently reduces vulnerability.

Brereton & Forbes (2004) monitored the impact of mining activities on the local communities in the area. However, the researcher found that though mining was a key sector for the economic development of the locals in the area, it could not sustain the economic benefits derived thereby, and also led to environmental issues. The study suggests that the mining industry be made accountable for their acts and may implement strategies to mitigate the adverse effects of mining and work towards promotion of positive outcomes.

Kitula (2005) examined the socio-economic and environmental impacts of mining on people's livelihood in the Geita district in Tanzania. For the purpose of the study, a comparison between the mining and non-mining communities in the areas was done. A sample of 72 respondents from each of the two communities was selected. The study made use of tools like ANOVA and cross tabulations using chi-square to test the socio-economic and environmental impacts in the two regions. The study revealed that the industry created complementary sources of income, direct as well as indirect; improved infrastructure, education and health services. At the same time, it brought adverse effects in the form of displacement of the people, loss of agricultural lands and grazing lands. The mining impact was also seen by way of in-migration that had led to a rise in the prices of goods, and the wages earned by these migrants was increasing the income of local traders/ business people. However, mining had affected the lands and water quality as well as the biodiversity of the area.

Bury (2005) conducted a case study to examine the impacts of Minera Yanacocha's mining operations on the land tenure patterns, livelihoods and access to resources in the Cajamurca region of Peru. For the purpose of the study, the researcher used the primary as well as secondary sources of data collection. A random sample of 59 was selected out of 349 households in the three communities in the area. The study revealed that the households close to the mines have experienced greater access to economic and human resources but a simultaneous decline in access to natural resources viz. the land holdings, and the quality and quantity of water. As the mining activities increased there was an increase in the mining claims by the private mining companies the result of which was seen in a transformation in the livelihood of the households. Thus, the researcher concludes that the increase in mining operations led to a decrease in the access to the social and natural resources on one hand and increase in the access to human and economic resource on the other.

Murthy and Patra (2006) assessed the impact of coal mining on the lives and livelihood of the people living in close proximity to Talabira mines in Orissa. The study used primary as well as secondary sources of data. A survey was conducted of five villages was conducted in the mining area. The study shows that though the level of activity is high, the people living close to the mines and the surrounding areas are not deriving any benefits. Thus, the quality of both – life and the environmental status, was low. The population density was very high in these areas; there no facilities to live a quality life and no potable drinking water was available that made conditions worse for living in those areas.

Larsen, et al (2006) assessed the local impact of two mines on employment, infrastructure, development of local business and social and community development in one of the world's poorest yet gold-rich countries, Mali. The study found that, while some stakeholders have been benefited considerably from mining, people living in areas close to the mines have experienced negative effects. The study concluded that the mining had affected the agriculture and pastoral activities and were becoming dependent on mines for their incomes.

Adjei (2007) investigated the impact of mining expansion on the livelihoods of the farmers in the frontier communities in the Tarkwa mining regions. The study revealed that while some of the rural households witnessed an increase in agricultural activities and diversification of livelihood activities, some others suffered loss of livelihood activity due to loss of farmlands. Furthermore, the compensation for the lands was not paid regularly and sufficiently.

Lahiri-Dutt & Mahy (2007) examined the positive and negative impacts of mining on women and youth in two mining regions in Indonesia. An intensive fieldwork was conducted for the purpose. The study followed a qualitative approach and used personal and focus group discussion. For the purpose of interview, snowball technique was used. The study revealed an increase in the economic opportunities for them by the means of business opportunities and services, but more youth than women were involved in this. At the same time, it decreased the land-based opportunities for the women, lowering their status and compelling them to depend on men. This also increased their workload at home. There was increase in crime and violence, alcoholism and cost of living. Increase in cash income was by way of compensations, jobs and business, but men controlled it.

Vandenbroucke (2008) investigated the environmental and socio-economic impacts of mining in Guatemala on the local communities. There were conflicts over land and natural resources which led to livelihood problems in the region. The researchers found that the people were in opposition to mining because there was inequitable distribution of wealth, violation of human rights and loss of traditional activities. There were conflicts in use of land and water resources as these were required for the local economic activities as well as the mining activities.

Galay (2008) studied the social, economic and environmental impacts of the gypsum mining activities on the people living near the mines in Bhutan. The researcher detected that the industry created employment opportunities however, these opportunities declined due to increased mechanisation over a period of time. The industry also created business opportunities mainly by way of shops and rental income. The researcher also observed draining-off of labour from other economic activities and decrease in horticulture as well. The social impacts identified were family disorganisation, deprivation of local people to work in mines by the influx of migrants, inadequate housing, safety problems and other social problems like prostitution. The people living close to the mines in addition to above problems also witnessed environmental hazards like air pollution, noise and vibration, water pollution and physical damages to properties. The economic benefits offered by the mining industry were small and shrinking every year. The researcher concluded that the continuation of mining in such situation would pose a serious challenge to the people in the areas.

Kangwa (2008) examined the economic, social and environmental impacts of copper mining in Zambia on the local people. For the purpose, he used case study method. Primary data was collected using unstructured questionnaire and for the purpose of analysis both the qualitative and quantitative methods were employed. Mining companies were selected on the basis of size of the mine to give better insight. 3 employees from each companies were interviewed and 3 people from five mining towns were interviewed to know the impacts of mining on their livelihoods. He found that the industry had a negative impact on the social support systems of the local people. The study also pointed the diversion of productive land for the mining activities instead of the traditional occupations, which had resulted in the displacement and resettlement of the people. The study also reported an increase in water and air pollution as well as land degradation with a simultaneous increase in the level of activity; however the revenues generated did not benefit the local people.

Chupezi, et al (2009) studied the impact of artisanal gold and diamond mining on livelihoods and the environment in the Sangha Tri-National Park Landscape. The study found that the artisanal gold and diamond mining had impact on livelihoods of the people. There was increase in employment, thus a simultaneous increase in income, provision of greater opportunities for education, health and shelter. This was accompanied by some insignificant impact in terms of the environment, such as diversions, siltation and sedimentation of water sources.

Petkova, et al (2009) assessed the impact of the mining boom on six communities in the Bowen Basin. The study revealed that the boom in the mining operations generates social and economic benefits that varied in the communities, depending upon the size of the operations. The local communities derived high incomes from the mining industry. There was an increased demand for accommodation by the non-resident. However, it led to increase in the food costs within the areas, which was affordable only for those people involved in the mining-related activities. As a result, the other residents would purchase their requirements from nearby places. The increase in the number of non-residents led to a change in the demography.

Temeng & Abew (2009) reviewed the alternate livelihood patterns of the people living in the mining communities in Ghana before, during and after mining operations. The study was done by conducting field visits to the mining companies and interviewing the local communities. The study followed a qualitative research method. 180 (that is 95 percent response rate) respondents were selected to answer the questionnaire. It was found that before mining, while the men were involved in small-scale mining and farming, the women were involved in trading and farming. During the mining operations, men were either employed by the mining company or engaged in small-scale mining activities, whereas the women continued trading and farming. Nonetheless after closure of the mines, majority of the people were idle. The researcher opined that this was a result of lack of proper assessment of the markets, the community's livelihood system, knowledge and experience which are a requirement for successful alternative livelihood programme.

Mengwe et al (2010) did a social impact assessment of three different copper-nickel mining sites by three different mining companies in Botswana. For the purpose both primary and secondary sources of data was used. He found that mining was accepted in the regions where it generated employment and business opportunities; and improved transport and related services. This led to in-migration in the areas close to the mining sites however the same migrants were forced to move out after the closure of mines. The study concluded that mining influences the population movements in the areas that has a positive as well as negative impacts on the communities in the area. The study suggests the practice of sustainable mining in order to reduce the negative impacts faced by the communities in the area due to mining .

Chauhan (2010) conducted a case study to assess the impact of mining on the human ecosystem in Bijolia mining area in Rajasthan. The findings revealed that the increase in the mining activities led to destruction of the forest and agricultural land, leading to scarcity of firewood used for cooking purposes. The study also found that the drilling, blasting and transportation activities led to suspension of particles in the air, resulting in lung and liver diseases. The noise levels were also beyond the tolerable limits. Thus, the researcher concluded that though mining created employment avenues, workers became disabled at a young age.

Opoku-Ware (2010) conducted a case study to analyse the changes that took place due to mining in the social and economic lives of the indigenous community of Kenyasi. For the purpose a random sample of 50 respondents was selected. The data collection instruments were composed of focus group discussions, semi-strucured interviews and participant observation. The study revealed the following social impacts: displacement and relocation of the people as their lands were taken over by the mining company, increase in the population, rise in poverty levels; and a pressure on social amenities and infrastructure due in-migration. The mining companies failed to fulfil the promises made with respect to employment and provision of better infrastructure as well as the other amenities that made the conditions of the people worser in the area. The study also revealed that the migrants were given preference over the locals and amongst the locals only those who were employed by the mining companies witnessed an improvement in their livelihoods.

Ticci (2011) also studied the socio-economic impact of mining boom on the people in the mining areas of the Highlands in the Peruvian Regions. The study was conducted especially with respect to migration, access to basic facilities, labour and occupational distribution. The researcher classified the districts into new mining districts, old mining districts and non-mining or untreated districts. He compared the non-mining districts with the old mining districts and non-mining districts with the new mining districts using logit model. He found that expansion in mining operation led to inflow of migrants in the area that affected the sectoral composition of the labour force in the mining areas. It had reduced labour share of agriculture and non-primary sector. The Propensity Score Matching(PSM) technique was used to seek the changes that mining had made on access to basic services like electricity, water services and sanitation. It was found that the mining industry had not led to improvement in the basic services. The displaced people were not given due protection with respect of their right to land and property. The study brought the fact to light that the mining boom has not produced a positive impact on their living conditions.

Brasier et al. (2011) compared impacts of natural gas on the local economy in Pennyslvania and New York. The study followed a qualitative research method. The social impacts, aesthetic quality, amenities, environmental quality, agriculture and physical infrastructure were the factors considered. The local economy experienced positive economic benefits by way of wealth creation, job creation, increased business and tax revenue. The study found that the industry created multiplier effects. The social impacts observed were a rise in population due to in-migration, increased pressure on social services like schools and water. It was found that the environmental threats with respect to water quality and quantity were consistent across all countries. Lack of specialised skill requirement compelled hiring out of state crews.

Zaman (2011) conducted a case study in Qasam Khel village in Pakistan to study the socio-economic impact of local community-managed coal mines. For the purpose of the study, the qualitative research method was followed. The study uses primary as well as seocondary source of data. The primary data was gathered through focus group discussions, key informant interviews and households interviews. A sample of 20 respondents was selected using stratified random sampling method. The respondents were classified into poor, middle and rich. The study showed a positive impact of income generated from coal extraction on the health, education, economic empowerment of women, marriages, livelihood diversification, local businesses and job creation, and improvement in the existing businesses. But it had negative effect on social relationships and agriculture. The villagers were occupied by work and physical interactions between the villagers had diminished. The incomes generated from coal mining gave the people an opportunity to give up agriculture and switch over to new and more profitable businesses and jobs.

Tiainen (2012) studied the social impact of gold mining industry in Kyrgyzstan with respect to sustainability. The study was ethnographic in nature requiring no structuring and no testing of hypothesis. In total, 16 interviews were conducted for the purpose of the study that includes individuals and groups interviews. The interviewees were selected using snowball sampling method. The study covered the direct economic impacts, social impacts, environmental impacts, CSR and impact on society. The study found that mining has a positive impact on employment, but a negative impact on the environment and social atmosphere of the region. Further the seasonal character of mining also was a disadvantage as it affected the incomes of the people at the same time; mining has not had a boosting effect on the local industries.

Terminski (2012) in his report discusses the social problems related to displacement and resettlement due to mining operations at the global level. He pointed out that displacement leads to unemployment, ethical and cultural conflicts, as well as social and economic risks. These were the problems mainly reported in the developing countries, due to poor monitoring policies with respect to compensation and resettlement.

Barclay, et al (2012) prepared a report discussing the problems creeping due to mining activities carried out intensively on a large scale in four mining intensive states of Australia. The methodology used for the purpose was desktop review, telephone interviews and in-depth case studies of five mining regions. The adverse economic impacts identified by the researchers were shortage of skill and uneven wealth creation. The social impacts were availability/affordability of housing and the challenges in managing and accommodating a rapidly expanding fly-in fly-out (FIFO) workforce. The environmental concerns included conflicts between resource developers and other rural residents over use of land and over water quality and supply.

Sahoo (2013) conducted a study in Odisha and found that in spite of an increase in the production and value of minerals there were no corresponding benefits received in terms of employment for the people in the areas. One reason for this could be the mechanisation of the mining sector, whereby the industry looks out for increase in quantity of the ore without having any concern for the development of the people in the area.

Gonzalez (2013) studied the impact of mining activities on the agricultural lands and the food in the Kyebi in the Eastern region of Ghana. The data was collected through both the primary and secondary sources and the researchers uses both the qualitative and the quantitative approach. The researcher followed a two stage sampling method for the purpose. 12 respondents from five communities each were selected on the basis of purposive sampling. Questionnaire was used for collection of primary data. The researcher found that the activities had led to reduction in the production of food in the area due to degradation of the agricultural land. The environmental pollution affected the farmlands, but people had adopted alternate means of livelihood. The small farmers were deprived of food production as a result.

O'Neil, Kaye, & Trevithick (2013) studied the expected impact of mining expansion on a selected community in the Eyre Peninsula. For the purpose the average household size of families was used to assess the expected growth in population. This was also used to assess housing demand and the land requirement of the families that would come and settle. They expect an increase in demand for services as follows: education- as the migrants would come with their families, and hence increase in the enrolment; boosts population, thus affecting house prices; increase in police officers; increase in number of hospitals; increase in social challenges; increased pressure on social services; increase in wealth of the region due to higher paying employment coupled with an increase in the number of local residents and consumption expenditure, as it will add to the number of non-mining jobs available through greater need for services; and a need to upgrade the infrastructural requirement by the mining company.

Onwuka, Duluora, & Okoye (2013) studied the social and economic impacts of tin mining in Rayfield of Jos Plateau, Nigeria. The study used primary as well a secondary source of data for the purpose. For analysis, the researcher used the frequency tables, percentages and ANOVA. The results of ANOVA test revealed a significant difference in the social components as well as the economic variables that was a result of mining activities on the people in the area. The tin mining activities also affected the environment significantly.

Pascual, et al (2013) conducted an interdisciplinary study on mining in Goa. The study used qualitative approach for the purpose. The researcher found that the mining activities had an effect on the agriculture sector. This was due to the running off of the mining silt into the fields that were close to the mining areas and secondly in the areas due to lack of sufficient quantities of water. The study revealed a shift in the activities from agriculture to mining.

Martin, Diaz, & Ruiz San Roman (2014) measured the mining image from the perspectives of the people in the mining areas of two towns in Spain who have direct and real information about the mining industry and its consequences on society, environment and economy. For the purpose of the study, a five factor model was constructed, that would measure the mining image. In total 18 variables were included in the model. The five factors were as follows: social impact; environmental impact; government and communication treatment; employment and housing impact; and infrastructure and industry impact. Structural Equation Modelling(SEM) was used to find a relationship between the latent factors mentioned above and the independent variable that is mining image. The results indicated a negative relationship between the social impact factors and the mining image; environment had negative and very low relationship; while the other three factors showed positive and a significant relationship with the mining image.

Steinweg & Schuit (2014) conducted an exploratory case study of Altain Khuder mining company in Mongolia. The report was a result of funding by European Bank for Reconstruction and Development (EBRD). The study used primary as well as the secondary sources of data and used various analytical tools. The aim of the study was to identify the common social and environmental factors that had an adverse impact on the local communities in the areas operated by different mining companies. The study found that the local communities were largely affected by the dust that spread due to transportation of the ore by heavy trucks. The monetary compensations were not effective in supporting the affected people. The study also revealed that the negotiations for land settlement were on an individual basis and no uniformity was maintained. The mining companies did not employ adequate strategies to protect the rights of the people, thus threatening their livelihoods.

Sreenivasa & R V (2014) conducted a socio-economic and environmental impact of a quarry on the inhabitants in Bidadi, Bangalore that is a rural district. The study used primary as well as secondary sources of data collection. The primary data was collected using questionnaire method with both open as well as close ended questions. A sample of more than 20 percent of the households in the four villages under study was randomly selected. The researchers assessed the pollution due to stone extraction that is air, water and noise and its impact on the social and economic status of the inhabitants. The study revealed creation of jobs, business opportunities and a development in the transport and communication facilities. These facilities proved highly beneficial to the poor and the landless people. However, the inhabitants also experienced negative hazards such as health issues, loss of crop and reduction in livestock. This further had an effect on the economic status of the inhabitants.

Popker (2014) undertook a study to identify the effects of mining on the socio-economic as well as the health of the people living in the mining areas in Goa. For the purpose of the study the researcher surveyed a sample of 350 respondents in the mining areas. The data was analysed through the SPSS software using frequencies and percentages. The study found that most of the families in the mining areas were living above poverty line. With respect to the education of the respondents, majority of them had completed upto higher secondary level. As far as the health of the people is concerned they agreed that the adverse impact was only due to mining.

Das (2015) studied the impact of coal mining on the inhabitants and their livelihoods in the Ib Valley Coalfield in the state of Orissa. For the purpose, 300 households from six mining affected villages and 100 households from two control villages were selected using systematic random sampling method. Both, qualitative and quantitative techniques were employed for the study. The qualitative data was analysed and interpreted using case study and the quantitative data was analysed using mean, standard deviation, percentage and frequency. The study revealed that the mining project has affected the traditional livelihood of the rural communities on one hand, whereas on the other hand it has created other sources of livelihood. As revealed by the other researchers the current study also has come with the finding that though the mining industry has led to an improvement in infrastructure, it has also brought about pollution leading to health issues. The company was biased in providing medical facilities, hence all were not given the benefit.

Singh (2015) studied the impact of mining on the tribal people in India. The study was done with special reference to the rehabilitation of the people in the mining area. The study revealed that the displacement of the tribals had led to destruction of their livelihood. The large-scale mining activities had affected the forest and water resources, air and water pollution. The socio-cultural lives of the people was also affected. The rehabilitation packages provided were not adequate enough to protect their interests. There was neither any adequate compensation for their lands and houses nor proper provision of basic amenities for the landless labour.

Behera (2015) identified the positive and negative effects of NALCO mining company on the human pattern of livelihood, education, income and settlement of the local population. To know whether the mining project had made a significant contribution to the livelihood of the people, an analysis of the following factors has been done: physical capital (land, house, livestock and other physical assets), financial capital (household income), human capital (health and literacy), social capital (displacement and social network) and natural capital (water, noise and air). The majority of inhabitants in the area were tribes who mainly practiced farming and allied activities, and were largely affected as water was contaminated. Deforestation had an adverse effect on the livestock. No initiative was taken to employ the women in the area. Promise to provide the company did not fulfil employment for the land acquired. Jobs, though offered to some, were not permanent in nature. Though the company addressed health problems, the quality of services was poor. The company was unfair in providing basic services to all.

Twerefou, et al (2015) studied the attitudes of the local people to mining policies and interventions. A sample of 1500 households was interviewed and the data was analysed using STATA and SPSS. Both the qualitative and quantitative methods of research were followed. Apart from literature review, preliminary stakeholders consultation, focus group discussions, surveys and key informants interviews were conducted. They found that the people have unfavourable attitude towards mining sector policies and interventions. The main reason being the challenges that they have to face with regard to the economic, social and environmental factors, with the economic conditions as the most severe one. The economic conditions include: payment of compensation, unemployment, Alternate Livelihood Programme(ALP), loss of land for farming, destruction of basic infrastructure, among others. The social issues involved were: resettlement, conflicts, inadequate provision of social services, water scarcity, increase in social problems, while the environmental issues in order of severity were: land degradation, water pollution, forest degradation, vibrations, cracks in buildings and air pollution. Majority of the resettled people are of the opinion that the packages they receive has not helped them improve their livelihoods.

2.1.2 Impact on economic status and Quality of Life(QOL):

With respect to the second objective, very few studies determining the economic status of the households in the mining areas existed. In Goan context, just one study was traceable so far in this area by Mendes (2001) when mining was mainly concentrated in Bicholim taluka. There has been drastic increase in the mining activities since then, which was no more concentrated only in Bicholim taluka but extended in Sattari, Sanguem and Quepem talukas as well. Thus with this rise in the mining activities this objective aims to seek whether there has been any change in the determinants of the economic status when compared with those found by Mendes. In addition, quality of life studies was conducted to gather more variables for the study.

Mendes G. (2001) in his thesis submitted to Utkal University, Department of Economics revealed that the socio-economic status of the households in the mining regions is better as compared to that of its non-mining counterparts in Goa's Bicholim taluka. He used a sample of 380 in each of the two strata for the purpose of study. The researcher in order to attain the objectives has employed the tools such as regression analysis, average, standard deviations and percentage. The major variable considered for the studies are education, participation rate, trade and service and landholding size to determine the per capita income of the households in the mining area. The researcher found that mining brings ample of employment as well as trade/business opportunities for the people in the mining areas as there is in-migration of the people into the areas. He also found an improvement in the economic status, literacy rates of the people and participation rate. The study reveals that the women in the mining areas are found to be better as compared to that of non-mining areas with respect to the variables considered in the study. He found that the traditional occupations were affected due to the impact of mining, but there was intensive cultivation on lands away from mine sites. The researcher further concludes that the health of the households was adversely affected in the study area due to mining operations.

A Quality of Life (QOL) tool was designed by Noronha, Nairy (2005) to compare the mining regions with the non-mining regions in Goa. The two regions were compared across six indicators having further sub-domains: economic, social, political, spiritual, biophysical and biomedical. The questionnaire was administered to 389 and 61 respondents in the mining and non-mining regions respectively. The mining regions were divided into three clusters: I, II and III depending on the age of mines, covering 17 villages. The researcher in order to analyse the data employed tools like t-test and ANOVA. The study open higher non-working population in the mining regions, substantial use of cooking gas, better health facilities, gender gap with respect to education and marriage, and access to social security benefits. People in the non-mining villages and villages where mining was closing down had more opportunities to engage in traditional activities. The researcher also noted that mining regions had a lower overall score in objective indicators compared to the non-mining regions. Further, the mining regions reported lower satisfaction with respect to environmental indicators considered in the study. The study concludes that among clusters, Cluster I had higher income, more assets and higher attainment in social indicators compared to the others.

Sills, et al (2006) tested the resource curse at the household level in Orissa. A stratified random sample of 600 households from 20 villages was selected. Econometric models were used to study the relationship between mine exposure, human welfare and forest resources. The researchers pointed out that households closer to mines report higher income from wage employment and better access to infrastructure, at the same time they witness higher incidences of many illnesses. As far as human development is concerned, they rank low, and own less land and assets required for agricultural practice. Proximity to mines was useful for measuring the asset holdings of the villages.

Sahoo & Sahu (2013) examined the relationship between the value of mineral production and quality of life variables in 11 major mining states of India. The socio-economic and quality of life indicators used for the purpose of the study were: total employment in mining operations, per capita income, access to electricity, poverty ratio, unemployment rates, access to tele-communication, illiteracy and expected years of living. The results of the correlation analysis revealed a negative association between quality of life indicators and total value of mineral production. Results showed that mining activity is significantly associated with decline in per capita income, literacy rate and life expectancy. Per capita income and tele-density is negatively associated with the total value of production, while poverty ratio is positively associated with mining activities. This proves that the resource curse hypothesis holds good for the Indian mining states.

Balanay, et al. (2014) analysed the income effects that mining is able to induce in the mining areas in Phillipines, using two-stage least squares. The authors surveyed 680 respondents as control group and 1045 respondents as treated group across 17 Barangays by using multi-stage systematic random sampling method. The data revealed that the age of the head of the household, years of schooling, loans taken, food and education expenditure had a positive influence on the income. The study revealed that mining would spur sustainable economic development if the associated income effects are properly managed and that can improve the standard of living of the people in the areas.

Patra, Meher, & Sethy (2015) studied the impact of mining on the socio-economic conditions of the people living around the mining areas of Keonjhar District in Orissa. This study also made use of the QOL tool indexed on a 10-point scale. 300 households were interviewed for the purpose. The findings of the study revealed that the people were not satisfied with the quality of life. It further revealed that the people rated low on educational status, housing and sanitary facilities, owned less assets as well as vehicles, and the per capita income was also low.

2.1.3 Environmental Perceptions of the households in the mining areas

The objective serves in understanding the perceptions of the people in the mining areas who are under constant environmental threat. Though the companies may take precautions in controlling the environmental pollution, whether it has served the purpose is what needs to be assessed from the affected people's point of view. Very few studies ever tried to know people's perceptions about the environmental quality in which they live in the mining areas. The open cast method of mining has serious implications on the environmental quality, yet it has been happening. Though the state of Goa ranks high in terms of its socio-economic indicators and literacy rate, yet the people overlooked the environmental implications. Hence, it is necessary to assess people's opinions about the quality of the environment in which they live. The following studies have been reviewed with respect to the objective:

Nayak (1994) reviewed the impact of mining on environment in Goa and found that mining has caused immense ecological damage. For the purpose, four point likert scale was used by him. The researcher studied the impact of mining activities on the villagers, and found that air pollution is the major problem faced by the people. Along with this, noise pollution and damage to agricultural land was also present largely. Mining operations had impact on the forestland, ground water and health of the people living close to the mines.

Yeboah (2008) studied the environmental effects (that is land degradation, air pollution, water pollution and noise pollution) of different methods of mining in Obuasi and surrounding communities. The study used both primary as well as secondary sources of data collection. A sample of 300 respondents was selected to answer the questionnaire. The study used quantitative as well as qualitative methods of data analysis. The researcher used Chi-square test to analyse the quantitative data. The study revealed that the mining activity has had an effect on the agricultural activities in the regions that further had an impact on the food production. Mining waste had affected the water resources, and air and noise pollution was present in the area. The combined environmental impacts led to health problems with high prevalence of disease that led to infection. The study also revealed that infections among residents were inversely related to distance from the mines.

Shi & He (2012) conducted a case study in Shaanxi Province in China to study the perception of residents on environmental pollution in the mining areas. For the purpose of the study, the authors used primary as well as secondary of data. The primary data was collected using questionnaires that was administered to 600 respondents of which 454 questionnaires (that is 75.6 percent) were found to be complete in all respects. The reserachers used five point likert scale to measure the intensity of pollution perception of air pollution, water pollution, sanitation, noise pollution, environmental satisfaction and health concern. The authors did a correlation analysis between socio-demographic variables and pollution perception. To test the significant differences between the socio-demographic and environmental pollution perception suitable tests were run. The socio-demographic variables like age, education, length of residence, proximity to mine and occupation showed close associations with local people's environmental pollution perception. Age and length of residence have significant positive effects on perception of air, water and noise whereas education has a notable negative impact on perception of water and noise pollution as well as sanitation. In addition to this, the variable proximity to mine has significant negative effect on perception of water and noise pollution. According to the people, environmental pollution in mining areas results from coal processing and poor law enforcement. As far as severity of environmental factors is concerned, air pollution was the most severe, followed by noise pollution, sanitation and water pollution.

Obafemi, Eludoyin, & Akinbosola (2012) obtained public perception on the pollution in the environment in Warri Township in Nigeria. For the purpose, primary information was collected using questionnaires that was randomly administered to 76 respondents. The study used descriptive statistics to explain the variables and the results were presented by way of tables and graphs. The data revealed that air pollution was the major pollutant among others and the high degree of pollution led to damage to resources. Also, the air and water pollution caused diseases.

Singh (2013) conducted an Environmental Impact Study (EIS) on mining in Goa. The study found high air pollution in the mining talukas. The researcher pointed out that very high transport density and traffic congestion has given rise to increased particulate matter and associated emission levels. As far as water pollution is concerned, the study found siltation in rivers and base water, which hampered the agriculture in the state. He also observed that wells had dried up in 8 villages situated in North Goa mining belt.

Shi X. (2015) examined the factors influencing the environmental satisfaction of local residents in the coal mine area in China. For the purpose of the study questionnaires were administered to 1936 respondents. Logistic regression and Ordinary least square method was used to analyse the data. The study came up with the findings that the residents in the area were not satisfied with the environment. The results revealed that health evaluation, government's attention degree, coal mine enterprises' attention degree and household income have the positive influence on local people's environmental satisfaction. However, air pollution has a negative impact on environmental satisfaction.

Obiri et al. (2016) assessed the environmental and socio-economic impact of mining on Ghana's economy. For the purpose, the author randomly selected 250 households for covering the socio-economic issues of mining. The data analysis was done using logistic regression. The author assessed the perceptions of residents of water quality in the area. He found that there is a highly significant correlation between the predictors (education, household income and familiarity with environmental problems) and perception model. The residents perceived water bodies to be highly polluted due to mining. However, their perception was not directly linked to their level of education. The economic gains derived from the industry compelled them to overlook the negative environmental and socio-economic effects. The study also revealed that the people's livelihoods are affected as the mining operations had an effect on the farmlands and deprived them from their livelihoods.

The environmental consequences of mining also influence lives. As pointed out by Stark, Li, & Terasawa (2006) in their study on environmental security assessment of Philippines in mining areas, the implementation and enforcement of mining laws, amendments and administrative orders are erratic and weak which leads to environmental problems. Land degradation, air, water and noise pollution affect people's lives. These problems needs attention, as founded by the literature, and are of great significance as they influence the social and economic factors as well.

2.1.4 Reviews based on socio-economic impacts of mining ban:

The researcher has come across the research work conducted by the researchers and social activists based on the impact of mining closure on the households in the mining regions, but no research work based on the impact of mining ban on the socio-economic characteristics of the households in the mining areas with respect to Goa. The review of literature with respect to mining closure on the households in the mining regions has been stated above in the review of literature based on the first objective on page number 37. As pointed out by Temeng and Abew (2009), mining closure made people idle while Mengwe (2010) found that the migrants vacate the place that affects the income sources of the inhabitants.

The researcher has not come across study with respect to impact of sudden ban of mining industry on the households in the mining regions, which suggests that this study would add to the literature.

2.2 STEPS TOWARDS SUSTAINABLE MINING

The current study revolves around the three pillars of sustainability: social, economic and environmental. For sustainable development of an area or an economy there needs to be a proper coordination amongst the three pillars. Collaborative efforts are in attempt across the globe by many associations to protect the interests of the mining affected communities by way of exchange of ideas, information and experiences. Sosa & Keenan (2001) have presented in their report as to how Impact and Benefit Agreeements (IBA) negotiations can be of use for nations as is done in the many of the Yukon and Northwest Territories. Under this arrangement, agreeements are signed between mining companies and the communities with the intention to establish a relationship between the two, such that the communities are made a part of the decision-making, with regard to any matter related to the exploitation of the land in the areas. This arrangement will give the communities an opportunity to address the adverse impacts of mining and get necessary benefits from the projects.

Social Impact Assessment (SIA) is a tool used by the mining companies to identify and mitigate the impacts of mining, positive as well as negative, that arise from the mining activity. Environmental Impact Assessment (EIA) is a tool for identifying the possible impacts the activity would have and to address the same. These are the tools that promote sustainability for the inhabitants in the areas.

Sustainability calls for a proper legal and regulatory framework and support of government, and can be an effective tool in building good relations between the mining companies and communities. There is also a need to conduct the EIA and SIA; if not done in recent times, then incorporate it by taking required advice from the communities as they are the ones who bear direct impacts of mining.

2.3 THE GAP

From the above discussion it is observed that the magnitude of impacts felt largely depends on the effective monitoring policies adopted by each nation government as well as the level of socio-economic development of the area. The studies point out the following gaps:

i. The Goan iron ore mining industry has seen a drastic increase in activities in the last decade. However, there has been negligible research covering the impacts of mining on the socio-economic characteristics of the households in those areas in the recent years. The study by Mendes (2001) has covered only one taluka out of the four mining affected areas that is Bicholim as mining was mainly concentrated in this region, however, there is a need to cover the entire mining belt as mining was actively practiced in all the four talukas after the year 2000.

ii. Mining industry comes along with educational support for the households in the areas, but whether it aids in attainment of higher education still needs to be assessed. This very important aspect needs attention in sustainability point of view.

iii. Lot of research exists on the environmental impacts of mining on the people. Nevertheless, the people's perception about the environmental pollution in Goan context in the recent years still needs to be evaluated.

iv. The sudden ban that imposed by the Supreme Court in September 2012, based on the findings of Shah Committee Report has led to a serious impact on the income sources of the people in the mining areas. No study was done to cover the impacts of the same on the incomes of the households in the mining areas.

Therefore, the three factors that are social, economic and environmental are inter-related and needs to be assessed for sustaining the economy in the mining regions. Hence, an attempt is made by the researcher in the current study to cover the unexplored impacts of mining in context to Goa, though not many and also do a cautious selection of the variables to meet the purpose of the study.

2.4 SUMMARY

From the above literature, it can be said that the mining industry comes with many impacts, direct and indirect, on the households in the areas of operations. Most of the studies have discussed the impacts of loss of traditional activities as a result of loss of land for mining purpose. This has affected the support systems of the inhabitants in the mining regions. Migration has been perceived as an opportunity as well as a threat by the households in the areas. Though migration creates employment opportunities, it also leads to a pressure on the basic facilities/services and has an impact on the cultures and the traditions of the people in the areas. Thus social problems creep in with migration. Instances of displacement or dislocation of the people has also led to a loss of livelihoods and support systems. The most unfortunate thing is that people are left onto themselves to face the repercussions of the mining activities, while the mining companies make huge profits. Furthermore the studies have found that, the compensations received in exchange for their productive lands are inadequate and can meet only their temporary requirements. There is a tussle between the mining companies and the households in the areas for most required basic facility that is water. Nevertheless, the mining companies claim that they bring infrastructural development, provide educational and medical support and conduct programmes for promoting the local economy. The past studies have covered the socio-economic impacts of mining at various stages of mining as well as the impacts of expansion in mining operations on the households. The reports by the international bodies like MMSD, IIED and ICMM have contributed a lot to the literature by giving a global view of the mining scenario world over. There has also been a careful selection of tools by the researchers for meeting their purpose. While some researchers have done case studies of mining affected regions, the others have done a comparison of mining areas with the non-mining areas. The studies conducted have also used different methods of sampling and the sample size varies with the area. Thus depending on the type of research approach followed, the researchers have very well applied various statistical tools to assess the impacts of mining industry on the households in the areas. Research has also been done on the economic status of the people in the mining areas and more common tool used is the regression analysis. Few studies on quality of life also exist in the Indian and Goan context with use of different socio-economic scales by the respective researchers. Intensive studies on environmental effects have been done, however the same does not fall within the scope of the current study. Further the study also gives the gap that exists in the study especially with context to Goa.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, the rationale, techniques and methods used for the purpose of the study have been discussed. On the basis of literature review already put forth in the previous chapter, a careful and cautious selection of the tools has been done to analyse the objective of the study. The data analysis is based mainly on the primary survey conducted in the mining belt of Goa. While the researcher was in the process of framing her questionnaire for the study, an unforeseen situation in the form of ban on the iron ore mining industry was imposed by the Supreme Court in September 2012. Although it was a hindrance, it was counted upon as an opportunity to explore another aspect of the topic, and the objectives in the study were slightly revised to suit the then present circumstances. The researcher took almost a year in understanding and reframing the questionnaire accordingly, so as to get a real picture of the socio-economic impacts mining had on the households in the affected areas. Discussions were held with the academicians and anti-mining activists, as well as with the Panchayat members and households of the affected villages before revising the questionnaire. A pilot study was conducted in October 2013 and a sample of 30 households was interviewed in the Shirgaon village of Bicholim taluka which was one of the affected areas. The pilot study was conducted to check the suitability of the questionnaire, and after few revisions in the questionnaire, a final interview schedule was prepared for data collection which was duly conducted from November 2013 to May 2014.

The mining ban gave an opportunity to assess whether it could sustain the livelihood of the people in the post-ban period. An interdisciplinary approach towards the study can be more effective in providing solution to the problems suffered by the households due to the mining industry.

The review of literature conducted is built around case studies and used qualitative research methods. Some studies have used combination of qualitative as well as quantitative methods. The researcher in current study entitled "The Impact of Iron Ore Mining Industry on the Households in the Mining Areas of Goa: A Study" also followed a combination of qualitative and quantitative approach to fulfill the objectives of the study. A descriptive survey design was used to obtain responses of the respondents in the mining and non-mining areas.

The current study intends to cover the impacts of iron ore mining industry on the households in the mining areas of Goa with respect to the socio-economic characteristics and environmental perceptions. The specific study objectives of current study are:

a. To compare the socio-economic characteristics of the households in the mining areas with the non-mining areas within the same talukas.

b. To study the economic status of the households in the mining areas.

c. To know household perception on the quality of environment in the mining areas.

d. To assess the impact of mining ban on the socio-economic characteristics of the households in the mining areas.

The methodology is explained objective-wise below for clarity.

3.1.1 Comparison of socio-economic characteristics of the households in the mining areas with the households in the non-mining areas in the same talukas:

The first objective aims at studying the socio-economic characteristics of the households in the mining areas. But it is not possible to study this impact unless compared to areas with similar physical characteristics as possessed by mining areas with the only difference being the presence of mining industry. Thus a comparison of the socio-economic characteristics of the households in the mining areas with the households in the non-mining areas within the same talukas was felt necessary.

i. Sample Design:

For comparing the socio-economic characteristics of the households in the mining areas with the households in the non-mining areas, the four talukas considered for the study were Bicholim and Sattari in North Goa and Sanguem and Quepem in South Goa.

Selection of mining villages and non-mining villages:

The list of mining leases operating during the year 2010-11 was obtained from the Goa Mineral Ore Export Association (GMOEA). Altogether there were 78 iron ore mining leases operating across the four talukas mentioned above covering 14 villages in Bicholim, 5 villages in Sattari, 5 villages in Quepem and 17 villages in Sanguem taluka. Bicholim taluka and part of Sattari is rich in terms of quality and quantity of ore and has large mines and mines are older than in the other talukas; the other parts has lower quality of iron ore with medium and small sized mines that have been operating on since the last decade. 25 percent of the total villages were selected for the purpose of the study that came to 10, but due to inadequate response from the households two more villages in Bicholim taluka were selected to form 12 villages out of 41 villages. It was decided to select higher number in the North Goa as mentioned earlier due to the age of mines and higher concentration of large mines in the areas operated by large mining companies. The selection of the villages was subject to the following conditions:

a. Grant of permission from the village panchayat

b. Age of mines more than 10 years.

c. Proximity to mines.

d. Random selection.

With respect to number of households, getting exact number of households meeting all the above mentioned parameters was not possible, thus whilst selecting the households the wards that met the above criteria only were selected. Attempt was made to cover 5 percent of the households in the selected villages in all the four talukas. The number of households selected was rounded up to the nearest multiple of 5.

Table 3.1

List of selected households in mining areas

Sr. No.	Talukas	No. of mining villages	Sample villages	Total no. of households	Selected (5% of total households)	Actual households undertaken for the study mining areas
1	Bicholim	14	6	2113	105	90
2	Sattari	5	1	582	30	30
3	Quepem	5	1	515	30	30
4	Sanguem	17	4	1956	100	106
	Total	**41**	**12**	**4412**	**265**	**256**

Source: Compiled by researcher

A systematic random sampling method was used in selection of the households for the study by using the formula, k=N/n wherein 'N' is the population and 'n' is the sample size. In each of the talukas k^{th} item was selected. Further these households had to be compared with the households in the non-mining areas within the same talukas. Two non-mining villages from each of the four talukas were selected having similar characteristics as the villages undertaken for the study in the mining villages of the respective talukas after discussion with the Village Panchayat members. 5 percent of the households were selected from each of the talukas. The number of households were taken as multiple of 5. Parameters for selection of non-mining villages and households for conduct of sample survey:

a. Similar physical characteristics with the mining villages in the respective talukas

b. No mining activities are practiced.

c. Located in the interiors and remote areas like the villages in the mining areas.

Table 3.2

List of selected households in non-mining areas

Sr. No.	Talukas	No. of households selected	Selected no. of households	Actual households in non-mining areas
1	Bicholim	1066	55	54
2	Sattari	798	40	41
3	Quepem	1074	55	52
4	Sanguem	1316	65	44
	Total	**4254**	**210**	**191**

Source: Compiled by researcher

Table 3.3

Taluka-wise list of selected villages and number of households in the mining and non-mining areas under study

Taluka	Villages	No. of Households	Percentage
	Mining villages		
Bicholim	Shirgao	17	6.6
	Mulgaon	22	8.6
	Velguem	23	9.0
	Pale	5	2.0
	Kudnem-Dignem	6	2.3
	Surla	17	6.6
	Total(i)	90	35.2
Sattari	Pissurlem	30	11.7
	Total(ii)	30	11.7
Sanguem	Rivona	40	15.6
	Calem	21	8.2
	Cormonem	25	9.8
	Uguem	20	7.8
	Total (iii)	106	41.4
Quepem	Cauvrem	30	11.7
	Total (iv)	30	11.7
	Total(i+ii+iii+iv)	**256**	**100**
	Non-mining villages		
Bicholim	Naroa	34	17.8
	Karapur-Sarvan	20	10.5
	Total (i)	54	28.3
Sattari	Nagargao	22	11.5
	Sanvordem	19	9.9
	Total (ii)	41	21.5
Sanguem	Bhati	12	6.3
	Barcem-Avedem	32	16.8
	Total (iii)	44	23.0
Quepem	Balli	32	16.8
	Morpirla	20	10.5
	Total (iv)	52	27.2
	Total(i+ii+iii+iv)	**191**	**100**

Source: Compiled by researcher

ii. Data and analytical tools employed

The study has used primary as well as secondary sources of data.

Primary Data:

The primary data was collected using interview schedule and key informant interviews, discussions and meetings with officials at the mining companies and various mining departments, NGOs, social and environmental activists, members of Panchayats, and mining officials. Observation method suitable to the research was also used.

a. Interview Schedule:

An interview schedule was used to gather information on demographic profile, social, economic and environmental impacts of mining in the mining areas, while in the non-mining areas only demographic and socio-economic data was collected. The interviewer presented the questions to the representative of the household and recorded them in the blank spaces. The schedule mainly comprised of mainly open-ended questions and a few closed-ended questions. Certain facts were verified by discussion with people who have knowledge in that particular respect. Mainly respondents aged 18 years and above were considered eligible to answer the interview. The reliability of the data was verified by asking indirect questions pertaining to the matter to the respondents. Every attempt was made to convince the respondents about the privacy and confidentiality of the data. Before conducting the interview the household members were given a briefing about the same and the purpose of the interview.

Period of data collection was from October 2013 to May 2014.

b. Key Informant Interviews:

These were the interviews held with key persons in the mining villages who could explain the impacts of mining on the environment as well as on the people in the area. These informants were identified from writings that appeared in the local newspapers/magazines, and recommendations made by Panchayat members or others. An attempt was made to meet at least one person who could provide necessary information about the impacts of mining on their lives and livelihood in every taluka.

c. Observation Method:

A simple observation method was conducted to know people's reactions to the mining ban and its effect on them. This method was used during the conduct of pilot study in order to know their views on the stoppage of mining activities. This method also helped in some way to know the expectations of the respondents from the government officials and the mining companies.

Variables under study:

For the purpose the following socio-economic variables were studied:

a. Social variables:

The researcher intended to cover the following social variables: residential status, mother tongue, length of residence, educational status of the households, access to natural resources (water and firewood), and economic activities practiced, place of purchase and shopping, and benefits availed and the problems faced due to mining operations.

The residential status and mother tongue was used to know the migration impact. Length of residence was used to know whether there was displacement due to mining. As learnt from the literature, literacy rates were higher in the mining villages, thus the educational status was used to know the literacy rate. The highest educated in the family was used to know the higher educational attainment in the mining as well as the non-mining villages. Variables such as access to main source of water and main source of cooking fuel was studied to know the impact of mining activities on these variables and also to study whether there is improvement in terms of these two basic facilities(that is water and firewood). Use of tap water indicates development of the area, while use of perennial sources indicates the area is not developed in terms of basic facility. In case of main source of cooking fuel used in the areas, use of gas cylinders or latest gadgets means improvement in the socio-economic status. But here the comparison is between the mining and the non-mining regions; hence, the use of gas cylinders is considered not only to assess the improvement in living standards but also to assess whether there is an adverse impact that the mining industry has left on the environment, due to which people have no choice other than opting for cooking gas. The encroachment of the mining industry upon the forest lands has denied their access to firewood, thus compelling them to use sources other than firewood as was learnt from the literature. Economic activities practiced are studied to know whether mining industry has influenced the economic activities of the households in the mining areas. The economic activities were broadly classified into four categories: agriculture and allied activities, labour, service and trade/business/profession. Agriculture and allied activities include all land-based activities as well as dairy/poultry farming, etc. Labour includes agricultural and non-agricultural labour. Service includes government as well as private jobs. Trade/business/profession includes all types of activities which are related to hotels, garage and repair shops, tea stalls, vegetable/fruit stalls, grocery shops, letting rooms on hire, letting trucks/mining machinery/vehicles on hire to mining companies and like activities. Place for purchase of food items and place for shopping of convenience goods is used to know whether the market place has developed for the two. It is also necessary to know the advantages and disadvantages due to the existence of mining industry in the areas. Thus the benefits availed by the people in the mining areas and the problems faced are also covered.

b. **Economic variables:**

The economic variables include the monthly household income, monthly household expenditure, monthly household savings and monthly household loan instalment and assets possessed by the households. The total of assets possessed in the two regions is considered for comparing the same. The total income includes income from economic activities mentioned above, as well as income in the form of remittances from family members abroad, and other income from pension schemes, government schemes and compensations from the mining companies. Thus variables that could provide complete data were used for the purpose of the study. Gathering data on these variables was difficult and subject to bias, though an attempt has been made to verify the same from different sources. To check the validity of income of government servants, various official records were retrieved. To check the validity of the truck owners' income the following data had to be obtained: nature of trip(long or short), number of trips per day, rate per trip, number of working days and number of trucks possessed by the household. Here, the seasonal nature of the mining business also had to be taken into consideration. With respect to agriculture and allied activities, the rates of the agricultural products had to be obtained from the respective Panchayats, and in some cases the Bagayatdars.

Collection of data with respect to economic variables had lot many constraints. The monthly household expenditures were quoted higher than the monthly household income by some of the respondents. The exact amount of savings was also difficult to obtain. The amount of loan instalments disclosed seemed to be very high by some respondents in the mining regions. It was also observed that some respondents who owned a truck and had loan liabilities were concealing the same as their trucks were not registered. Gathering data on asset holding was not a difficult task, but getting correct details of land holding was not possible. Thus the land owned has been taken as a dummy variable with '0' if no land is possessed, and '1' if the households possessed land.

Data Analysis tools:

The primary data gathered was organized and analyzed using the statistical package SPSS (Statistical Package for Social Sciences). The techniques used aims at finding out whether there are any similarities or differences with respect to the socio-economic characteristics of the households in the mining and non-mining regions under study.

The socio-demographic profile of the respondents was displayed using simple frequency table with percentages. Further since the sample size differs in the two regions use of means test with ANOVA table was made. Thus use of mean was made to compare the following variables in the two regions: gender, age, marital status, family size and educational status of the respondents. The rating of '1' was given for male respondent and '2' for female respondent for determining the mean age of the respondent. For determining the mean marital status a score of '1' was given to married respondents, '2' to single and '3' to divorcee/widow. For determining the mean family size the mean of total number of family members in the household was considered. For determining the educational status of the respondent, the score allotted were as follows: '1' illiterate, '2' primary education, '3' upto secondary level education, '4' completed SSC, '5' HSSC/Diploma/Vocational, '6' Graduation and '7' Post graduation/professional.

To compare the socio-economic characteristics of the two areas that are mining and non-mining regions, means test with ANOVA table as well as non-parametric test that is Mann Whitney U test was run. Further correlation analysis was also done.

Means test:

Means test was used to find the mean of the variables in the two areas that is the mining and the non-mining areas and ANOVA was performed to test the difference in the means. Means test was run for the following variables: residential status, mother tongue, educational status of the household members, access to natural resources, main economic activity and place of purchase and shopping in the mining and non-mining areas.

Mann Whitney U test:

Mann Whitney U test is a non-parametric test. It is used to test whether there exist any significant difference in the ordinal or scale or dependent variable by a single dichotomous independent variation. It does not require properties regarding distribution of the dependent variable. It was developed in the year 1947 by two people namely Mann and Whitney and designed to cover different sample sizes. This test compares the median scores of two samples. In the test statistics that is provided using the test U shows the number of times observations in one sample precede observations in the other sample in ranking. When the test is conducted using the SPSS package the test statistics presents U-value and Wilcoxon W. SPSS sorts out the observations and assigns ranks to each of the observation. This test was run for testing difference in monthly income, monthly expenditure, monthly savings and monthly loan instalment in the mining and non-mining areas.

Correlation analysis

Correlation analysis is extensively used in socio-economic studies. According to W. A. Neiswanger, "Correlation analysis contributes to the understanding of economic behaviour, aids in locating the critically important variables on which others depend, may reveal to the economist the connections by which disturbances spread and suggest to him the paths through which stabilising forces may become effective." Correlation analysis gives a critical analysis of the data. However, it can measure the quantitative aspects and not the qualitative aspects. Correlation analysis was used to find correlation between income and education, and income and loan, in both the mining and the non-mining regions.

3.1.2 Economic Status of the households in the mining areas:

The second objective aims as determining the economic status of 256 households under study in the mining areas. As discussed earlier mining operations before 2000 was largely concentrated in Bicholim taluka and spread into other parts during the last decade to meet the rising demand placed by China for iron ore. Under this scenario this objective aims at assessing whether there is any change in the determinants as compared to those identified by Mendes (2001).

Regression Analysis:

Regression analysis is used to estimate relationship amongst the variables. It explains relationship between a dependent and one or more independent variable also called predictor. Multiple regression analysis was used to determine the economic status of the households in the mining areas. In the regression model given by Mendes (2001) per capita income was dependent variable, while agriculture, labour, service, trade, mean years of education, participation rate and landholding size were taken as the predictors of per capita income. This model was taken as a base in the current study, with some variations in the predictors.

Two regression models were run as given below:

Model I

Under this model per capita income of the household is taken as dependent variable and the following independent variables were considered agriculture as an occupation business as an occupation; participation rate; mean years of education and land ownership (dummy variable). After running the model it was observed that this model could explain only 38.6 percent of the variation in per capita income and thus there was need to find variables suiting the current mining scenario.

Model II:

It was decided to exclude variables that were not significant in the first model that is land ownership and surprisingly also the mean years of education, and was replaced by loan instalment. It was learnt in the process that, more the number of trucks/mining machineries/vehicles owned by the household member, more the income earning opportunity as these assets could be fruitfully employed with the mining companies that fetched direct and good income to the people. The large mining companies offered contracts to those people who lost their incomes and had no alternate source of income due to mining operations on their lands, by easing loan process for them and giving them trucks/mining machinery for employment into mines. It was observed that to operate such business, higher education was not required. The earnings were not at all dependent on the educational status of the people. Thus education was not a significant variable in determining income. This equation could explain 60.2 percent of the variation in per capita income.

The data was checked for autocorrelation using the Durbin Watson value which has to be close to 2 which was also met. The model was acceptable as the F value was significant at $p<0.000$. The economic status of the household in the mining areas is thus dependent on trade/business, participation rate and loan instalment paid. Agriculture was also a significant but negative contributor to per capita income.

The following regression equations were run:

1. $Y=\alpha+\beta_1 Agri+\beta_2 Lab+\beta_3 Busi+\beta_4 Ser+\beta_5 ME+\beta_6 Part+\beta_7 Land+U_1$
2. $Y=\alpha+\beta_1 Agri+\beta_2 Busi+\beta_3 Part+\beta_4 Loan+U_1$

The per capita income of the households was derived as follows:

a. Per capita income of the household: Total annual income from all sources/total no. of members in the households

b. Mean years of education: Sum of years of schooling of each member in the household/total no. of members in the households

c. Participation rate: Total number of working members in the household/total no. of members in the households

d. Loan: Actual loan instalment paid during the year was considered.

e. Dummy variable: Business, service, labor, agriculture and land owned were taken a dummy variable. If the household is involved into business, the value was taken as ‘1’, else ‘0’. The same was applied for the households involved into service, labor and agriculture as well. Likewise the households having land were given value of ‘1’, and if not then ‘0’.

3.1.3 Household perception about environmental quality in mining areas:

This objective was studied to know the severity of the environmental pollution in the opinion of the people in the mining areas. The same sample of 256 households was under study for the purpose. They are the ones under the threat of continuous mining pollution and thus in a better position to convey the environmental quality and the impacts it has on their lives. The study of environmental quality was not in the purview of the researcher’s domain. But the literature suggests that understanding people’s perceptions about the environment in the mining areas is important for the redressal of their problems.

Four factors were covered for determining the environmental quality: air pollution, water pollution, noise pollution and land degradation. 21 statements were drawn to understand the overall perception of environmental quality in the mining areas as follows: 4 statements explaining the perception of air pollution, 7 statements explaining perception of water pollution, 3 statement explaining perception of noise pollution and 7 statements explaining perception of land degradation.

Likert scale: the statements were rated on a five-point Likert scale with ratings of 1- strongly disagree, 2- disagree, 3-neutral, 4-agree and 5- strongly agree. Composite scores were computed as follows:

Composite Score= $W_1R_1+W_2R_2+\ldots\ldots..+W_nR_n$ / N

where R = Response

W = Weight of the response

The average weighted scores were derived to find the intensity of pollution for each factor. The scores were classified as follows: low, medium and serious. A mean score in between 1-2.4 indicates low perception, 2.5-3.4 indicates medium perception and 3.5-5 indicates serious pollution as given by Shi, He (2012) in their perception study.

To assess whether the pollution perception differs across mining talukas and within age groups, length of residence and income groups ANOVA test was run. Further t-test was run to test difference in pollution perception by gender of respondents in the mining areas.

3.1.4 Socio-economic Impact of mining ban:

This objective aims at bringing out the impact of mining ban on a sample of 256 households in the mining areas. The following impacts were covered: impact on economic activities and incomes; and the impact on health status for which two parameters were used such as medical expenditure before and after mining ban, and people's perception about their health before and after the mining ban. For the purpose paired sample t-test was used to compare the socio-economic characteristics before and after mining ban.

Paired sample t-test:

Paired sample t-test is a parametric test used to determine whether the mean difference between two of observations is zero. Each subject is measured two times, which results in pairing of observations.

3.2 OTHER DATA CONSIDERATIONS

Research error:

The level of significance or as is said, the chances of error or the chance of going wrong was fixed at 5 percent in the current study.

Errors in data entry:

To reduce the chances of error in data entry, the three main steps i.e. error checking, data editing and data cleaning were carried out to the extent possible.

Cronbach alpha:

Where ever the variable was measured using Likert scale, Cronbach Alpha was used to check its reliability. A higher value of more than 0.7 is considered ideal and acceptable in most social science researches (www.ats.vela.edu/stal/spss/faq/alpha.html). Hence, the above criterion was considered for the purpose of the current study.

Normality tests:

To run parametric tests, the normality conditions have to be fulfilled; this assumption was required for running the paired sample t-test.

Factor Analysis:

Factor analysis using Principal Component Analysis (PCA) was run to assess the reliability of the statements drawn to study people's perception about the quality of environment. The rules of PCA were met here, that is KMO value was greater than 0.60, Sig. of Bartlett's test value was less than 0.05 and the total variance explained was more than 60 percent.

3.3 SECONDARY DATA

In addition, quantitative data on exports, production, royalty, number of barges and trucks was collected from the Directorate of Mines & Geology (DMG), Goa Minerals Ore Exporters Association (GMOEA) and Goa Chamber of Commerce & Industry (GCCI). Data on different benefits provided by the Mining companies was obtained from the Village Panchayat and Mineral Foundation of Goa (MFG). The data was also collected from various related journals, books, websites, newspapers, and thesis and research papers.

3.4 SUMMARY

This chapter gave the detailed research methodology of the study. The chapter is divided into four parts. The first part discusses the objective wise methodology used in the study. The current study is quantitative and descriptive in nature. An interview schedule was used to survey a sample of 447 respondents of which 256 were from the mining areas and the remaining 191 from the non-mining areas. There were two schedules: one for the respondents in the mining areas, covering socio-economic characteristics, environmental quality and socio-economic impacts after the imposition of the mining ban; the second one was for the respondents in the non-mining areas of the same village, covering socio-economic characteristics only. The interviews went on almost for a period of 8 months, following a pilot study carried out month before the conduct of formal interview. SPSS package was used to analyse the data. The study uses frequency table with percentages to compare the socio-economic variables of the mining areas with the non-mining areas under study. Tools such as Mann Whitney U test, Paired sample t-test, and ANOVA were run to study the impacts of mining. Furthermore, multiple regression analysis was run to predict the economic status of households in the mining regions. A correlation analysis was run to find relationship between socio-economic variables. The second part discusses the other data considerations in the study. The third part confers the secondary sources of data while the last part gives a summary of the chapter.

CHAPTER 4

MINING IN GOA

4.1 INTRODUCTION

Goa is a very small state situated in the western coast of India, with just 3,702 sq.km area and is known for its scenic beauty all over the world. The population of the state is over 14,50,000 (Goa Census 2011). The state was ruled by the Portuguese for almost 450 years and got liberated on 19th December 1961. Goa is located between the parallels 15^0 – 47’-59” and 14^0 -53’-57” of latitude north and between meridians 73^0 -40’-54” and 74^0 -53’-11” of longitudes east of Greenwich. The land of sun and sand with a 105 km long coastline has always attracted not only the domestic tourists but also tourists from all over the world. It is blessed with biodiversity rich Western Ghats which are protected by a National Parks and six Wildlife Sanctuaries covering an area of 107 km^2 and 648 km^2 respectively. Geographically it is divided into three: Sahyadri Watershed, Middle Plateau and the final flood plains. There exist 9 major rivers originating from the Western Ghats and 42 tributaries. With harbouring rich tropical forests and a varied biodiversity, the Western Ghats is one of the biodiversity hotspots of the world. The forests are spread over of 1,224 sq. km, covering 33.06 percent of its geographical area. Of this, the reserve forest constitutes 20.67 percent, protected forest 69.04 percent and un-classified forest 10.29 percent of the total forest area (Dongre, 2013). The Mormugao Port, a natural harbor is situated on the Southern side of the Zuari on the West Coast of the country. The climate is normally warm and humid. The State has a high population density of 394 person/km^2 and 62 percent of the population lives in the urban area according to the 2011 census. The state has a high literacy rate of 87.50 percent. This is because of the good education system in Goa compared to the other states. Every taluka in Goa has a government run school.

In terms of quality of life Goa ranked 3rd in the HDI ranking in 2005. Many agencies have declared Goa as the number one state in the country (Directorate of Planning S. a., 2004). 40 percent of the population in Goa is made up of migrants. Goa has a low birth rate, but the migration into the state especially after the liberation has tripled.

In Goa, agriculture has been the dominant economic activity followed by fishing and tourism. The main food crops cultivated in the state are rice, pulses and ragi with rice cultivation covering almost around 47,237 ha. But the state has witnessed a shift in the pattern of economy from an agrarian based to other sectors like manufacturing and tertiary. The issues linked to this as identified by TERI 2012 are loss of traditional varieties, ill-effects of the mono-culture system, rising cost of cultivation and inabilities to link to local markets. Although Goa gets 120 inches of rainfall annually, it still has to look at the neighbouring state for meeting its water requirements.

4.2 MINING AND ITS IMPACTS

Mining has made a tremendous impact on the state directly and indirectly. A glance into the scenario would give an understanding of the role mining has played in this small state of Goa.

4.2.1 History of Mining:

Mining operations have been in practice in Goa since the Portuguese era. The presence of iron ore was traced back in the 16th century by a Dutch traveller but explorations started lately during the Portuguese regime. By a decree of September 20, 1906, the grant of numerous mining concessions began (Chhibber, Rogers, & Milkereit, Case Studies Human Rights Violation By Transnational Corporations in Goa and Chattisgarh, 2011). The holders of these concessions were allowed to excavate in perpetuity and the right was inheritable. More than 800 concessions were granted by the then Portuguese government covering an area of 16 percent of the state. In 1987, when Goa attained statehood the Indian government enacted 'the Goa, Daman and Diu Mining Concession Act 1987', by which all Mining Concessions granted by the Portuguese were treated as Mining Leases. The leases were no longer in perpetuity but were valid for a period of 10 years after which they would have to be renewed again. Thus the Goan mines had to follow laws prevailing in the country.

The entire mineral belt of Goa has been leased out to the private mine operators. These mine operators had acquired "Mining concessions" from the then Portuguese authorities in the fifties and they did not have much knowledge of the mineral potential of the concerned land. A total of 868 mining leases/concessions existed at that time, covering an area of 65,400 ha. A number of "concessions" have since been terminated by the Government for violation of the essential condition that it would be exploited for the production of minerals. About 50 percent of these leases have then been terminated.

4.2.2 Mining Operations and Growth:

The major minerals found in Goa besides, iron ore are manganese, bauxite, high magnesia, limestone and clay. The minor minerals include basalt, laterite stones and rubbles, river sand and murrum. The state is rich in iron ore deposits with the mining belt covering approximately 700 km^2. A total of 18 percent of the geographical area is under mining of which the forest alone accounts for 70 percent of the leased out area reckoning to 43 percent of the forest area (Forest Survey of India, 1985).

Mining in Goa is done mechanically employing open cast type of mining technique. As Goa has low grade iron ore, the overburden ratio is also high that is 1:3. Thus, larger quantities of soil have to be extracted, leading to greater environmental impact. Systematic benches are formed on the hill top and along hill slopes and the pits are laterally extended in stages in all directions with increasing depth. The height and width of the bench are maintained at 7m and 10 m respectively. The stages of extraction include:

- Removal of lateritic overburden: soft lateritic is removed by dozing and ripping and hard and compact laterite by drilling and blasting.
- Lumpy ore is then extracted followed by the powdery ore
- Wet or dry processing of the mixed material so as to attain the desired cut-off grade of the iron ore (62 percent of iron) for export purpose.

Iron ore mining comprises of variety of heavy earth moving equipment. Most of the large mines also have mineral beneficiation plants comprising crushers, classifiers, hydrocyclones, logwashers and magnetic separators.

In Goa, the entire iron ore produced is exported. The reason being, the ferrous content in the ore ranges from 58 percent to 62 percent while the requirements of the domestic markets is higher. The major exporter in the days of inception was Japan, but later iron ore was exported to Japan, China, South Korea, Taiwan, Middle East and Europe. Since the last decade China has emerged as a major importer of the state's iron ore exports. The ore is exported in the form of lumps, fines and pellets.

The favourable feature for mining has been the natural harbour that is, Mormugao Harbour equipped with sophisticated, high capacity, mechanical ore handling facility; the navigable perennial rivers namely, Mandovi and Zuari for transporting ore through barges; good infrastructure by way of railways and liberal mineral concession policies. In Goa, the iron ore extracted and brought from Karnataka are also directly shipped through the port. The minor port at Panaji also contributes significantly to the state's exports.

Mining in Goa is largely in the hands of the private companies. For many years it has been made up of families like the Timblos of the Fomento Group, the Salgaocars, Dempos, Chowgules and the Bandekars. These families have been mining for many decades and have also been contributing towards the creation of infrastructure like roads and educational facilities.

The following table gives the details of major mining companies, their ownership and share in mining:

Table 4.1

Share of mining industry

Mining entity	Share of Mining industry	Area of operation
Sesa Goa	35-40%	Bicholim and Sanguem
Fomento	15%	Sanguem, Quepem and Salcete
VM Salgaokar & Bro. Pvt. Ltd.	8-10%	NA
Anil Salgaokar	8-10%	NA
PVG	8-10%	NA
Chowgule	8-10%	NA
RNSB Group	8-10%	NA

Source: currentnews.in/illegal-mining-threatens-goa/

The major mining companies like the Sesa Goa, Chowgules, Dempo and Salgaocar contributed 67 percent of the state's iron ore which is 68 percent of the exports of Goa.

The mining companies as a part of their Corporate Social Responsibility (CSR) activities extended educational support, medical aid and infrastructural support to the people in the mining areas. The mining industry consists of large, medium and small firms. Thus the large mining firms like the Sesa Goa and Fomento have been seriously investing into CSR activities benefiting the communities in the area. As is witnessed in case of Vedanta, the company has invested into football academy, technical schools, and employment generation activities for the people in the areas. Each company followed their own discretion whilst extending the benefits to the people. Mining company in Ponocem provided water pipeline to the villagers. Some have offered their pit water for irrigation in the village fields. Companies like Sesa Goa and Fomento compensate for the damage caused due to water pollution in their areas of operation. They provide potable water tanks and have put up doctors at the disposal of the workers to take care of health issues.

The Mineral Foundation of Goa (MFG) is a co-operative venture started by the mining companies to address the social and environmental issues in the eastern interior mining belt of Goa. The foundation has supported the people in their areas of operation by undertaking projects and programmes of livelihood generation, educational support, women empowerment, health programmes, environment conservation, etc. Some of the activities undertaken are in the following ways: donating books, compass boxes; providing scholarships in different disciplines; organising medical examination on students; supported two babies in getting their heart operations; provision of mobile medicare unit in Pilgaon and Shirgaon twice a week; working in small projects; provided financial support for a Society of Youth Development; undertook community development programmes in Pissurlem and Carmona; worked towards beautification of Harvalem Waterfalls; took initiative in improving the fertility of paddy fields in Lamgao; came up with conventional methods to improve silt affected paddy field and many more activities. Table 4.2 lists out the educational support extended by the MFG to the locals in the mining areas.

The foundation was made up of 11 local mining firms initially, but later had 15 members as follows: Sesa Goa, Damodar Mangalji, Sesa Resources Ltd., Sesa Mining Corporation Pvt. Ltd., Sociedade De Fomento Indl. Ltd., Chowgule & Co. Pvt. Ltd., Emco Goa Pvt. Ltd., V. M. Salgaocar & Bro. Pvt. Ltd., M/s Ahiliabai Sardessai, Cosme Costa & Sons, Timblo Pvt. Ltd., D. B. Bandodkar & Sons Pvt. Ltd., Rajaram Bandekar(Sirigao) Mines Pvt. Ltd., M/s Raghuvir Sinai Gharse and Pandurang Timblo Industries.

Table 4.2

Educational support provided by MFG through scholarship

Year	No. of males	No. of females	Total no. of awardees
2003-04	6	6	12
2004-05	1	4	05
2005-06	5	3	08
2006-07	3	4	07
2007-08	28	10	38
2008-09	5	7	12
2009-10	15	8	23
2010-11	4	11	15
2011-12	13	18	31
2012-13	21	8	29
2013-14	16	17	33
Total	117	96	213
Scholarships awarded(fields)			Total number of awardees
Doctors(medical, dental, ayurved, homeo)			20
Engineers(degree)			54
Pharmacy			8
Masters degree/diploma			50
Diploma			38
Architect			1
ITI			9
Law			7
Nursing			5
Others(B.Ed, BBA, etc.)			21
	Total		213

Source: MFG, Panaji Goa(Visited as on 19/11/2014)

Mining industry has been hyped as the backbone of the Goan economy. Between 1968 and 1990, the number of working mines had reduced by 50 percent that is 400 out of 800 concessions granted. Of these 80 percent were controlled by large mine owners. These mine owners had their own prospecting and operation wings for working the mines. However, there was increase in the production considerably inspite of the reduction in the number of mines. In the early stages, just 100 tonnes of ore were exported in 1947 which touched one mnt in 1954, 7 mnt in 1968, 10 mnt in 1971, 13-15 mnt in1980s and 15.16 mnt in the year 1993-94(www.downtoearth.org.in/node/25419). The table 4.3 gives the classification of exports that took place after 2000, indicating an increase in the exports each year. According to the information provided by the Goa Mineral Ore Exporters Association (GMOEA), 54.45 million metric tonnes of mineral ore was exported in 2010-11, which was the highest by any state in the country. Most of this was iron ore, with a small percentage of manganese and bauxite (less than 20 percent). Of the 54.45 million metric tonnes, 48.93 million metric tonnes were sent to China, followed by 3.4 million metric tonnes to Japan and the rest to South Korea, UAE, Qatar, Pakistan, Thailand, Netherlands, Romania and Italy.

Table 4.3

Classification of Goan Iron Ore Exports (in tons)

Year	Lumps	Fines	Pellets	ROM	Total
2000-01	3331432	12741179	-	-	16072611
2001-02	3062170	13581720	54620	-	16698510
2002-03*	3104508	17482941	101918	-	20689367
2003-04	4112230	17983763	-	-	22095993
2004-05	3806980	19342023	159030	-	23308033
2005-06	4436990	21006982	93952	-	25537924
2006-07	6207702	24686251	-	-	30893953
2007-08	5855461	27407768	171200	-	33434429
2008-09	5755992	31990991	37500	290740	38075223
2009-10	8038052	37648848	-	-	45686900
2010-11**	8815926	37870257	48300	-	46846383
2011-12	NA	NA	NA	NA	38252554

Source: GMOEA, Goa
*Exports during 2002-03 includes 1,729,219 tons of non-Goan ore blended with Goan ore
** Exports during 2010-11 are of classified ore only.

The table above shows an increase in the exports every year. When compared with 2000-01, the export has increased by two times in the year 2010-11. However the year 2011-12 has shown a decline due to the mining ban ordered by the Supreme Court in September 2012.

Table 4.4

Exports through Mormugoa and Panaji Ports

Financial Year	Mormugoa Port	Panaji Port	Total
2001-02	15171424	1918486	17089910
2002-03	16133606	4889747	21023353
2003-04	19358250	8102991	27461241
2004-05	20188483	7934929	28123412
2005-06	19630340	11476032	31106372
2006-07	19394317	13985847	33380164
2007-08	20943445	12657253	33600698
2008-09	27565213	11899610	39464823
2009-10	32272045	13678677	45950722
2010-11	37802589	14485346	52287935
2011-12	27482883	14305070	41787953
2012-13	7826912	3275822	11102734

Source: GMOEA, Goa

Table 4.4 gives the bifurcation of exports through the two ports of Goa the Mormugao (Major) and the Panaji (Minor) port. Table 4.5 gives the production of iron ore in Goa and the contribution in the total production in India.

Table 4.5

Production of iron ore in Goa and contribution in the total (in million tonnes):

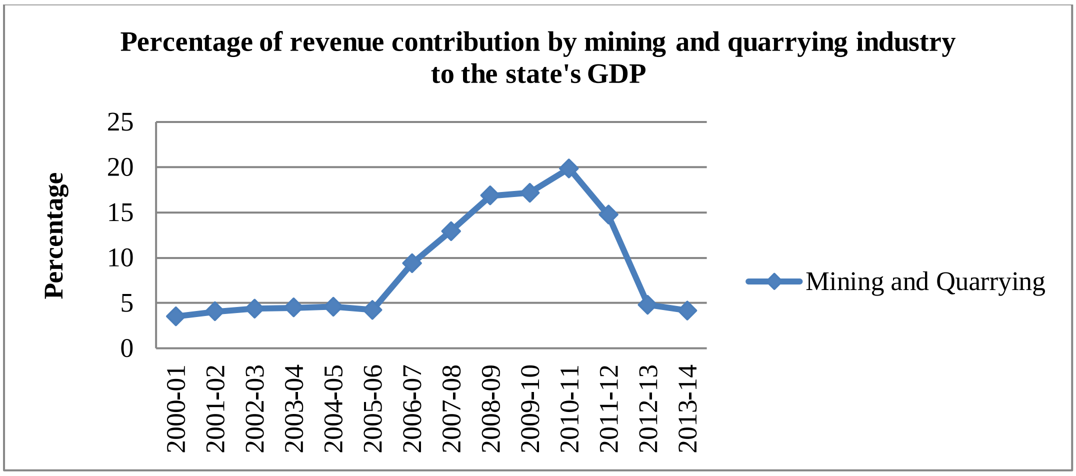
Year	Goa	Total	Contribution in the total production (%)
2002-03	17.89	99.07	18
2003-04	20.25	122.84	17
2004-05	22.31	142.71	16
2005-06	23.74	154.44	15
2006-07	NA	172.30	-
2007-08	30.53	213.25	14
2008-09	31.20	212.96	15
2009-10	39.32	218.64	18
2010-11	36.48	208.11	18
2011-12	33.37	167.29	20
2012-13	10.58	136.02	8

Source: IBM and compilation from various sources

The production of Goa shows an increasing trend from 17.89mnts in 2002-03 to 23.74mnts in 2005-06 upto 39.32mnts in 2009-10 while it declined in 2010-11 onwards from 36.48 to 10.58mnts in 2012-13. The rise in exports of iron ore led to an increase in the barge capacity to carry ore from 100 tons in 1951, to 2000 tons in the recent years. A simultaneous increase is observed in the number of barges over a period in the last decade from 137 in 2000 to 357 in 2010. The quantity handled also shows an increase from 167230 tons to 618615 tons in 2010. The average size also has increased from 1221 in 2000 to 1733 in 2010.

Fig. 4.1

Revenue Contribution by Mining and Quarrying Industry to States GDP:



Source: Economic Survey 2006, 2011, 2015

Fig. 4.1 depicts the contribution of the mining and quarrying sector in the states GDP from 2000-01 upto 2013-14. The figure shows a very negligible increase in the revenue contribution of mining and quarrying sector from 2001-02 upto 2004-05 but a huge move from 2005-06 onwards upto 2010-11 from 4.23 percent to 19.87 percent respectively after which there has been a decline in the same due to the mining ban imposed by the Supreme Court in September 2012.

Table 4.6

Contribution of Mining and Quarrying Sector and Agricultural Sector in the State's GDP

(in percentage)

Year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Mining and Quarrying	9.36	12.94	16.84	17.18	19.87	14.73	4.8	4.16
Agricultural sector	4.61	4.32	3.56	3.26	3.09	2.91	3.21	3.74

Source: Directorate of Planning, Statistics and Evaluation, 2015

Table 4.7

Royalty Data

Year	Rs. (in crores)
2007-08	36.4
2008-09	36.35
2009-10	285.91
2010-11	974.16
2011-12	941.16
2012-13	328.021

Source: Directorate of Mines and Geology, Goa

Note 1. Figures from F.Y 2007-08 to 2008-09 are inclusive of receipts from major minerals, minor minerals, dead rent, application fees, interest on delayed payments as there was no separate detailed budget head for the same.

Note 2. Figures from 2009-10 onwards royalty from Major Minerals only.

The royalty data also shows a very high jump from Rs. 36.4 crores in 2007-08 to Rs. 285.91 crores in 2009-10 to still further increase of Rs. 974.16 crores in 2010-11 with a decline in 2012-13 to Rs. 328.021 crores.

4.3 MINING AREA AND IMPACTS OF MINING

The iron ore is located in four talukas namely, Bicholim and Sattari in North Goa district and Sanguem and Quepem in South Goa district. The iron ore deposits are divided mainly into three zones: northern zone with richer deposits of iron ore; central zone with moderate grade iron ore and the southern zone with only superficial deposits of iron ore. Thus, most of the large mines were located in the Northern zone, while the other two zones had medium and small mines. Usgaon river forms the dividing line between the northern and the central zone and Sanguem between the central and southern zones. All mines and barge loading jetties are situated in are surrounded by human habitat/ villages. The rich forests support the livelihoods of the people in the regions. However, the privileges changed with the expansion in mining activities with the mining companies capturing the areas and losing their right to access to water and fuel wood.

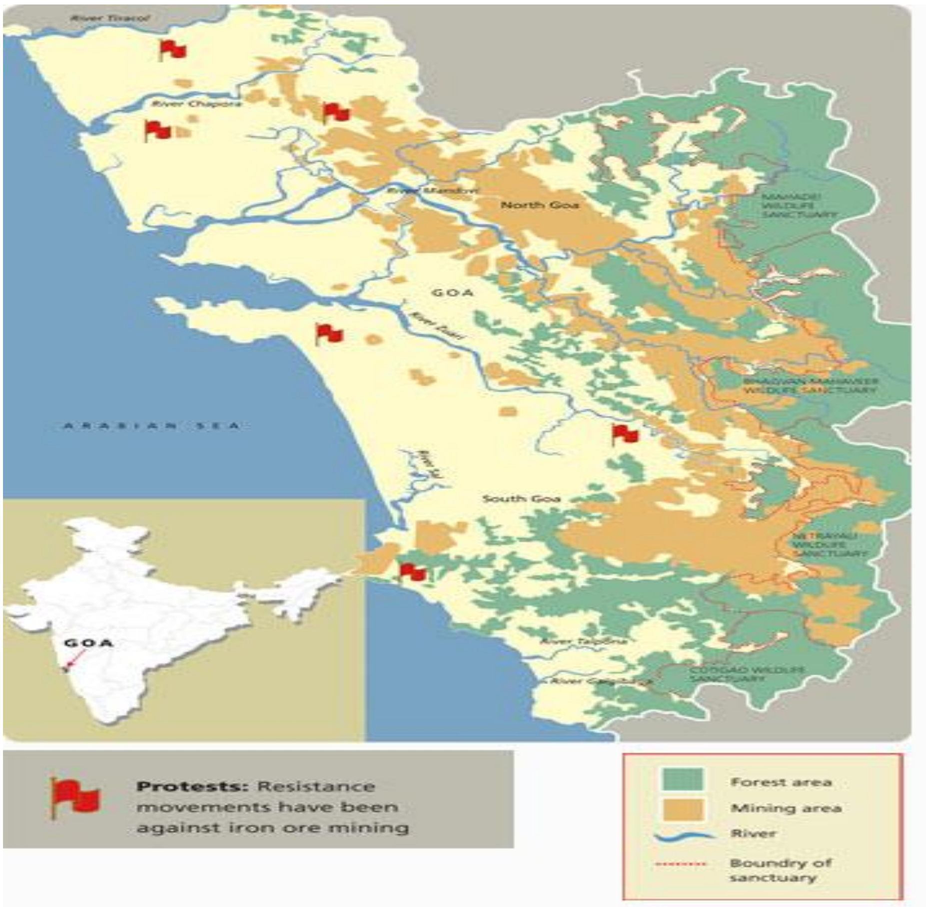


Table 4.8

Details of the land use pattern in the four talukas under study

Land use categories	Mining Talukas							
	Bicholim		Sattari		Quepem		Sanguem	
	Area (Km^2)	%	Area (Km^2)	%	Area (Km^2)	%	Area (Km^2)	%
Forest cover	12.20	5.11	278.40	56.88	101.58	31.92	570.47	68.17
Mangrove forest	0.12	0.05	0	0	0	0	0	0
Water bodies	5.70	2.39	12.36	2.52	5.76	1.81	38.79	4.63
Paddy fields/Khazan lands	31.34	13.12	22.27	4.55	37.13	11.67	21.31	2.56
Orchard	119.43	50.01	118.11	24.13	132.03	41.48	149.58	17.87
Cultivable lands	25.65	10.74	15.16	3.10	8.54	2.68	3.32	0.40
Others	44.36	18.58	43.16	8.82	33.21	10.44	53.35	6.38
Total	238.80	100	489.46	100	318.25	100	836.82	100

Source: CEE Report

Table 4.7 gives the land use pattern of the four mining talukas under study. Amongst the four talukas, Sanguem has the largest area of 836.82 km^2 followed by Sattari (489.46km^2), Quepem (318.25 km^2) and Bicholim (238.80 km^2). A lot of mining before the year 2000 has been happening in the Bicholim taluka owing to the superior quality of iron ore it had. Following the Chinese boom that is after 2000 mining took speed in the other talukas as well. This had an impact on the land use pattern. All these talukas lie along the Western Ghats rich in biodiversity. Sanguem taluka covers a large forest area of 570.47 km^2 and while Sattari covers an area of 278.40 km^2. Orchards occupied the most area in Sanguem of 149.58 km^2, followed by Quepem with 132.03 km^2. Cultivable land was 25.65 km^2 in Bicholim, 15.16 km^2 in Sattari, 8.54 km^2 in Quepem while it was just 3.32 km^2 in Sanguem. Paddy fields as shown in the table were more in Quepem followed by Bicholim, Sattari and Sanguem. As far as the literacy rates are concerned, the four talukas are educationally backward (Directorate of Planning S. a., 2004).

The four areas under study are as follows:

Bicholim taluka

This taluka is located about 30 km away from the capital city of Goa, Panaji and is in the mining heartland of Goa. About 36 percent of the population in the taluka work for a single iron ore mine owner that is Vedanta Resources. The taluka has 3 primary and 4 secondary schools; a polytechnic institute; a number of hospitals, temples, churches, mosques and a protected site, pandava caves. The literacy rate as shown in the economic survey 2010-11 is 89.24 percent. The taluka is densely populated with a density of 410 per km^2 and the population is 97955 as per the Census

Survey of 2011. The taluka has a Bicholim Industrial Estate set up by GIDC. In total there are 17 panchayats, one primary health centre and 7 sub-centres.

Sattari taluka

Sattari taluka is also situated in the North district of Goa. The taluka has a literacy rate of 85.24 percent. The population of the taluka as given in 2011 census is 63817 and with a low density of population of 130 per km^2. This is yet another taluka which has witnessed the impacts of mining activities. For instance, a mining company obtained permission to cut 6731 trees in Sattari for the purpose of its operations (timesofindia.indiatimes.com/city/goa). The three main mines in the villages include Sesa Goa, Chowgules and Keny mines. The Mandovi River is the lifeline of the people of Sattari. The Mhadei Wildlife Sanctuary with an area of 208 km^2 is situated in Sattari taluka. The taluka has 12 panchayats, one community health centre and 13 sub centres.

Quepem

Quepem taluka lies in the South district and is located on the bank of River Kushawati. It is said that a Portuguese nobleman Deao Jose Paulo, took initiative and established a public market, hospital and other facilities for the people in the area in 1787. He was able to make the village arable and self-sustaining and a habitable place. The people are more into large scale agricultural and allied activities especially in the areas where mining is not practiced. The Quepem dam is one of the oldest dam in South Goa. The taluka also has a sacred grove at Morpirla. Though the taluka has low quality ore, yet mining activities have been taking place in parts of the taluka. The taluka has a comparatively low literacy rate of 82.93 percent. The population of the taluka is 81193 and the density is 255 per km^2. The taluka has 11 panchayats, 2 community health centres and 8 sub-centres.

Sanguem

Sanguem has the largest forested area when compared with the other mining talukas mentioned earlier. The taluka has 2 wildlife sanctuaries and one national park. A lot of deforestation has been witnessed in the taluka due to the mining operations. In Sigao village of Sanguem, 7199 trees were cut down for mining operations. There were as many as 295 mining leases in Sanguem and most of which existed within the protected area. The taluka however has a low density of population of 78 per km^2 and a population of 65147. The taluka has one primary health centre and 12 sub-centres as stated in the economic survey 2010-11.

4.4 IMPACTS OF MINING ACTIVITIES IN THE MINING BELT OF GOA:

The growth in the mining sector as discussed in the earlier part of this section has led to a lot of socio-economic impacts on the villagers in the areas of mining as they are directly exposed to the mining operations. The socio-economic and environmental impacts of mining industry are placed below from the evidences collected from the mining belt of Goa by means of secondary data.

4.4.1 Socio-economic impacts of mining:

The growth in the mining sector has seen an increase in the employment opportunities and hence people from neighbouring states have made their way into the state of Goa. In Goa, approximately 21,000 people are employed in the mining industry, both directly and indirectly (Chhibber, Rogers, & Milkereit, Case Studies Human Rights Violation By Transnational Corporations in Goa and Chattisgarh, 2011). The truck drivers are mostly from the states of Bihar and Jharkhand who came along with their families in search of jobs. The labourers employed by the mining companies were also migrants from Karnataka who settled into the state. The adverse impacts of mining in the areas have compelled the residents to sell off their properties. In Pissurlem, most of the residents have left because the waste from the mines had polluted their wells which they used for domestic purposes.

The mining belt lies in the Western Ghats as mentioned earlier and people depend on the forest products for their livelihoods. At this juncture, the mining encroachment into the forest areas coupled with the accumulation of mining silt into the fields affects their source of livelihoods. The women actively involved into agriculture lose scope for earning income. The other reason for unemployment in the mining industry is that the employment of machineries by the mining companies. In context to Goa, the mining companies offers to hire trucks and mining machineries to the villagers for the loss of livelihood. The mining companies took lands from the villagers to dump the waste that is the red silt. This accumulated silt enters the fields during rains making the lands unfit for cultivation. **The Indian School of Mines(ISM), Dhanbad** found siltation in rivers and base water, affecting agriculture in the area. The mining industry requires water in huge quantities for backwashing of the ore. **ISM** further observed that wells had dried up in 8 villages situated in North Goa mining belt. The **Goa State Pollution Control Board (GSPCB)** found a decline in productivity of the fields affected by the washout from the dumps. The mining dumps have resulted in a permanent damage of the local area. From 25/10/1980 to 30/09/2008 around 1453.64 ha of land has been diverted for the purpose (**Ministry of Mines, 2008).** The use of machinery to increase production had also reduced the scope for employment of labour in the mining companies. At the same time people had lost their lands used for agriculture and livestock. With migration, people came into the mining areas with their families and had their ration cards done too. New bars and restaurants opened in the areas, rooms were let on rent and people took full advantage of this as well.

Due to mining encroachment into the forest areas there is shortage of fuel wood as well. While few people away from the mines did grow crops, villagers close to the mines refrained as it not only proved costly but also did not give them any yield. Farmers shifted to high yielding varieties from traditional varieties. The use of chemical fertilizers was in practice for higher yields. Bahuguna (1985) found out that iron ore was entering the agricultural lands and adversely affecting the fertility of the land with cashew, coconut and other trees dying a slow death. Besides, the water sources were drying up.

People in villages such as Bordem, Sangod, Sigao, Surla, Velguem, Pale where mining is done extensively are supporters of mining not only because they are dependent on mining activities for their incomes in a big way but also because the mining companies undertake many developmental activities.

4.4.2 Environmental Impact:

The mining industry in Goa has witnessed many environmental impacts. The result of which was seen in the protests held by the social activists, environmentalists and the locals in the area. Mining is a temporary activity which uses land and generates income but the imprints that it leaves behind are not temporary in nature.

a. Impact on water sources:

The major rivers in Goa are Zuari and Mandovi that flow over an area of 2,50,000 ha through the mining belt. These rivers are threatened by arsenic. The Kushawati river faces siltation from the iron ore mines. Siltation refers to the reduction in the water holding capacity which results in floods. Bicholim has witnessed flood due to siltation in the year 2007. This river is the major source of agricultural and drinking water supply for people living in the villages of Rivona, Pirla, Sulcorna, Zambaulim, Chandor, Kevona, Paroda, Colomba and Quepem. The other primary water resources like Kalay, Uguem, Khandepar and Advoi are affected due to the runoff from the mines.

Table 4.9

Mines and rivers affected due to the mines

Mines	Rivers affected
Bicholim mine	Bicholim river
Pissurlem-Sonshi, Cudnem mines	Onda/Harvalem river
Pale mines	Mhadei river
10 large mines	Zuari river
27 large mines	Mandovi river
Codli-Quirlapale, Bimbal-Sigao and Tathodi	Khandepar river
Quepem	Khushawati river
Sattari Taluka	Sonshi and Advai Nallah

Source: Compilation from different sources

Besides, most of the mines are located below the water table. Thus, for every one tonne of ore mined about 10 tonnes of water needs to be pumped out. There is depletion in the groundwater in the surrounding areas. The surface water from the rivers seeps and flows into the mining pits, due to this the rivers get dried up. It is reported that due to all these activities the nearby wells and springs have been drying up on which the neighbouring villages such as Cavorem, Rivona and Codli are dependent. The water quality according to the reports is bad and polluted which people use for domestic purposes. Large companies like Sesa Goa and Fomento, provide portable water tanks. Studies have reported serious levels of siltation of Khandepar, Kudem rivers and lakes at Mulgao and Lamgao. It is found that the ground water in Pissurlem is entirely dried up and fields are silted completely. Scarcity of water has affected the vaingan cultivation practiced in mining areas.

It is reported that in Goa, the mining depth attained is +80 mts, while few mines have gone even -50 mts below the sea level. Out of 105 mines under operation in 2011, 60 percent of the mines were operating below the ground water level as per the Regional Office, MOEF Bangalore that was stated in a joint meeting with people affected by mining (http://www.indiawaterportal.org/post/18440).

b. Impact on air quality:

Dust generation is the key issue observed due to mining. The blasting and drilling activities for extraction; and the transportation of ore has led to serious air pollution in the areas of operations as well as transportation. The transportation of ore through trucks leads to the spillage of ore, fuel emission from these trucks, and overburden dumps. All this leads to poor air quality. Reports say that atleast 7,000 trucks would travel every day in Goa through villages, wildlife sanctuaries, forest and farmlands. Studies conducted found that the annual average dust Suspended Particulate Matter (SPM) and Respirable Particulate Matter (RPM) were 323µg/m^3 and 117µg/m^3 respectively with a maximum concentration during the summer that is 1615 µg/m^3 and 518µg/m^3. Amongst all the causes mentioned above, the major cause of dust was overloading and over speeding of the tipper trucks. The 6 km stretch of Guddemol-Capxem road handling around 5.4 mnt of ore and the 8 km stretch of Sanguem-Curchorem road is where the dust generation is most serious. Most of the major companies have been taking utmost care for the dust suppression within the mines and also whilst transportation of the ore, yet the problem still exists. The Curchorem rail yard handles the Bellary ore and the dust generated has leads to infections from an excess of atmospheric dust. There was an increase in the respiratory infections in the region. Long term exposure to ambient air pollution causes acute and chronic respiratory diseases such as pneumoconiosis, bronchitis, bronchial asthma, emphysema and upper respiratory disease. Air pollution has been the major problem in the mining areas of Goa. Villagers in Sattari complain of cough and cold due to dust and have experienced that it does not get cured.

c. Impact on land:

Mining is associated with problems of land degradation. The overburden waste is the main reason for the destruction of forest and agricultural lands in the state. According to TERI (2012) 12,000 ha of land has been rendered wasteland. From 25/10/1980 to 30/09/2008 around 1453.64 ha of land has been diverted for mining (Ministry of Mines, 2008). Mining has led to a significant decline in the agricultural sector. The silt that gets accumulated in the water bodies and fields lowers the fertility of the soils. It is reported that more than 600 MNTs of mining wastes are dumped in and around 50 villages spread across Goa's mining belt and more than $3/4^{th}$ of a million trees have been cut for the mining purpose. Aghor, 2011 stated that in Cauvrem village, in South Goa 2,000 families having farms have been destroyed by the mines operating there. A study by Goa State Pollution Control Board (GSPCB) states that mining dumps are let into the agricultural lands that result in a permanent damage of the area. The encroachment of mining into the forest has resulted in loss of herbal and medicinal plants. Some villagers have attempted use of chemical fertilizers in order to improve their yield (Interview with Ramesh Gawas, social activist).

d. Noise pollution:

Mining involves activities like drilling, blasting, transportation of ore, etc. All these activities involve a lot of noise pollution. The noise level of working machinery is between 100-140 db. The movement of the trucks during the day as well as at night creates lot of noise pollution. The noise levels in the villages is around 90-100 db. Children and teachers in the school face lot of inconveniences due to this noise. The noise affects not only the ears but there are also psychological and physiopathology effects. People have been suffering from this problem for years and over a period of time it has resulted in headaches and also difficulty to sleep and rest. The exposure to noise for a long time leads to effect on the auditory system.

4.4.5 Other impacts:

The increase in number of trucks has led to accidents in the areas. According to Mr. Pedrito Fernandes there was over usage of public infrastructure by the mining companies and this was a biggest problem during the boom period.

Pascual, Cascallar, Calle, Rodes, & Casau, 2013 conducted an interdisciplinary study on mining in Goa. The study revealed that the residents in the mining areas are exposed to continuous air pollution hence have risk of developing respiratory sicknesses. The air pollution is beyond the standard limits and is primarily caused due to the heavy movement of the traffic.

4.5 SUSPENSION OF MINING INDUSTRY AND IT IMPACTS:

The mining sector showed an indiscriminate increase in the production and exports of iron ore in the last decade. This had an immense adverse impact on the environment and the locals in the mining areas as reported by many social activists and environmentalists. The illegalities traced and the weak enforcement of laws as pointed out by them had led to agitation against the mining companies. A series of writ petitions were filed by the Goa Foundation against such illegalities, owing to which a Committee was formed under the chairmanship of Justice M.B. Shah to probe into the illegalities and irregularities in the iron mining sector. The Shah Committee visited all 91 working mines as well as other non-operational mines into the mining belt of Goa. The committee also had to place its recommendations and remedial measures to overcome such illegal mining in the state. The Shah Committee after conducting an enquiry into the matter placed certain facts before the Government which compelled the Supreme Court to order a ban on the iron ore mining industry of Goa in the interest of those affected by the operations. Eight teams under the panel were appointed to inspect 90 operating mines and 32 non-operating mines to check the illegalities taking place at various levels in iron ore mining and have brought many facts to light. According to the Shah Commission iron ore of worth Rs. 35,000 crores was plundered by the mining companies. There was serious violation of environmental laws. Mining leases encroached outside the mining lease. There was illegal mining and the excess production of ore has affected the environment. Mining has been practiced even after the expiry of lease period without renewal. Mines were operating within the permissible limits of wildlife sanctuaries and National Parks. Large number of violations in the Environmental Clearances was observed. The Shah Committee revealed that only nine of the 90 active mining leases are valid. However, of these nine valid mining leases, some are said to be operating without the mandatory clearance from the National Board of Wildlife (NBWL) that is normally required for carrying out mining operations within 10 km of a protected area.

Claude Alvares of Goa Foundation pointed out that the mining companies have violated the Environment Protection Act, the Air and Water Act, the Wildlife and Forest Protection Acts. According to the Goa Foundation, 20.4 million tonnes of unaccounted ore, worth Rs.4,500 crore at $50 a tonne or Rs.10,800 crore at $120 a tonne, was illegally exported from Goa between 2002 and 2010. Claude Alvares of Goa Foundation has pointed out that every single mine operating in Goa violates some law or the other and is therefore illegal. Goa Foundation too had filed Public Interest Litigation in March 2011 that points out the ways in which the miners have violated different laws to meet their motives.

Besides, the Public Accounts Committee (PAC) has also brought to light the facts about the involvement of concerned authorities into the illegal mining operations. The PAC has pointed out a 1,200 crore scam, involving seven million tonnes of iron ore. Goa Assembly's Public Accounts Committee (PAC), headed by the then Leader of the Opposition Manohar Parrikar of the Bharatiya Janata Party, has sought an inquiry into the various aspects of the illegal mining that goes on in the State and the failure of the departments that are responsible for monitoring the industry. The PAC report says that 56,56,450 tonnes of ore was illegally extracted but no royalty has been paid during 2010-11. It was further reported that the same ore was worth Rs. 1,100 crore and the royalty amounted to Rs. 120 crore. For the period from 2005 upto 2011 the ore illegally extracted is estimated to be 1,42,00,437 tonnes, which is valued at Rs. 2,776 crore whereas the royalty loss is estimated to be Rs. 200 crore.

Eventually, on 5th October 2012 the Supreme Court of India (its Forest Bench), relying on the findings of the Shah Commission, stopped the mining operations and transportation in all iron ore leases in Goa. The enquiry was also a result of a petition submitted by the Goa Foundation (an environmental action group led by Claude Alvares) (*The Hindu*, 5 October 2012). All mines were halted. Many people have lost jobs and have no alternative to waiting in the hope that there will be a turnaround (Maad & Shetye, 2013).

Frenetic mining and transportation in the windfall years had galvanised downstream establishments catering to 20,000 trucks, machinery, barge building industries and an army of migrant/contract workers, creating a ripple effect on the economy of those areas, and indirectly providing employment to 1.5 lakhs according to government estimates. These people have since fallen back on an agrarian and government job economy, with all but the more hopeful waiting for a resumption that is unlikely to be the same (D'Mello, Goa's Mining Logjam, 2016).

Agriculture has been affected due to mining but the collapse of mining industry in 2012 has shaken its dependents, especially the migrants who had come to live in Goa for the purpose of employment and the villagers also lost the source of income they were earning as a result of ripple effect in the economy. Estimates show that Goa lost Rs. 3,000 crore due to mining ban two years after the ban. Not only those who are directly involved in mining such as the mining companies, truck operators, barge transporters, mining machinery owners, but small time business / industry such as tea stalls, automobile workshop, petrol pump, consumer goods vendor, road side tyre service provider etc. The mining ban has had a serious impacts on the source of earning of it's dependents.

Impact of mining ban has been positive on the environment. The findings of the study by Jorge, De Sa, & Jain, 2013 with respect to the environment are as follows: the air is devoid of dust, the springs that had dried gradually started to flow and the noise pollution has reduced. Further there has been an improvement in the social impacts like change in demographics as the migrant force has fled due to joblesssness. As in case of shut down of mines at Netravali, Sanguem in the year 2003 has shown improvement in the quality of stream water and yield of local products. The accidental rates have also come down according to social activist Mr.Ramesh Gawas.

The NavhindTimes(19/10/16) has shown a change in the demography of Curchorem, Sanvordem as reported by Sameer Bhatt. This has affected the incomes of the locals who earned rent from the rooms let out to the migrants. He also reported a stoppage of garage work and retrenchment of staff by the mining companies. The truck owners, barge owners and heavy machinery owners had purchased these assets by selling their gold ornaments and raising loans which they are now unable to pay.

CHAPTER 5

COMPARISON OF THE SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS IN THE MINING AREAS WITH THE NON-MINING AREAS

5.1 INTRODUCTION

Rural areas differ from each other depending on their specialized economic activity. Within the same state, the regions can differ depending upon the economic activities practiced. The presence of an industrial unit in an area also has an impact on the socio-economic characteristics of the inhabitants in the area. In the present study, an attempt is made to compare the socio-economic characteristics of households in the mining areas with the households in the non-mining areas. For the purpose of present study, four talukas are considered, namely, Bicholim, Sattari, Sanguem and Quepem. These are the talukas wherein either one or all of the following mining operations like extraction, storage and transportation of iron ore take place. In order to study the socio-economic characteristics of the households in the mining and non-mining areas, 12 villages and 8 villages respectively were selected for the purpose of obtaining the sample households. Further, the researcher has considered 256 households out of 4412 households from the mining areas under study, and 191 households out of 4254 households from the non-mining areas were considered. The sample households were selected using the systematic random sampling method as is stated in the research methodology.

Since the two groups for comparison are of unequal sample sizes, tools have been accordingly selected to suit the purpose of the selected variables under study, as already depicted in the research methodology chapter. An interview schedule was administered to a total of 447 respondents major in age, in the villages in the mining and non-mining areas under study. Personal discussions with the respondents and Panchayat members were also held for the purpose of analysis.

This study is divided into two parts. The first part deals with the social characteristics of the selected households, and second part deals with the economic characteristics of the selected households in the study area.

5.2 SOCIAL CHARACTERISTICS OF THE SELECT HOUSEHOLDS IN THE MINING AND NON-MINING AREAS

In this part of the study an attempt is made to understand the social characteristics of the households in the mining and non-mining areas. In order to understand the social characteristics and the comparative analysis of the same in the mining and non-mining area, the variables considered are demographic profile, social characteristics and access to natural resources of the respondents which includes: gender, age, marital status, family size, educational status (of respondents), residential status, mother tongue, length of residence, educational status (of household members), access to natural resources which include water resources and cooking fuel. The detailed analysis with the interpretation of each of aforesaid variables is presented as below:

5.2.1 Demographic profile of the respondents:

The demographic profile is very useful to understand the background of the respondent, as it reflects their thinking and decision-making ability. The variables used for describing the demographic profile of the respondents are as follows: gender, age, marital status, family size and educational status. The primary data collected from 447 respondents; of which 256 were from mining areas and the rest 191 from the non-mining areas. To analyze the data means test with ANOVA table has been used. Table 5.1 presents the demographic profile of the respondents in the mining areas and the non-mining areas. The detail analysis of the demographic profile of the respondents in the mining and the non-mining areas is presented as under:

a. **Gender:**

Gender has a significant role to play in the decision-making in a family, as the state, like the other states, is male-dominated. The analysis as depicted in Table 5.1 clearly indicates that in the mining areas 55.1 percent of the respondents are females and the rest are males. Whereas in case of non-mining areas as highlighted in the table 52.4 percent were females and 47.6 percent were males. The study reveals that the mining and non-mining areas are female-dominated in terms of gender. Further, analytical tool mean test as depicted in Table 5.2 reveals that there is no significant difference in the means of gender in the mining and non-mining areas under study. The study also reveals that the mean is 1.55 and 1.52 respectively in mining and non-mining areas under study, which is close to 2, indicating more of female respondents in both the areas. The study has also attempted to verify the resultant means by employing the ANOVA test as depicted in Table 5.3 which also reveals significant results with F=.325(p>.005), indicating no significant difference in terms of gender in the areas under study.

b. **Age:**

Age determines maturity level of an individual in understanding a particular process or problem and thus influences the responses. In Table 5.1, of the total respondents, 36 respondents, that is 14.1 percent, are of the age group 18-30 years, 29.3 percent of the respondents are of the age group 31-40 years, 29.7 percent are of the age group 41-50 years 17.6 percent are of the age group 51-60 years and the remaining 9.4 percent are of the age group of above 60 years. Of the total respondents in the non-mining areas, 13.1 percent are of the age group 18-30 years, 24.1 percent are of the age group 31-40 years, 29.8 percent are of the age group 41-50 years, 22 percent are of the age group 51-60 years and 11 percent of the age group of 60 years and above.

The mean age of the respondents in the mining areas is 42.76 and in the non-mining areas it is 42.93 as shown in the means Table 5.2. The ANOVA Table 5.3 shows no significant difference in the mean age of the respondents in the two areas and also within the age groups with F=.020(p>.005).

c. **Marital Status:**

The responses of an individual are also highly influenced on their marital status. Marriage makes a person more responsible and brings a maturity in understanding level which is reflected in their responses. As shown in Table 5.1, 70.7 percent of the respondents in the mining regions are married, 25.4 percent are single and the rest are either divorced/widowed. 75.4 percent of the respondents in the non-mining regions are married, 22 percent are single and remaining 2.6 percent are divorced/widowed. A score of ‘1’ is given to the married respondent, ‘2’ is given to the respondent who is single and ‘3’ is given to the divorced/widowed respondents.

Table 5.2 shows no significant difference in the mean score of marital status of the respondents in the mining and non-mining areas which was 1.32 and 1.27 respectively. The score was close to 1, indicating more of married respondents in both the regions. The study has also attempted to verify the resultant means by employing the ANOVA test as depicted in Table 5.3 which reveals results with F =1.223 ($p>.005$) indicating no significant difference in the marital status of the respondents in the mining and non-mining areas under study.

d. **Family Size:**

Family size is an important indicator in determining the socio-economic status of the households. This is especially true in case of those areas where ample employment opportunities are available as larger family size would mean more opportunities to get employed in the area. Table 5.1 shows that, 11.7 percent of the respondents in the mining areas have upto 3 members in the family, 62.1 percent have 4-6 family members, 20.3 percent have 7-9 family members, and the rest have more than 9 family members. In the non-mining areas, as reflected in the same table, 15.7 percent of the respondents have upto 3 family members, 59.7 percent have 4-6 family members, 13.6 percent have 7-9 family members and remaining 11 percent have more than 9 family members.

The means table reports an average family size of 5.4 in the mining areas while it is 5.6 in the non-mining areas. The ANOVA table shows no significant difference in the average family size of the respondents in the mining and non-mining regions as well as within the groups at F=.743(p>.005).

e. **Educational status:**

Education brings about a sense of understanding, with an increased reasoning and thinking ability in a human. It aids in logical and analytical thinking to a phenomena. Table 5.1 shows that 10.9 percent of the respondents in the mining areas are illiterate, 30.5 percent have obtained their primary education, 30.9 percent have obtained secondary education, 19.9 percent have studied upto SSC, 2.7 percent have obtained Diploma /Vocational/HSSC, 3.5 percent are graduates and 1.6 percent are trained in other professional courses. The table further shows that 18.3 percent of the respondents are illiterate, 36 percent have obtained primary education, 26.6 percent have obtained secondary education, 14 percent cleared SSC, 4.1 percent have done Diploma/Vocational/HSSC and just 1 percent of the respondents is graduate in the non-mining areas under study.

The means Table 5.2 shows a difference in the mean of education levels in the mining and non-mining areas, with 2.6 and 1.98 score respectively. The respondents in mining areas were mainly educated upto secondary level while in the non-mining areas the respondents were mainly educated upto primary level. This is reflected in the ANOVA table with F=21.418(p=.000) indicating a significant difference in the educational status of the respondents in the mining and non-mining areas under study. The findings indicate that compared to the respondents in the non-mining areas the respondents in the mining had obtained more education.

Table 5.1

Demographic profile of the Respondents

Demographic variables		Mining Areas		Non-mining Areas	
		No. of Respondents	Percentage	No. of Respondents	Percentage
Gender	Male(1)	115	44.9	91	47.6
	Female(2)	141	55.1	100	52.4
	Total	**256**	**100**	**191**	**100**
Age	18- 30	36	14.1	25	13.1
	31-40	75	29.3	46	24.1
	41-50	76	29.7	57	29.8
	51-60	45	17.6	42	22
	Above 60 years	24	9.4	21	11
	Total	**256**	**100**	**191**	**100**
Marital Status	Married(1)	181	70.7	144	75.4
	Single(2)	65	25.4	42	22
	Divorcee/widow(3)	10	3.9	5	2.6
	Total	**256**	**100**	**191**	**100**
Family size	<3	30	11.7	30	15.7
	4-6	158	62.1	114	59.7
	7-9	53	20.3	26	13.6
	>9	15	5.9	21	11
	Total	**256**	**100**	**191**	**100**
Educational Status	Illiterate(1)	28	10.9	35	18.3
	Upto primary(2)	78	30.5	69	36
	Upto Secondary(3)	79	30.9	51	26.6
	SSC(4)	51	19.9	26	14
	HSSC/Diploma/Vocational(5)	7	2.7	8	4.1
	Graduation(6)	9	3.5	2	1
	Post graduation/Profession(7)	4	1.6	0	0
	Total	**256**	**100**	**191**	**100**

Source: Primary data

Table 5.2

Report of means test

Area		Gender	Age of Respondent	Marital Status	Total family members	Education of Respondent
MINING	**Mean**	1.5508	42.7656	1.3281	5.44	2.6016
	N	256	256	256	256	256
	Std. Deviation	.49839	12.33136	.54750	2.286	1.50731
NON-MINING	**Mean**	1.5236	42.9319	1.2723	5.64	1.9895
	N	191	191	191	191	191
	Std. Deviation	.50076	12.38125	.50180	2.532	1.19644
Total	**Mean**	1.5391	42.8367	1.3043	5.53	2.3400
	N	447	447	447	447	447
	Std. Deviation	.49902	12.33911	.52860	2.394	1.41446

Table 5.3

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Gender * Area	**Between Groups**	**(Combined)**	.081	1	.081	.325	.569
	Within Groups		110.984	445	.249		
	Total		111.065	446			
Age of respondent * Area	**Between Groups**	**(Combined)**	3.026	1	3.026	.020	.888
	Within Groups		67902.053	445	152.589		
	Total		67905.078	446			
Marital Status * Area	**Between Groups**	**(Combined)**	.341	1	.341	1.223	.269
	Within Groups		124.280	445	.279		
	Total		124.622	446			
Total family members *Area	**Between Groups**	**(Combined)**	4.260	1	4.260	.743	.389
	Within Groups		2551.194	445	5.733		
	Total		2555.454	446			
Education of respondent * Area	**Between Groups**	**(Combined)**	40.975	1	40.975	21.418	.000
	Within Groups		851.338	445	1.913		
	Total		892.313	446			

5.2.2 Socio-economic characteristics of households in the mining and non-mining areas:

An assessment into the socio-economic characteristics will provide an insight into the differences and the common features in the mining and non-mining areas under study. For this purpose the following socio-economic characteristics have been studied:

a. Residential Status:

The residential status was covered to assess the presence of migrants in the mining areas under study. The temporary residents are given a score of ‘1’ and the permanent residents are given a score of ‘2’ as shown in Table 5.4. Table 5.4 gives the residential status of the households in the mining and non-mining areas, as well as the mean scores of residential status with ANOVA results to verify the same. The table shows that 0.8 percent of the households in the mining areas and 0.5 percent in the non-mining regions were temporary residents, while the remaining were permanent residents in the respective areas.The means test result shows a mean of 1.99 in both the areas, that is close to '2', which indicates that majority of the households in both the areas are permanent residents, and this is supported by the f test results with F=.108 at p>.005, indicating no significant difference in the residential status of the households in the two regions.

Table 5.4

Residential Status and results of mean test with ANOVA

Residential Status	Mining Area		Non-mining Area	
	No. of households	**Percentage**	**No. of households**	**Percentage**
Temporary (1)	2	0.8	1	0.5
Permanent(2)	254	99.2	190	99.5
Total	**256**	**100**	**191**	**100**
	Mean	**Std. deviation**	**Mean**	**Std. deviation**
Means test result	1.99	.088	1.99	.072
	F value		**Sig.**	
ANOVA Results	.108		.742	

Source: Primary survey

Residential status was mainly used to study the migration impact in the mining and non-mining areas under study. But since the data collection was done after the mining ban, this aspect could not be studied. However, discussions held with the villagers and Panchayat members revealed the presence of migrants in the mining areas. The in-migrants in the mining areas were mainly from the Karnataka state, employed as labourers while others were mainly the truck drivers who belonged to the state of Bihar. According to the villagers they came along with their families for the purpose of making a living. However, after the mining ban they lost their income sources hence migrated to their native places. In case of the non-mining areas, however, such opportunities did not exist.

b. Mother tongue:

The mother tongue of the respondent reveals the original place of birth and hence indicates whether the person is a native or a migrant in the area. Table 5.5 shows that 97.3 percent and 98.4 percent of the respondents spoke Konkani (with given score '1') in the mining and non-mining areas respectively, whereas the rest, that is 2.7 percent and 1.5 percent respectively spoke other than Konkani (Marathi, Kannada and Hindi) and were given a score of '2'. The means of the two areas is 1.05 and 1.02 indicating that in the both the areas under study, Konkani is the main spoken language with the responses close to '1'. The same is verified by the ANOVA table with the F value=1.492 at p>.005 showing no significant difference in the mean of the respondents in the mining and non-mining areas with respect to mother tongue.

Table 5.5

Mother tongue and results of mean test

Mother tongue	**Mining Area**		**Non-mining Area**	
	No. of households	**Percentage**	**No. of households**	**Percentage**
Konkani (1)	249	97.3	188	98.4
Others(2)	7	2.7	3	1.5
Total	**256**	**100**	**191**	**100**
Means test result	**Mean** 1.05	**Std. deviation** .350	**Mean** 1.02	**Std. deviation** .176
ANOVA Results	**F value** 1.492		**Sig.** .223	

Source: Primary survey

Konkani is the official language of Goa. But due to in-migration of the people into the state there are people speaking languages other than Konkani. This variable too was taken to study the migration effect which could not be accomplished for the reason mentioned above.

c. Length of residence:

The length of residence was studied to know whether there has been displacement and dislocation of the households in the mining areas. Table 5.6 shows length of residence of the respondents in the mining and non-mining areas under study. The table displays that majority that is 62.9 percent of the households in the mining areas and 58.6 percent of the households in the non-mining areas have been residing at their respective places for more than 50 years. Further 8.2 percent in the mining areas and 7.9 percent in the non-mining areas have been living for upto 10 years in their respective areas; while the remaining 28.9 percent in the mining areas and 33.5 percent in the non-mining areas have been living at their current place in between 10 to 50 years.

Table 5.6

Length of Residence

Length of Residence	Mining Area		Non-mining Area	
	No. of households	Percentage	No. of households	Percentage
<10 years	21	8.2	15	7.9
10-20	22	8.6	11	5.8
20-30	22	8.6	24	12.6
30-40	12	4.7	12	6.3
40-50	18	7	17	8.9
>50 years	161	62.9	112	58.6
Total	**256**	**100**	**191**	**100**

Source: Primary survey

It was found from the discussions held with the respondents in the mining areas that 20 households out of 256 (that is 8 percent) were displaced due to expansion in mining operations. These respondents further informed that they were given ready-to-move-in/ constructed houses to live in and were also offered a contract of a truck to be employed with the mining companies.

d. Educational status of the households:

Education is important as it enhances one's thinking abilities. The mining industry is said to provide educational support to the households in the mining areas. Thus the variable here aims at assessing whether the presence of mining industry has led to an improvement in the educational levels of the family members of the households in the mining areas under study, in comparison with the non-mining areas under study. Further, educational support by way of scholarship for higher education is also provided by the mining companies to the households in the mining areas. The total number of family members of the households in the mining areas are 1390 and in the non-mining areas 1079. Table 5.7 gives the details of educational levels of the family members of the respondents in the mining and non-mining areas under study. Further, the mean and standard deviation is also displayed with ANOVA table to test difference in the education levels in the two areas under study.

The Table 5.7 shows that 16.5 percent of the total number of people in the mining areas under study and 19.3 percent of the total number of people in the non-mining areas under study respectively are illiterate. The mean score for the illiterate people in the mining area is .89 and the non-mining area is 1.09 indicating that there is more number of illiterate people in the non-mining areas when compared with the number of illiterates in the mining areas. The same was verified using ANOVA, and that showed a statistically significant difference in the number of illiterates in the mining and non-mining areas with f=4.169 at p<.005. With respect to attainment of primary level education, the mean is .80 in the mining areas and 1.04 in the non-mining areas. This indicates that more number of family members in the non-mining areas have primary education as compared to the family members in the mining areas under study. The results of the ANOVA table with f=7.490 at $p<.005$ also indicate that there is a significant difference in the number of people attaining primary level education in the mining and non-mining areas under study. Likewise, means of higher levels of education, that is secondary level, SSC, HSSC/Diploma/Vocational, Graduation and Post-graduation is displayed in the Table 5.7 along with the results of ANOVA. The results of the ANOVA test show no significant difference in the higher education levels in the mining and non-mining areas under study with f values of 1.513, .568, .730, .885 and 3.167 respectively for secondary level, SSC, HSSC/Diploma/Vocational, Graduation and Post-graduation with $p>.005$ for all the levels.

The illiterate category includes all those who do not know to read and write. The incidence of illiteracy is higher in case of the non-mining regions than the mining regions. The overall literacy rate of the sample under survey is 83.53 percent in the mining areas and 80.72 percent in the non-mining areas. The study however concludes that there is no significant difference in the education levels of the family members of the households in the mining areas and that of the non-mining areas under study; however there was a significant difference in the primary level education of the family members of the households in the mining and the non-mining areas. The discussion held with the respondents portrayed that though educational support was provided by the mining companies for the households in the mining villages, most of the beneficiaries were the children of the migrants who had settled in the areas for the purpose of earning incomes, as they were directly employed with the mining companies. Though Government primary schools existed in every taluka, there was lack of basic facilities like latrine and water. These facilities were provided by the mining companies in the mining areas. However, there are no higher level educational facilities as well as transport facilities in both types of areas under study and that was a hindrance in attainment of higher education.

Table 5.7

Educational Status of the households

Educational Status	Mining Area				Non-mining Area				ANOVA Results	
	No. of households	Percentage	Mean	Std. deviation	No. of households	Percentage	Mean	Std. deviation	F	Sig.
Illiterate	229	16.5	.89	.916	208	19.3	1.09	1.094	4.169	.042*
Upto primary	205	14.7	.80	.819	198	18.3	1.04	1.002	7.490	.006*
Upto Secondary	366	26.3	1.43	1.075	249	23.1	1.30	1.067	1.513	.219
SSC	288	20.7	1.13	.978	225	20.9	1.18	.957	.327	.568
HSSC/Diploma/Vocational	181	13.1	.62	.737	130	12	.59	.821	.119	.730
Graduation	86	6.2	.34	.617	54	5	.28	.556	.885	.347
Post graduation/Professional	35	2.5	.14	.387	15	1.4	.08	.270	3.167	.076
Total	**1390**	**100**			**1079**	**100**				

Source: Primary survey

Moreover, an analysis was done to know whether there exists any difference in the highest educated member in the family in the mining and non-mining areas. For the purpose, the highest educated person in the household, in completed years, was considered as follows: illiterate-0, upto primary level- 6 years, secondary level-9 years, SSC-11 years, HSSC/Diploma/Vocational-13 years, Graduation-16 years and Post-graduation/professional course-18 years. Table 5.8 gives the mean of the highest educated member in the family that is 13.20 in the mining areas and 12.82 in the non-mining areas, indicating that the highest education attained by most of the family members is upto HSSC/Diploma/Vocational. The results of the ANOVA table revealed no significance difference in the highest educated family member in the mining and non-mining areas with f=1.712 at p>.005.

Table 5.8

Group Statistics on highest educated in the family

Variable	Area	N	Mean	Std. Deviation	Std. Error Mean
Highest educated in family	**MINING**	256	13.1992	3.05045	.19065
	NON-MINING	191	12.8220	2.96821	.21477

Table 5.9

ANOVA Table for highest educated in the family

		Sum of Squares	Df	Mean Square	F	Sig.
Highest educated family member* Area	**Between Groups**	15.566	1	15.566	1.712	.191
	Within Groups	4046.787	445	9.094		
	Total	4062.353	446			

e. Access to natural resources:

Mining activities have an adverse impact on the natural resources in the areas of operation. Lot of water is consumed by the mining industry for washing of the ore, the impact of which is seen in the lowering of the water table. Expansion of mining activities also leads to destruction of lands and forests on which people are dependent for their basic requirements. Thus this variable is studied to assess whether the mining industry has affected the access to natural resources such as water and cooking fuel that is firewood.

Source of water:

The mining areas are located in the Western Ghats which are rich in biodiversity, and has perennial water sources on which people were dependent. In this scenario, analyzing this variable is an attempt to assess whether there is any difference in the main source of water in the mining and non-mining areas under study. Table 5.10 displays the main source of water consumed by the households in the mining and the non-mining regions. The different sources of water include: spring well water, tap fixtures PWD water connection, pond/stream and others. PWD water tap connection as a source of water is used by large majority of 51.3 percent in mining areas and 76.4 percent in the non-mining areas; while well water is used by 29.9 percent in mining and 17.3 percent in the non-mining areas. Pond/stream is a source of water for 10.2 percent and 6.3 percent respectively for the mining and non-mining areas. With respect to the other sources of water, 8.6 percent of households in the mining regions were dependent on tanker water supplied by the mining companies for consumption, as there was scarcity of water in the mining areas. Although the water was not fit for consumption, people did consume the tanker water as they were left with no other option. The following score were given to the sources of water: well-1, tap-2, pond/stream-3 and any other -4. The mean for the main source of water consumed by the households in the mining area is 1.98 that is close to 2, indicating that the PWD water tap connection is the main source of water consumed by the households in the mining areas. In the non-mining areas also, the mean as displayed in Table 5.10 is 1.89, which is again close to 2, indicating that here also tap is the main source of water used by majority of the households. Thus there is no significant difference in the main source of water in both the areas and that is also indicated by the ANOVA test result with F=1.878(p>.005). This indicates that the respondent households relied to a large extent on the tap water for consumption. The respondents informed that the perennial water sources have been affected with the expansion in the mining activities. Though people in the mining areas have wells, not all the water was safe for drinking. The respondents showed the greasy/oily layer formed in their wells in parts of mining areas that are very close to the mine sites. While in the non-mining villages, it is observed that although people have wells with water fit for drinking, they use the more convenient source of water that is the PWD water tap connection.

Table 5.10

Main source of water and results of mean with ANOVA table

Main source of water	Mining Area		Non-mining Area	
	No. of households	**Percentage**	**No. of households**	**Percentage**
Well	76	29.9	33	17.3
PWD water tap	132	51.3	146	76.4
Pond/stream	26	10.2	12	6.3
Any other	22	8.6	-	-
Total	**256**	**100**	**191**	**100**
	Mean	**Std. dev.**	**Mean**	**Std. dev.**
Means test	1.98	.858	1.89	.474
ANOVA test results	**F**		**Sig.**	
	1.878		.171	

Source: Primary survey

Source of cooking fuel:

Accessibility and cost play an important role when determining fuel use (Howells, Alsfad, Cross, & Jeftha, 2002). This is especially in context of the rural areas. In Goa too, like the other states, people in the remote areas depend on traditional source of cooking fuel that is firewood. This variable attempts to study whether there is any difference in the use of main source of cooking fuel in the mining and the non-mining areas. Table 5.11 displays the main source of cooking fuel used by the households in the mining and the non-mining areas under study and the results of the ANOVA test. The table shows that majority of the households that is 61.3 percent use gas cylinders in the mining regions, 35.9 percent use firewood and 2.7 percent use other sources as mentioned below as their main source of cooking fuel, while a majority in the non-mining regions, that is 58 percent, use firewood, 38.7 percent use gas cylinder and the remaining 3.1 percent use other sources. Given the score of 1-gas cylinder, 2-firewood and 3-others (biogas, kerosene, induction, gobar gas), the mean of the main source of cooking fuel in the mining area is 1.41, that is close to 1, indicating that more number of households use gas cylinder as the main source of cooking while in the non-mining areas the mean is 1.64 that is closer to 2, indicating that firewood is the main source of cooking in these areas. The same is verified using ANOVA. Table 5.11 reveals that there is a significant difference in the main source of cooking in the mining and non-mining regions with F=19.508(p<.005).The mines are located in the forest areas and the mining companies have restricted villagers' entry into the area, thus some of the households in the mining areas have lost their right of access to firewood while there is also deforestation in other parts. Although using gas cylinders is expensive, in absence of other sources of cooking fuel, the respondent family members are compelled to use the same.

Table 5.11

Main source of cooking fuel and results of mean with ANOVA table

Main source of cooking fuel	**Mining Area**		**Non-mining Area**	
	No. of households	**Percentage**	**No. of households**	**Percentage**
Gas cylinder	157	61.3	74	38.7
Firewood	92	35.9	111	58.1
Others	7	2.7	6	3.1
Total	**256**	**100**	**191**	**100**
	Mean	**Std. dev.**	**Mean**	**Std. dev.**
Means test	1.41	.546	1.64	.541
	F		**Sig.**	
ANOVA test results	19.508		.000	

Source: Primary survey

f. Economic Activities:

The economic activities practiced by the people aids in determining their standard of living. It determines the socio-economic status of the people. The economic activities are broadly classified into the following four categories: agriculture and allied activities, labor, service and trade/business. The agricultural and allied activities include all traditional activities undertaken by the households in the mining areas such as: paddy cultivation, cashew cultivation, growing of vegetables, poultry farming, dairy farming, and like activities. Practice of agriculture and allied activities requires lot of time, efforts and labour services, and the income derived from the same varies seasonally depending on the type of agricultural activities practiced.

Labour includes the agricultural labor and the non-agricultural labor. The non-agricultural labour further includes the mining labor and non-mining labour. The labour earns wages, income which may be on daily basis or on contract.

Service means the jobs taken by the family members into private organizations or government organizations for which a regular monthly salary is received. Service implies white collar jobs in mining or non-mining sector which demands minimum suitable qualification and qualities, that are compensated based on their quality of services at particular level in the hierarchy of job.

Trade/business activities are carried out to earn an income from the profits earned by conduct of such activities by an individual or a group of individuals and it also bears the risk of loss suffered if any. Some of the trade/business related activities practiced by the household members include: grocery shops, tea stalls/hotels, garage and repair shop, letting of rooms on rent, hiring truck/vehicles/mining machinery to the mining companies and like activities.

Main economic activity:

Table 5.12 shows the main economic activity practiced by the households in the mining and non-mining areas under study. The table shows that a majority of the households in the mining areas that is 45.7 percent are mainly involved in trade/business, while 29.3 percent were employed in the private and government services; further 16.4 percent were labour and a handful of 5.9 percent practiced agriculture and allied activities in the mining areas. In the non-mining areas, however, the table displays that a majority of 46.1 percent had taken up jobs, 17.3 percent undertook agriculture and allied activities, 16.2 percent were labor and 15.7 percent had trade/business as their main economic activity. The table also shows that 2.7 percent in the mining areas and 4.7 percent in the non-mining areas did not practice any particular economic activity. This indicates that a large number of households in the mining areas practiced trade/business as their main economic activity while in the non-mining areas service was the main economic activity.

Table 5.12

Main economic activities practiced

Main Economic Activity	Mining Area		Non-mining Area	
	No. of households	Percentage	No. of households	Percentage
Agriculture and allied activities	15	5.9	33	17.3
Labor	42	16.4	31	16.2
Service	75	29.3	88	46.1
Trade/business	117	45.7	30	15.7
None	7	2.7	9	4.7
Total	**256**	**100**	**191**	**100**

Source: Primary survey

Local economic activities:

The main economic activities are displayed in Table 5.12. Moreover, the households also had alternate sources of income. Thus, to assess the pattern of local economic activities of the households, the economic activities are classified as follows: agriculture and allied, labour(excludes mining labour), service(excludes mining employee), trade/business(excludes directly related to mining) and mining related activities (that is mining labor, mining employee, mining contracts for hire of truck/vehicles/mining machinery, and like activities). A multiple response Table 5.13 gives a picture of the economic activities practiced by the households in the mining and the non-mining areas under study. For the purpose, a score of '1' was allotted if the respondent's family member was involved in a respective activity or else a score of '0' was given for not being involved in any activity.

Table 5.13 displays that the percentage of cases in both the mining and non-mining areas is 149 and 152.2 respectively, indicating that the households in both the areas do have an alternate source of revenue as the percentage is more than 100. For the purpose of the study, 256 households from mining areas were selected as mentioned earlier but as the households have an alternate source of income, the number of responses as shown in the table is 371. Likewise, the number of respondents under study in the non-mining areas is 191 but the response obtained with respect to economic activities is 277. On the basis of the responses, the table shows that the majority of the households that is 42 percent in the mining areas were directly working for the mining companies, 27 percent were employed by the private and government concerns, 13.5 percent of the households practiced their traditional economic activity that is agriculture and allied activities, 11.3 percent took up various trade/business activities and 6.2 percent were labour. In the non-mining areas however, a majority of the respondent households that is 35 percent were employed by the private and government undertakings, 33.6 percent practiced agriculture and allied activities, 16.6 percent were labour, 10.5 percent had their trade/business activities and 4.3 percent were directly involved in mining-related activities. Further to verify whether there was any difference in the pattern of economic activity practiced the means test was used. Table 5.14 depicts the means test report and ANOVA results. A higher mean value indicates more participation of the household family members in the respective economic activity.

With respect to the participation of the household family members in the agriculture and allied activities, the mean value in the mining areas is 0.1953, while it is higher in the non-mining areas of 0.4869. This indicates that the participation of the household members in agriculture and allied activities is more in the non-mining areas than mining areas. The result of the ANOVA test shows a significant difference in the number of respondent family members practicing agriculture and allied activities in the mining and non-mining areas with $F=47.060$ at $p<.005$. The study also confirmed that the households in the mining areas practiced more of allied agricultural activities while the households in the non-mining areas practiced paddy cultivation and like activities.

The mean value with respect to participation in labor as an economic activity is 0.2266 and 0.2565 in the mining and non-mining areas respectively. Though the mean value in the non-mining is marginally higher than the mining areas, the results of ANOVA shows no significant difference in the two areas with respect to the family members participation in labour as an economic activity with F=.538 at p>.005.

The mean value with respect to household participation in service as an economic activity is 0.4570 and 0.5079 respectively, indicating a higher participation of the household members in service in the non-mining areas; however the ANOVA test shows no significant difference in the household participation in service as an economic activity in the mining and non-mining areas respectively. The same is revealed by the F value of 1.130 at p>.005.

The mean value with respect to household's participation in trade/business as an economic activity is 0.4727 and 0.1885 respectively in the mining and the non-mining areas indicating a higher participation by the household members in the mining areas compared to the non-mining areas under study. The study thus reveals a significant difference in the household member's participation in the trade/business activities in the mining and non-mining areas. The same is verified by ANOVA table with F value of 42.258 at p<.005.

With respect to the household's participation directly in mining-related activities, the mean value is 0.6094 and 0.0628 respectively in the mining and non-mining regions. The large difference in the mean values indicates that mining areas are largely influenced by the presence of mining industry and the results of ANOVA test with F=201.439 at p<.005 indicates a significant difference in the participation of the household members in mining-related activities. The mining companies have also influenced the non-mining areas as is evident from the participation of 4.3 percent of the respondent family members participation in the mining-related activities.

Table 5.13

Local economic activities practiced

Economic activities	Mining			Non-mining		
	Responses		Percent of cases	Responses		Percent of cases
	Frequency	Percentage		Frequency	Percentage	
Agriculture and allied activities	50	13.5	20.1	93	33.6	51.1
Labor	23	6.2	7.2	46	16.6	25.3
Service	100	27	40.2	97	35	53.3
Trade/business	42	11.3	16.9	29	10.5	15.9
Mining related	156	42	62.7	12	4.3	6.6
Total	**371**	**100**	**149**	**277**	**100**	**152.2**

Dichotomy group tabulated at value 1. Source: Primary survey

Table 5.14

Means Test Report with ANOVA for local economic activities practiced

Area		Agriculture and allied activities	Labor	Service	Trade/ business	Mining related
MINING	Mean	.1953	.2266	.4570	.4727	.6094
	N	256	256	256	256	256
	Std. Deviation	.39722	.41943	.49913	.50023	.48885
NON-MINING	Mean	.4869	.2565	.5079	.1885	.0628
	N	191	191	191	191	191
	Std. Deviation	.50114	.43787	.50125	.39212	.24329
ANOVA test result	F	47.060	.538	1.130	42.258	201.439
	Sig.	.000	.464	.288	.000	.000

Furthermore, to assess the household participation in mining and non-mining related activities, the mining-related activities are classified into labour, service and trade/business as is depicted in Table 5.15. The table displays that 35 out of 256 respondent family members under study were working as mining labour, 15 were into service with the mining companies and 106 had direct trade/business with the mining companies. In the non-mining areas, 5 out of 191 households had family members working as mining labour and 7 had direct trade/business with the mining companies.

This indicates that a large number of households were involved in mining-related activities in the mining areas while a handful of the household members in the non-mining areas were also influenced by the mining industry.

Table 5.15

Household participation into mining related activities

Mining related activities	Mining Area No. of households	Non-mining Area No. of households
Labor	35	5
Service	15	0
Trade/business	106	7
Total	**156**	**12**

Source: Primary survey

g. **Income from economic activities**:

Income determines the spending power of the households and is a major variable in determining the socio-economic status. A higher income has the capacity to meet the basic requirements as well as comforts of the people. It aids people in satisfying most of their requirements. The amount of income earned depends on the number and nature of the economic activities practiced by an individual or a household. Table 5.16 gives the monthly income earned by the family members from different economic activities in the mining and non-mining areas under study.

Income from agriculture and allied activities

Agricultural and allied income is a seasonal income and thus depends on the nature of such activities practiced by the households in the area. In Table 5.16, the income from agriculture and allied activities shows that 5.9 percent of the households in the mining areas earn a monthly income upto Rs. 5000, 6.2 percent earn an income between Rs. 5001 to Rs. 10000, a marginal percentage of 1.6 earn in the income groups of Rs. 10001 to Rs. 15000 and Rs. 15001 to Rs. 20000, another 0.8 percent earn income between Rs. 20001 to Rs. 25000 and 3.5 percent of the households earn an income of more than Rs. 25000. In the non-mining areas under study, 40.3 percent of the households earn an income upto Rs. 5000, 3.7 percent earn an income between Rs. 5001 to 10000 and 4.7 percent earn an income between Rs. 10001 to Rs. 15000, while no household under study earns an income above Rs. 15000 as revealed in the study. The study thus reveals here that the income earned from agriculture and allied activities is spread across different income groups while in the non-mining areas the income is limited upto Rs. 15000. The study confirms that though the number of households practicing agriculture and allied activities was higher in the non-mining areas, yet the income in the higher range was earned by the households in the mining regions. The average annual income from agriculture and allied activity is more in the mining areas compared to that of the non-mining areas. The discussion held with the respondents confirmed that the compensation paid to the households for non-cultivation was quoted as income from agriculture and allied activities. The Panchayat members also expressed that a lot of fertilizers were used by the farmers to improve the yield of crops owing to the demand for food crops from the migrants in the mining areas.

Wage income from labour

The labour earns wage income for the services provided by him/her either on a regular basis or on contract basis. The Table 5.16 shows that 6.2 percent of the households in the mining areas earn a monthly income upto Rs. 5000, 12.9 earn an income in between Rs. 5001 to Rs. 10000, 3.1 percent earn an income between Rs. 10001 to Rs. 15000 and just 0.4 percent earn an income between Rs. 15001 to Rs.

20000. In the non-mining areas, 19.9 percent of the households earn an income upto Rs.5000, 4.2 percent earn an income in between Rs. 5001 to Rs. 10000 and 2.6 percent earn an income between Rs. 10001 to Rs. 15000. The study shows that there are higher number of labor households earning a lower income upto Rs. 5000 in the non-mining areas while a higher number of labor household earning income in between Rs. 5001 to Rs. 10000 in the mining areas. This reveals that the wage income from labour is more in the mining regions compared to the wage income in the non-mining regions under study.

Salary income

Salary income is paid to the individuals employed by private and government companies that hire the services of qualified people. From Table 5.16 it is clear that 2.7 percent of the respondent family members in the mining areas receive a monthly income upto Rs. 5000, 11.3 percent receive an income between Rs. 5001 to Rs. 10000, 10.5 percent receive an income between Rs. 10001 to Rs. 15000, 5.1 percent receive an income between Rs. 15001 to Rs. 20000, 3.9 percent receive an income between Rs. 20001 to Rs. 25000 while 11.3 percent of the family members receive an income of more that Rs. 25000. In the non-mining areas the table displays that 5.8 percent of the respondents family members receive an income upto Rs. 5000, 10.5 percent receive an income between Rs. 5001 to Rs. 10000, 12.6 percent receive an income of Rs. 10001 to Rs. 15000, 6.8 percent receive an income between Rs. 15001 to Rs. 20000, 2.6 percent receive between the income group of Rs. 20001 to Rs. 25000 while 12.6 percent receive an income of more than Rs. 25000. The study thus points out that in both the mining as well as non-mining areas under study, the households employed in the private and government companies are earning income across different income groups.

Income from trade/business

Trade/business activities are carried out to earn an income from the profits earned by conduct of such activities by an individual or a group of individuals and also bear the risk of loss suffered if any. Table 5.16 very clearly shows the monthly income earned by the trade/business owners in the mining and non-mining areas under study. The table reveals that out of 148 households, family members undertaking trade/business in the mining areas is just one individual, that is 0.4 percent earning an income upto Rs. 5000; a marginal percentage of 2.3 percent, 2.7 percent, 2.3 percent and 0.8 percent earning an income in between Rs. 5001 to Rs. 10000, Rs. 10001 to Rs. 15,000, Rs. 15001 to Rs. 20000 and Rs. 20001 to Rs. 25000 respectively while a large number of family members that is 49.2 in terms of percentage earn a monthly income more than Rs. 25000. In the non-mining areas, 2.1 percent earn an income upto Rs. 5000 per month, 5.2 percent earn an income between Rs. 5001 to Rs. 10000, 3.7 percent each earn an income of Rs. 10001 to Rs. 15000 and in between Rs. 15001 to Rs. 20000, 0.5 percent earn a monthly income between Rs. 20001 to Rs. 25000 and 3.7 percent earn an income in the income group of above Rs. 25000. Out of 148 of the respondent family members doing trade/business in the mining areas under study, 106 (see Table) were directly involved in mining related trade/business activities, who were earning huge incomes out of such trade/business. Thus the study clearly reveals that the trade/business activities in the mining areas fetch the family members with high incomes when compared to the incomes received by the trade/business owners in the non-mining areas under study. The study thus confirms that the high income from business was due to the presence of mining industry that had created multiplier effects for the households in the mining areas.

Table 5.16

Monthly income from economic activities

Income range	Mining Area		Non-mining Area	
	No. of households	Percentage	No. of households	Percentage
Agriculture and allied activities				
Upto Rs. 5000	15	5.9	77	40.3
Rs. 5001-Rs. 10,000	16	6.2	7	3.7
Rs. 10001-Rs. 15,000	4	1.6	9	4.7
Rs. 15,001-Rs.20,000	4	1.6	0	0
Rs. 20,001-Rs. 25,000	2	0.8	0	0
More than Rs. 25,000	9	3.5	0	0
Total	**50**	**19.5**	**93**	**48.7**
Labor				
Upto Rs. 5000	16	6.2	38	19.9
Rs. 5001-Rs. 10,000	33	12.9	8	4.2
Rs. 10001-Rs. 15,000	8	3.1	5	2.6
Rs. 15,001-Rs. 20,000	1	0.4	0	0
Total	**58**	**22.7**	**46**	**24.1**
Service				
Upto Rs. 5000	7	2.7	11	5.8
Rs. 5001-Rs. 10,000	29	11.3	20	10.5
Rs. 10001-Rs. 15,000	27	10.5	24	12.6
Rs. 15,001-Rs. 20,000	13	5.1	13	6.8
Rs. 20,001-Rs. 25,000	10	3.9	5	2.6
More than Rs. 25,000	29	11.3	24	12.6
Total	**115**	**44.9**	**97**	**50.8**
Trade/Business				
Upto Rs. 5000	1	0.4	4	2.1
Rs. 5001-Rs. 10,000	6	2.3	10	5.2
Rs. 10001-Rs. 15,000	7	2.7	7	3.7
Rs. 15,001-Rs.20,000	6	2.3	7	3.7
Rs. 20,001-Rs. 25,000	2	0.8	1	0.5
More than Rs. 25,000	126	49.2	7	3.7
Total	**148**	**57.8**	**36**	**18.8**

Source: Primary survey

Total income from all sources:

This part of the study attempts to assess the total income received by the households from all sources of income and compare the same in the mining and the non-mining areas under study. Table 5.17 shows the total monthly income earned by the households in the mining and non-mining areas under study. The table demonstrates that 19.1 percent each of the household earn a total monthly income in the income group of upto Rs. 10000 and in between Rs. 10001 to Rs. 20000, 9 percent earn an income in between Rs. 20001 to Rs. 30000, 10.2 percent earn an income in the income group of between Rs. 30001 to Rs. 40000, 9.4 percent earn an income in between Rs. 40001 to Rs. 50000 and a large number of the households that is 33.2 percent earn a high income of more than Rs. 50000. However in the non-mining areas, a large number of households that is 40.3 in terms of percentage earn a total monthly income upto Rs. 10000, 32.5 percent earn an income between Rs. 10001 to Rs. 20000, 12.6 percent earn an income in the income group of Rs. 20001 to Rs. 30000, 8.4 percent earn an income between Rs. 30001 to Rs. 40000, 1 percent earn an income between Rs. 40001 to Rs. 50000 and 5.2 percent earn an income more than Rs. 50000 per month. The study concludes that a large number of households in the mining areas earn high incomes as compared to the households in the non-mining areas under study. The study thus indicates that the presence of mining industry has had an impact on the income of the households in the mining areas.

Table 5.17

Monthly Total Income from all Sources

Total Income	Mining Area		Non-mining Area	
	No. of households	Percentage	No. of households	Percentage
Upto Rs. 10,000	49	19.1	77	40.3
Rs. 10,001-Rs. 20,000	49	19.1	62	32.5
Rs. 20,001-Rs. 30,000	23	9	24	12.6
Rs. 30,001-Rs. 40,000	26	10.2	16	8.4
Rs. 40,001-Rs. 50,000	24	9.4	2	1
More than Rs. 50,000	85	33.2	10	5.2
Total	**256**	**100**	**191**	**100**

Source: Primary survey

Contribution of income from different sources:

Table 5.18 shows the contribution of different sources of income earned by the households in the mining and non-mining areas under study in the total income from all sources. For the purpose, the total annual income from each source earned by all the 256 households in the mining areas under study and 191 households in the non-mining areas under study was computed. Further the average of each of the source of annual income was obtained and presented in the table along with the percentage of contribution from each source in the total annual income. The different sources of income considered are: income from agriculture and allied activities, income from labour, income from service, income from trade/business/profession, remittances from family members working abroad and other income.

The table depicts that within the surveyed mining areas, trade/business activities have been contributing substantially towards the total average annual income of the households that is Rs. 7,28670 which forms 46.7 percent in the total average annual income from all sources. The average annual income of households from agriculture and allied activities is Rs. 1,81870 that forms 11.6 percent of the total average annual income, while the average annual income from labour is Rs. 88,950 contributing to 5.7 percent, average annual income from salary is Rs. 2,49280 that forms 16 percent, remittances from family members abroad is Rs. 2,72570 forming 17.5 percent while the average annual income from other sources is Rs. 40540 forming 2.5 percent in the total average annual income from all sources. Thus, the income from trade/business is the highest contributor towards the total incomes of the households in the mining areas under study. In the non-mining areas, the average annual income from agriculture and allied activities is Rs. 62360 that forms 10.7 percent in the total average annual income, the average annual income from labour is Rs. 58580 that forms 10 percent, the average annual income from salary is Rs. 2,31540 that forms 39.6 percent, the average annual income from trade/business is Rs. 1,95750 that forms 33.5 percent and the average annual income from other sources is Rs. 36430 that forms 6.2 percent in the total average annual income from all sources. Thus in the non-mining areas, income from service forms the major contributor in the total average annual income from all sources followed by the average annual income from trade/business. The total average annual income from all sources in the non-mining areas is 37.4 percent of the total average annual income from all sources in the non-mining areas. The study concludes that the incomes earned by the households in the mining areas from different sources are higher than the incomes earned by the households in the non-mining areas under study. The average income from agriculture and allied activities is higher in the mining areas by 34.2 percent as compared to the income in the non-mining areas. The table very clearly displays that the average annual income from all respective sources is higher in the mining areas as compared to the average annual income from the non-mining areas. This very well confirms that the mining industry influenced the income of the households in the mining areas under study.

Table 5.18

Contribution of income from different sources

Variable	Mining Area		Non-mining Area	
Sources of income	**Average annual income**	**Percentage**	**Average annual income**	**Percentage**
Agriculture and allied activities	181870	11.6	62360	10.7
Labor	88950	5.7	58580	10.0
Service	249280	16.0	231540	39.6
Trade/business/profession	728670	46.7	195750	33.5
Remittances from member working abroad	272570	17.5	0	0.0
Other income	40540	2.5	36430	6.2
Total	**1561880**	**100**	**584660**	**100**

Source: Primary survey

Table 5.19 classifies the total average annual income earned by the households in the mining and non-mining areas under study into mining-related and non-mining related sources. The table shows that the income from direct mining-related activities contributes 36.6 percent in the total average annual income in the mining areas and 36.4 percent in the non-mining areas. However, the average annual income from mining related activities in the mining areas is Rs. 571160 while the income earned from the same source in the non-mining areas is Rs. 2,13000 which is 37.29 percent of the income in mining areas.

Table 5.19

Average annual income from mining related and non-mining related activities

Variable	Mining Area		Non-mining Area	
Sources of income	**Average annual Income(Rs.)**	**Percentage**	**Average annual Income(Rs.)**	**Percentage**
Direct mining related	571160	36.6	213000	36.4
Other than mining related	990720	63.4	371660	63.6
Total	**1561880**	**100**	**584660**	**100**

Source: Primary Survey

Results of Mann Whitney U test:

To test whether there is a difference in the income of the households in the mining areas with the households in the non-mining areas, Mann Whitney U test was used. The research methodology very well explains the conditions which have to be fulfilled for the use of Mann Whitney U test. Table 5.20 displays the mean ranks and the sum of ranks of the mining and the non-mining areas under study. A higher mean rank denotes a higher income. The mean rank as well as the sum of ranks is higher in the mining areas as compared to the non-mining areas under study. The mean rank and the sum of ranks in the mining areas is 267 and 68242 respectively and 167 and 31886 in the non-mining areas. This data reveals that the total income is higher in the mining areas as compared to the total income in the non-mining areas. The test statistics is displayed in Table 5.21 that provides the test statistics, U statistic as well as the asymptotic significance (2-tailed) p-value. From the table it can be concluded that there is a significant difference in the distribution of incomes of the households in the mining areas and the non-mining areas as indicated by U=13550 with z=-8.069 at p=.000.

Table 5.20

Ranks table for total income from all sources

Variable	Area	N	Mean Rank	Sum of Ranks
Total income from all sources	MINING	256	267	68242
	NON-MINING	191	167	31886
	Total	**447**		

Table 5.21

Test Statistics[a]

	Total income from all sources
Mann-Whitney U	13550.000
Wilcoxon W	31886.000
Z	-8.069
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Area

h. Household expenditure:

The household expenditure is useful in determining the socio-economic status of the households. High monthly expenditure indicates the capacity to spend more due to high income. The monthly household expenditure includes consumption of food items, grocery, clothing, other apparels, payment of various bills and traveling expenses, but excludes financial liability such as loan. Table 5.22 displays the distribution of monthly household expenditure of the households in the mining and the non-mining areas under study. The table shows that 19.9 percent of the households in the mining areas under study incur monthly household expenditure upto Rs. 4000, 36.3 percent spend in between Rs. 4001 to Rs. 8000, 27 percent of the households spend in between Rs. 8001 to Rs. 12000, 10.5 percent spend an amount in between Rs. 12001 to Rs. 16000, 5.1 percent spend in between Rs. 16001 to Rs. 20000, and the remaining 1.2 percent spend an amount of more than Rs. 20000. In the non-mining areas under study, 36.6 percent of the households spend an amount upto Rs. 4000, 33.1 percent spend an amount between Rs. 4001 to Rs. 8000, 18.8 percent incur expenses between Rs. 8001 to Rs. 12000, 5.2 percent spend an amount in between Rs. 12001 to Rs. 16000, 4.2 percent spend an amount between Rs. 16001 to Rs. 20000 and 2.1 percent incur a monthly household expenditure more than Rs. 20000. Further, the mean monthly household expenditure as displayed in Table 8.11 is Rs. 8520 in the mining areas and is higher than that of the non-mining areas of Rs. 7000. The results of Mann Whitney U test as displayed shows a significant difference in the distribution of monthly household expenditure in the mining and non-mining areas with z value=-4.375 significant at $p<.005$.

The households under study are located in villages where people are largely dependent on nature for their living, using resources such as use of wood, fruits and vegetables grown in their farms or land and yielding milk by domesticating animals. However, with the expansion of mining activities, there has been encroachment of the mining companies into these areas and thus the people in the mining regions have lost access to natural resources leading to the rise in the monthly household expenditure. Moreover, the in-migration has put a pressure on the basic goods that has led to an increase in the prices of such goods. Furthermore, the tendency of people to spend more when the income is high also cannot be ignored as is observed in the mining areas under study.

Table 5.22

Monthly household expenditure

Monthly household expenditure	Mining Area		Non-mining Area	
	No. of households	Percentage	No. of households	Percentage
Upto Rs. 4,000	51	19.9	70	36.6
Rs. 4,001- Rs. 8,000	93	36.3	63	33.1
Rs. 8,001-Rs. 12,000	69	27	36	18.8
Rs. 12,001-Rs. 16,000	27	10.5	10	5.2
Rs. 16,001-Rs. 20,000	13	5.1	8	4.2
More than Rs. 20,000	3	1.2	4	2.1
Total	256	100	191	100
	Mean	Std. deviation	Mean	Std. deviation
Monthly household expenditure	8520	4800	7000	5110

Source: Primary survey.

Table 5.23

Ranks table for household expenditure

	Area	N	Mean Rank	Sum of Ranks
Household expenditure	MINING	256	247.02	63237.00
	NON-MINING	191	193.15	36891.00
	Total	447		

Table 5.24

Test Statistics[a] for household expenditure

	Household expenditure
Mann-Whitney U	18555.000
Wilcoxon W	36891.000
Z	-4.375
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Area

i. Savings:

Savings determine the income earning capacity of the individual. Higher the income of the individual, higher is the savings and vice-versa. Table 5.25 displays the monthly savings of the households in the mining and the non-mining areas under study. The table shows that 72.3 percent of the households in the mining areas had savings upto Rs. 3,000 per month, 12.9 percent had monthly savings between Rs. 3001 to Rs. 6000, 3.1 percent had savings between Rs. 6001 to Rs. 9000, 7 percent had savings between Rs. 9001 to Rs. 12000, 1.6 percent had monthly savings between Rs. 12001 to Rs. 15000 and 3.1 percent had monthly savings of more than Rs. 15000. In the non-mining areas however, 96.3 percent of the households had savings of upto Rs. 3,000 per month, 1 percent each had monthly savings between Rs. 3001 to Rs. 6000 and between Rs. 6001 to Rs. 9000, and 1.6 percent had monthly savings of more than Rs. 15000. Thus the distribution in the table very clearly displays that the households in the mining areas save more than the households in the non-mining areas under study. Further, Table 5.26 shows a higher mean rank in the mining areas of 253 as compared to mean rank of 185 in the non-mining areas. Table 5.27 gives the results of test statistics which reveals a significant difference between in the distribution of monthly savings of the household in the mining areas and that of the monthly savings of the households in the non-mining areas under study with z=-5.812 at p<.005. Owing to the huge incomes of the households in the mining areas, the ability to save is also more in these areas. The trade/business owners and the government employees in the mining as well as non-mining areas are the ones who draw good incomes and thus have higher savings.

Table 5.25

Monthly household savings

Monthly household savings	Mining Area		Non-mining Area	
	No. of household	Percentage	No. of households	Percentage
0-Rs. 3,000	185	72.3	184	96.3
Rs. 3,001- Rs. 6,000	33	12.9	2	1
Rs. 6,001-Rs. 9,000	8	3.1	2	1
Rs. 9,001-Rs. 12,000	18	7	0	0
Rs. 12,001-Rs. 15,000	4	1.6	0	0
More than Rs. 15,000	8	3.1	3	1.6
Total	**256**	**100**	**191**	**100**

Source: Primary survey

Table 5.26

Ranks table for household savings

Variable	Area	N	Mean Rank	Sum of Ranks
Savings	MINING	256	253.40	64871.50
	NON-MINING	191	184.59	35256.50
	Total	447		

Table 5.27

Test Statistics[a] for monthly household savings

	Savings
Mann-Whitney U	16920.500
Wilcoxon W	35256.500
Z	-5.812
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Area

An attempt is further made to assess the pattern of savings in the mining and the non-mining areas under study. The savings in the organized sector includes savings in banks, recurring deposits and life insurance schemes while the unorganized sector includes savings into local chit funds, self-help groups and the like. Table 5.28 displays different type of savings and the average annual savings of the households in the mining and non-mining areas. The table reveals that 162 households out of 256 had savings in the mining areas. Of this majority of the savings that is 84.6 percent were diverted in the organised sector, 6.2 percent in the unorganised sector and 9.2 percent into both the organised and the unorganised sector. In the non-mining areas, 92 out of 191 households had savings in different forms. The table shows that 75 percent of these households have their savings in the organised sector, 12 percent have their savings into the unorganised sector and 13 percent have their savings in both the organised and the unorganised sector. The table reveals a similar pattern of savings amongst the households in the mining as well as the non-mining areas.

Table 5.28

Type of savings and amount of savings

Type of savings	Mining Area				Non-mining Area			
	No. of households	**Percentage**	**Amount of savings**	**Percent age**	**No. of households**	**Percentage**	**Amount of savings**	**Percentage**
Organised sector	137	84.6	521765	79.4	69	75	105310	85
Unorganised sector	10	6.2	30100	4.6	11	12	1650	1.4
Organised and unorganized sector	15	9.2	105050	16	12	13	16880	13.6
Total	**162**	**100**	**656915**	**100**	**92**	**100**	**123840**	**100**

Source: Primary survey

j. Loan:

Loans are taken for various purposes by the households in the mining and the non-mining areas under study. Table 5.29 exhibits the monthly loan instalment paid by the households in the mining and the non-mining areas under study respectively. From the table it is clear that a large number of households that is 54 percent in the mining regions have availed of loans for various purposes. Of these 25.4 percent of the households in the mining areas had a loan of upto Rs. 10000 and 28.9 percent had a loan of above Rs. 10000 indicating that more number of people having loans. On the other hand, only 26.7 percent of the households in the non-mining regions had loan liabilities which is lesser compared to the number of households possessing loan in the mining regions under study. Out of the 26.7 percent of the households having loans in the mining areas, 24.6 percent had loan upto Rs. 10000 while a handful of them that is 2.1 percent had loan of more than Rs. 10000. The data concludes that loans are raised more by the people in the mining areas compared to the people in the non-mining areas. The study further reveals that the amount of loans raised was also higher in the mining areas compared to the amount of loans raised in the non-mining areas.

Table 5.29
Monthly loan instalment

Monthly loan instalment	Mining		Non-mining	
	Frequency	Percentage	Frequency	Percentage
No loan	117	45.7	140	73.3
Upto Rs. 10,000	65	25.4	47	24.6
More than Rs. 10,000	74	28.9	4	2.1
Total	**256**	**100**	**256**	**100**

Source: Primary survey

Further the Mann-Whitney test was run to verify whether there is a significant difference in the loan instalment of the households in the mining and non-mining areas under study. The rank Table 5.30 revealed that the mean rank of mining areas that is 247 is higher when compared to the mean rank of non-mining areas of 193. This indicates that the loan is more in the mining areas compared to the non-mining areas. The same is verified from the results of the test. The data shows that there is a significant difference in the loans of the households in the mining and the non-mining areas with $z=-5.036$ at $p<.005$.

Table 5.32 clearly portrays the purpose of raising loans in the surveyed mining as well as the non-mining areas under study. The loans were raised for various purposes such as house repair/renovation, purchase of vehicle (that includes purchase of two wheeler/four wheeler), purchase of truck/mining machinery, educational loans, agricultural loans, and other trade/business/multipurpose loans (The other loans include loans for business purposes, marriage loans, loans for purchase of consumer goods and combination of two or more types of loans). The tabulated data reveals that 139 households out of 256 under study had loan liabilities in the mining areas. Of these, most of the households that are 28.1 percent each had taken loans for purchase of vehicles and purchase of truck/mining machineries to be gainfully employed with the mining companies, 20.9 percent of the households had taken loan for house repair/renovation, 3.6 percent had taken loan for agricultural purpose and unexpectedly a negligible percentage of 0.7 had taken loans for educational purpose. There were yet another 18.6 percent of the households who had other business and multipurpose loans. With respect to the amount of loans raised, the data reveals that the highest amount of loan raised of Rs. 18,06500 was diverted towards purchase of truck/mining machinery in the mining areas, the share of which in the total amount of loans raised was 54.9 percent. Likewise other trade/business/multipurpose loans contributed 19.9 percent in the total loan raised followed by 16.4 percent of the loan share for the purpose of vehicle purchase while just 3 percent of the share in total loan was towards education and 2.1 percent in the total loan raised was towards agriculture.

In the non-mining area however, 51 out of 191 households under study had loans, which made up to 26.70 percent. Of these 51 households, 41.2 percent of the households had loan liabilities towards repair/renovation of their houses, 21.6 percent had loans for purchase of vehicle for personal use, 31.2 percent of the houses had other trade/business loans while 2 percent each had loans towards purchase of truck employed in the mining areas, educational and agricultural loan. With respect to the share in the total amount of loans raised by the households in the mining areas for various purposes, majority of the loans that is 45.3 percent of the total amount of loan raised was diverted towards house repair/renovation, 31.1 percent was diverted towards other trade/business activities, 14.8 percent was diverted for purchase of vehicle for personal use, 6.8 percent of the share was used for purchase of trucks, a marginal percentage of 1.7 was used for educational purpose and 0.3 percent was used for agricultural purposes. The total average annual loan in the non-mining area is 24.38 percent of the total average annual loan in the mining areas under study that is Rs. 2,84150 and Rs. 69,280 respectively. The findings of the data thus reveal that large amount of loans were raised by the households in the mining areas as compared to the households in the non-mining areas. The study further tells that large number of households took loans in the mining areas that were diverted to trade/business while in the non-mining regions they were diverted for the purpose of house repair/renovation followed by trade/business activities.

Table 5.30

Rank table for loan taken

Variable	Area	N	Mean Rank	Sum of Ranks
Loan taken	MINING	256	246.96	63221.50
	NON-MINING	191	193.23	36906.50
	Total	447		

Table 5.31

Test Statistics[a] for loan taken

	Loan taken
Mann-Whitney U	18570.500
Wilcoxon W	36906.500
Z	-5.036
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Area

Table 5.32

Purpose of loan

Purpose of loan	Mining Area					Non-mining Area				
	No. of households	Percentage	Amount of loan	Percentage	Average annual loan	No. of households	Percentage	Amount of loan	Percentage	Average annual loan
House repair/renovation	29	20.9	120500	3.7	49860	21	41.2	133400	45.3	76230
Vehicle Purchase	39	28.1	541200	16.4	166520	11	21.6	43550	14.8	47510
Purchase of truck/mining machinery	39	28.1	1806500	54.9	555850	1	2	20000	6.8	240000
Educational purpose	1	0.7	1000	3	12000	1	2	5000	1.7	60000
Agricultural purpose	5	3.6	68000	2.1	163200	1	2	1000	0.3	12000
Other trade/business /Multipurpose	26	18.6	754200	19.9	348100	16	31.2	91500	31.1	68630
Total	139	100	3291400	100	284150	51	100	294450	100	69280

Source: Primary survey

k. Place of purchase and shopping:

In this part of the study, place of purchase denotes the market place for buying the daily consumed goods and place of shopping denotes the market place for consumer goods and convenience/luxury items. Thus purchasing these goods from within the village signifies that the village is developed in terms of market.

Place of purchase:

Table 5.33 displays the place of purchase of daily consumed goods in the villages that includes local market within the village, outside the village, main cities and other alternative source, if any. The data shows that 23.4 percent of the households in the mining areas make their purchases from the local markets; a majority of 48.4 percent purchases from outside the village, 25 percent of the households go to the main cities while a handful of 3.1 percent have other alternative source of meeting their daily goods. A similar pattern is also observed in case of the non-mining areas. In the non-mining areas, 16.2 percent of the household's purchase their daily requirements from the local markets within their villages, a majority of 59.1 percent purchase from outside the village, 19.9 percent go to the main cities and the rest have alternate source of consumption of their goods. To test whether there is any difference in the place of purchase of goods in the mining and non-mining areas, means test with ANOVA table was used. Table 5.34 gives the report of means test for the place of purchase in the two areas under study. For the purpose of running the means test, the place of purchase was coded as follows: '1' – local market, '2'- outside village, '3'- main cities and '4'- any other. The table shows a mean of 2.08 and 2.13 in the mining and the non-mining areas under study, which is close to 2.

This reveals that majority of the family members in both the mining as well as the non-mining areas go outside the village to purchase their daily consumed goods, indicating that the markets do not meet their requirements. The results of the ANOVA table also shows that there is no significant difference in the place of purchase of daily consumed goods in the mining and non-mining areas with F=.529 at p>.005.

Table 5.33

Place of purchase

Place of purchase	Mining		Non-mining	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Local Market	60	23.4	31	16.2
Outside village	124	48.4	113	59.1
Main cities	64	25	38	19.9
Any other	8	3.1	9	4.7
Total	**256**	**100**	**191**	**100**

Source: Primary survey

Table 5.34

Means Report for place of purchase

	Area	Mean	N	Std. Deviation
Place of purchase	MINING	2.08	256	.778
	NON-MINING	2.13	191	.732
	Total	2.10	447	.758

Table 5.35

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Place of purchase * Area	Between Groups	(Combined)	.305	1	.305	.529	.467
	Within Groups		256.165	445	.576		
	Total		256.470	446			

Place of shopping:

Table 5.36 gives the place of shopping of convenience and luxury goods in the mining and the non-mining areas. The place of shopping includes local market within the village, outside/nearby villages and the main cities. The table shows that 0.8 percent of the family members in the mining areas meet their requirements within the village market, 25.8 percent purchase from outside the village and a majority of 73.4 percent goes to the main cities for shopping. In the non-mining areas however, 2.6 percent purchase from the local market, a substantial percentage of people purchase from outside/nearby villages and 42.4 percent go to the main cities for shopping. To know whether there is a difference in the place of shopping in the mining and non-mining villages mean test with ANOVA table was used. For the purpose of calculating the mean, the following codes were given: ‘1’- local market, ‘2’- outside village and ‘3’ main cities. Table 5.37 gives the means of place of shopping with the mean of 2.73 in the mining areas and 2.40 in the non-mining areas, indicating that majority of the family members in the mining areas go to the main cities for shopping, as the mean is close to the code ‘3’; while the family members in the non-mining areas go outside the village for shopping as the mean shown is close to the code ‘2’. The results of ANOVA displays a significant difference in the place of shopping in the mining and the non-mining areas under study with F=47.532 at p<.005.

Table 5.36

Place of shopping

Place of shopping	Mining		Non-mining	
	Frequency	%	Frequency	%
Local Market	2	0.8	5	2.6
Outside village	66	25.8	105	55
Main cities	188	73.4	81	42.4
Total	**256**	**100**	**191**	**100**

Source: Primary survey

Table 5.37

Means Report for place of shopping

	Area	Mean	N	Std. Deviation
Place of shopping	**MINING**	2.73	256	.464
	NON-MINING	2.40	191	.542
	Total	2.59	447	.524

Table 5.38

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Place of shopping * Area	Between Groups	(Combined)	11.815	1	11.815	47.532	.000
	Within Groups		110.619	445	.249		
	Total		122.434	446			

The mining as well as the non-mining areas under study are situated in the remote areas where normally the market place is not developed. However, it was observed that in the mining areas, most of the daily consumed goods were available but the prices of these goods were higher as compared to the prices of the same goods in the nearby villages. This was due to the presence of migrants who settled in the areas with their families with the advent of mining. On the other hand, there were no markets for all required goods in the non-mining areas. Thus high prices of goods in the mining areas and unavailability of the same in the non-mining areas compelled people to go to nearby villages. Family members of the households who possessed their own vehicles preferred to go outside the village or the main cities to meet their basic requirements as both the regions did not have proper public transport facilities. People with high incomes and vehicles preferred to go to main cities to purchase consumer goods, luxury items, clothing and like conveniences. Moreover, no proper banking facilities and transport facilities are available for convenience shopping.

Asset possession:

Asset possession is also an indicator for determining the socio-economic status of the household. This variable is used to assess whether there is any difference in the assets possessed by the households in the mining regions compared to the households in the non-mining regions under study. For the purpose, the following assets were considered: house type; possession of two wheeler, four wheeler, and truck; land owned; tractor and any other agricultural equipment; television, refrigerator and mobile phone. For the purpose of comparison, each asset is coded as shown in the table below and means test along with ANOVA is run to verify whether there is a significant difference in the possession of assets in the mining and the non-mining areas.

House type:

The house type includes: rented, traditional, repaired/renovated and new construction. The type of housing would help in determining which area is economically better off. The codes are shown in Table 5.39.1. The table shows that 76.5 percent of the households live in traditional houses, 21.5 percent had repaired/renovated their houses while a meager 2 percent have newly constructed their houses in the mining areas. In the non-mining areas also, a higher percentage of households that is 85.9 percent still live in traditional houses, 13.1 percent have repaired/renovated their houses while just 1 percent of the households have newly constructed houses. However, all the households under study had their own houses. The mean value for housing is 1.25 and 1.15 in the mining and non-mining areas respectively. Of these values 1.15 is close to 1 indicating that more number of houses in the non-mining villages are traditional. This is supported by the ANOVA results with $F=5.823$ at $p<.005$ indicating that there is a difference in the housing of the households in the mining and the non-mining areas under study. The most unfortunate observation from the study was that inspite of having high income in the mining areas, there was a very negligible percentage (2 percent) of households had newly constructed house.

Table 5.39.1

Housing and means test report with ANOVA

Housing	**Mining**		**Non-mining**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Rented (0)	0	0	0	0
Traditional (1)	196	76.5	164	85.9
Repaired/renovated (3)	55	21.5	25	13.1
New construction (4)	5	2	2	1
Total	**256**	**100**	**191**	**100**
Mean		**1.25**		**1.15**
ANOVA test				
F-value				**5.823**
Sig.				**.016**

Two-wheeler:

Possession of two-wheeler is no more a comfort but a need of the recent times. Table 5.39.2 shows the possession of two wheelers in the mining and the non-mining areas. A majority of 51.2 percent of the households in the mining areas possess one two-wheeler while 30.5 percent possess more than one two-wheeler while the rest have no two-wheelers. In the non-mining areas as well a higher percentage of households that is 52.9 percent possess atleast one two-wheeler, 27.2 percent possess more than one two-wheeler while the remaining 19.9 percent do not possess two-wheelers. The mean value for possession of two-wheeler is 1.12 and 1.07 in the mining and the non-mining areas respectively which is close to code ‘1’, indicating that most of the households in the both the regions possess two-wheelers. The ANOVA test shows no significant difference in the possession of two-wheeler by the households in the mining and the non-mining areas with F=.529 at p>.005.

Table 5.39.2

Possession of two wheeler and means test report with ANOVA

Two wheeler	Mining		Non-mining	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No two wheeler (0)	47	18.3	38	19.9
1 two wheeler (1)	131	51.2	101	52.9
More than 1 two wheeler (2)	78	30.5	52	27.2
Total	**256**	**100**	**191**	**100**
Mean		**1.12**		**1.07**
ANOVA test				
F-value				**.529**
Sig.				**.467**

Four-wheeler:

Possession of four-wheeler is dependent on the income capacity of the family member in the household. Table 5.39.3 shows that 33.6 percent of the households in the mining areas possessed one four-wheeler, 7 percent had more than one four-wheeler and the rest did not possess the same. In the non-mining areas, 15.2 percent of the households had one four-wheeler, 3.1 percent had more than one four wheeler and a large majority of 81.7 percent did not possess the same. The means test reports a higher mean value of 0.48 in the mining areas compared to the mean value of 0.21 in the non-mining areas. This is a clear indication that a higher number of households in the mining areas possessed a four-wheeler compared to the households in the non-mining areas, as the mean value of mining area is closer to code '1' than the non-mining areas. The ANOVA table also shows a significant difference in the mean value of possession of four-wheeler in the mining and the non-mining areas with $F=23.178$ at $p<.005$.

Table 5.39.3

Possession of four wheeler and means test report with ANOVA

Four wheeler	Mining		Non-mining	
	Frequency	Percentage	Frequency	Percentage
No four wheeler (0)	152	59.4	156	81.7
1 four wheeler (1)	86	33.6	29	15.2
More than 1 four wheeler (2)	18	7.0	6	3.1
Total	**256**	**100**	**191**	**100**
Mean		**.48**		**.21**
	ANOVA test			
F-value				**23.178**
Sig.				**.000**

Truck/Mining machinery:

This asset is used by the households in the mining areas especially for the purpose of employing the same with the mining companies and earn fruitful income from such business. The trucks were employed by the mining companies for the purpose of transportation of ore from the mining sites to be exported through the major port. The mining machinery was used at the mining sites on hire basis by the mining companies. For the purpose of the study, the two assets, truck and mining machinery is clubbed together. Table 5.39.4 displays that 19.1 percent of the households in the mining areas owned atleast one truck/mining machinery; 15.6 percent owned more than one truck and the rest did not possess any truck. In the non-mining areas, hardly 1.6 percent of the households owned atleast one truck and 0.5 percent owned more than one truck while a very large majority did not own any truck. This very clearly shows that trucks were possessed by the households in the mining regions more than the non-mining regions under study. The mean value of 0.50 in the mining areas that is close to code ‘1’ indicates that more number of households in the mining areas possessed atleast one truck, compared to the non-mining areas whose mean value is 0.03 that is close to code ‘0’, indicating that most of the households in the non-mining areas did not possess truck. The ANOVA table with F= 73.637 at p<.005 also reveals the same, that there is a significant difference in the possession of trucks by households in the mining and the non-mining areas under study. Thus trucks/mining machinery provided a source of income to the households in the mining areas, and the study reveals that few households in the neighbouring non-mining areas were also influenced by the mining industry to provide their trucks on hire. Discussions held with the villagers in the mining areas confirmed that the mining companies offer contracts to employ trucks/mining machinery to the households in the mining areas whose source of income was affected due to the conduct of mining activities.

Table 5.39.4

Possession of truck and means test report with ANOVA

Truck	Mining		Non-mining	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No Truck (0)	167	65.2	187	97.9
1 Truck (1)	49	19.1	3	1.6
More Than 1 Truck (2)	40	15.6	1	0.5
Total	**256**	**100**	**191**	**100**
Mean		**.50**		**.03**
	ANOVA test			
F-value				**73.637**
Sig.				**.000**

Land Owned

In this part of the study, the researcher intended to assess the land holdings of the households in the mining and the non-mining areas under study; however due to inadequate data, the same could not be gathered and thus the study only covered the land ownership of the households in the two areas. Table 5.39.5 gives the land possession of the households in the mining and the non-mining areas. A majority of 58.2 percent of the respondents in the mining areas revealed that they did not have any land, while 41.8 percent did own land. In the non-mining areas, 36.1 percent of the respondents revealed that they do not possess land while a large majority of the respondents that is 63.9 percent did have land. The mean value of land possessed by the households in the mining areas is 0.42 while that of the households in the non-mining areas is higher that is 0.64 and close to the code '1' which indicates that more number of households in the non-mining areas possess land as compared to those in the mining areas. The ANOVA result with F=22.309 at p<.05 shows a significant difference in the number of households owning land in the mining and the non-mining areas under study.

Table 5.39.5

Land ownership and means test report with ANOVA

Truck	Mining		Non-mining	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No (0)	149	58.2	69	36.1
Yes (1)	107	41.8	122	63.9
Total	**256**	**100**	**191**	**100**
Mean	**.42**		**.64**	
	ANOVA test			
F-value				**22.309**
Sig.				**.000**

Tractor

Tractors are possessed by the households that undertake cultivation on a large scale. Table 5.39.6 shows that a handful of 3.9 percent owned tractor in the mining areas while no households possessed tractor in the non-mining areas under study. The ANOVA table thus reveals a significant difference in the means of possession of tractor by the households in the mining and the non-mining areas under study with F= 6.928 at p<.05. The discussions held with the villagers and members of Panchayat confirms that large scale agriculture was practiced by the households away from mines and that a lot of fertilizers as well as chemicals were used by them to increase the yield, as it would serve as good source of income by selling the products in the market at high prices due to the presence of the migrants.

Table 5.39.6

Possession of tractor and means test report with ANOVA

Tractor	Mining		Non-mining	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No (0)	246	96.1	191	100
Yes (1)	10	3.9	0	0
Total	**256**	**100**	**191**	**100**
Mean	**.05**		**.00**	
	ANOVA test			
F-value				**6.928**
Sig.				**.009**

Any other agricultural equipment

This includes agricultural equipment other than tractor possessed by the households involved in agricultural practice. Table 5.39.7 demonstrates that only 6.6 percent of the households in the mining areas possess such agricultural equipment other than tractor while a minority of 1.1 possessed the same in the non-mining areas. The mean values of 0.07 and 0.01, though close to code ‘0’, indicate a negligible number of people possessing other agricultural equipment. Yet with a higher number in the mining area possessing the same, the ANOVA table reveals a significant difference with respect to its possession in the mining and the non-mining areas under study with F= 8.532 at p<.05.

Table 5.39.7

Possession of other agricultural equipment and means test report with ANOVA

Other agricultural equipment	**Mining**		**Non-mining**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No (0)	239	93.4	189	98.9
Yes (1)	17	6.6	2	1.1
Total	**256**	**100**	**191**	**100**
Mean		**.07**		**.01**
	ANOVA test			
F-value				8.532
Sig.				.004

Television

Television is no more a luxurious form of entertainment and is possessed by most of the households in the rural areas. In Table 5.39.8 it can be seen that a majority of the households in the mining areas, that is 93.8 percent possess atleast one television set in their homes while 0.4 percent possess more than one television set, while in the non-mining areas, 85.9 percent of the households possess atleast one television set and 0.5 percent possess more than one television set while the rest 13.6 percent do not possess any. The mean value of 0.95 in the mining areas is higher than that of the mean value of possession of television in the non-mining areas of 0.87, indicating that more number of households in the mining areas possesses atleast one television. The same is verified by the ANOVA result with F= 7.255 at p<.05

indicating that there is a significant difference in the possession of television in the mining and the non-mining areas.

Table 5.39.8

Possession of television and means test report with ANOVA

	Mining		**Non-mining**	
Television	**Frequency**	**Percentage**	**Frequency**	**Percentage**
No (0)	15	5.9	26	13.6
One (1)	241	94.2	165	86.4
Total	**256**	**100**	**191**	**100**
Mean	**.95**		**.17**	
		ANOVA test		
F-value				7.255
Sig.				.007

Refrigerator

Refrigerator though considered as a luxury gadget is now becoming a necessity. In villages also it is now a gadget that is widely used as in the case of television. Table 5.39.9 denotes that a large majority of 84.8 percent of the households in the mining areas possess a refrigerator while the remaining do not possess the same; in the non-mining areas majority of 69.6 percent of the households possess refrigerator and the remaining do not own the same. Thus it is clear from the data that more number of households possess refrigerator in the mining areas compared to the non-mining areas under study. The means show a value of 0.85 and 0.70 in the mining and the non-mining areas under study respectively with a higher mean in the mining areas, indicating more number of households possessing refrigerators than the non-mining areas. The ANOVA test results also show significant difference in the possession of refrigerator by the households in the mining and non-mining areas with F=15.692 at p<.05.

Table 5.39.9

Possession of refrigerator and means test report with ANOVA

Refrigerator	Mining		Non-mining	
	Frequency	Percentage	Frequency	Percentage
No (0)	39	15.2	58	30.4
One	217	84.8	133	69.6
Total	**256**	**100**	**191**	**100**
Mean	**.85**		**.70**	
	ANOVA test			
F-value				15.692
Sig.				.000

Mobile phone

Mobile phones are also widely used source of communication everywhere and that has not spared the rural areas as well. Table 5.39.10 gives the details of mobile phones possessed by the family members in the mining and the non-mining areas under study. In the mining areas, 22.3 percent of the households under study possess atleast one mobile phone, a large majority of 73.8 percent have more than one mobile phone while very small percentage of 3.9 do not have one. In the non-mining areas, 27.8 percent of the households possess atleast one mobile phone, while a majority of 67 percent possesses more than one and the rest 5.2 do not possess any mobile phone. The mean value of households possessing mobile phone is 1.70 and 1.62, close to code '2' in the mining and non-mining areas under study respectively, indicating that majority of the households in both the areas possess more than one mobile phone. The ANOVA table further verifies that there is no significant difference in the possession of mobile phones in the mining and non-mining areas under study with F=2.322 at p>.05.

Table 5.39.10

Possession of mobile phone and means test report with ANOVA

Mobile phone	**Mining**		**Non-mining**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
No mobile phone (0)	10	3.9	10	5.2
1 mobile phone (1)	57	22.3	53	27.8
More than 1 mobile phone (2)	189	73.8	128	67
Total	**256**	**100**	**191**	**100**
Mean		**1.70**		**1.62**
ANOVA test				
F-value				**2.322**
Sig.				**.128**

Housing, cooking facility used, transport implements owned, agricultural implements owned, land, household gadgets (like television, refrigerator and others if any) and the number of mobile phones in the family provide some understanding about the difference in the socio-economic characteristics of the households in the two areas. Two-wheelers are a need, hence possessed by most of the people. Mobile phones are also no more a luxury or pleasure item but it has become a necessity; hence, most people possess mobile phones. With respect to television and refrigerator, they have become common appliances in most of the houses in the rural areas as well. The study reveals that the households in the mining areas possessed more assets than the households in the non-mining areas under study. However, it was observed that in terms of possession of productive asset, that is land, a higher number of households possessed the same, while the households in the mining areas invested into purchase of truck/mining machinery/vehicles to be fruitfully employed with the mining companies to earn lucrative income.

l. Benefits availed due to mining operations:

Every organization is obliged to serve the society in the areas where it operates. Mining is a destructive industry that causes lot of pollution and thus has an impact on the environment in which the inhabitants have to survive. Thus, the mining companies, as an obligation, provided certain benefits such as: medical facilities, job opportunities, extended educational support, compensation for loss of source of income and other benefits (that includes payment of water bills, improved infrastructure and like activities) to the people in the areas where mining operations take place. Table 5.40 shows the number of respondents stating that benefits are provided by the mining companies in the areas and the percentage of households who have availed of these benefits. The data shows that out of 256 households under study, 156 households that is 60.9 percent agree that the mining companies have provided improved medical facilities in their respective areas, however of these only 82 that is 32 percent have availed of the same. Further, 18 percent of the total respondents stated that the mining companies did provide jobs to the people in their areas; however the beneficiaries within the areas were just 11.3 percent. 43 percent of the total respondents under study agreed that the mining company provided educational support of which 22.3 percent availed of the same. 16 percent of the total respondents agreed that mining companies provide compensation to the people in the areas, of which 10.9 percent agreed that they received compensation from the mining companies. Amongst various other benefits provided by the mining companies to the households in the area as agreed by 17.2 percent of the total respondents, 9.4 percent availed of the different benefits in their respective mining areas. The study however points out that the number of benefits and the kind of benefits offered by the mining companies to the people in the areas was dependent on the size of the company and the scale of operations in the area. The respondents further revealed that add on benefits were provided by the mining companies in those areas where they wanted to extend their operation. Benefits were mere tools for obtaining people's consent for further expansion in the mining activities without agitation. The non-mining areas however availed of the benefits that were provided by the government in common to all the villages in the state such as primary health centres, anganwadi and primary schools.

Table 5.40

Benefits in mining areas

Benefits in mining areas	**Provided**		**Availed**	
	Frequency	**%**	**Frequency**	**%**
Improved medical facilities	156	60.9	82	32
Job preferences	46	18	29	11.3
Educational support	110	43	57	22.3
Compensation	41	16	28	10.9
Other benefits	44	17.2	24	9.4
Sample Size: 256				

Source: Primary survey

m. Problems faced:

This variable attempts to assess the problems faced by the households in the mining and the non-mining areas and find the common problems if any. A comparison is done between the mining and the non-mining areas so as to judge whether these impacts arise due to mining operations in the mining areas or otherwise also. Table 5.41 displays the problems faced by the households in the two areas under study.

The table shows that the most prominent problems faced by the households in the mining areas are traffic congestion/road accidents, water problems (shortage and polluted) and destruction of agricultural lands. 149 out of 256 respondents in the mining areas complained of traffic congestion/road accidents taking place in their vicinity. 122 respondents out of 256 complained of water problems and 107 out of the same number were unhappy with the damage caused to their agricultural land. 34 out of the total respondents in the mining areas also complained of respiratory sicknesses faced by their family members. Moreover, 34 out of 256 had other problems not mentioned in the table such as high prices of locally available foods items, fights by the migrants with the locals, inability of the children to learn and concentrate on their studied due to the noise from the mining sites and such other problems. In the non-mining areas however, there were problems of water shortage as agreed by 46 out of 191 respondents, while a majority of the respondents that is 102 out of 191 expressed their discontent about the lack of proper infrastructure, unemployment, lack of medical facilities and their inability to connect to the markets, hampering their agricultural activities.

Table 5.41

Problems faced by households

Problems faced by households	Mining (N=256)				Non-mining(N=191)			
	Frequency (Yes)	**Percent age**	**Frequency (No)**	**Percentage**	**Frequency (Yes)**	**Percentage**	**Frequency (No)**	**Percentage**
Traffic congestion/road accidents	149	58.20	107	41.80	0	0	191	100
Death in the family due to road accidents	2	0.80	254	99.20	0	0	191	100
Major disability due to accident	2	0.80	254	99.20	0	0	191	100
Minor disability due to accident	4	1.60	252	98.40	0	0	191	100
Respiratory sicknesses	34	13.30	222	86.70	2	1	189	99
Other health problems	3	1.20	253	98.80	7	3.70	184	96.30
Water problems	122	47.70	134	52.30	46	24.10	145	75.90
Agricultural land affected	107	41.80	149	58.20	2	1	189	99
Cracks on walls and floor	21	8.20	235	91.80	0	0	191	100
Inflow of migrant	23	9	233	91	0	0	191	100
Any other	34	13.30	222	86.70	102	53.40	89	46.60

Source: Primary survey

5.3 CORRELATION ANALYSIS:

The data discussed above revealed that the households in the mining areas earned higher incomes compared to the households in the non-mining areas. It is commonly observed that when the income increases it leads to an improvement in the standard of living. Unfortunately, the findings of the study revealed no significant difference in higher educational levels of the family members in the mining and the non-mining areas under study. However, primary level education showed a significant difference in the mining and the non-mining areas under study inspite of the fact that the mining companies provided educational support to the people in the mining areas. No efforts seemed to be taken by the household members in attainment of higher education. This is a clear indication that incomes are not directly related to the educational qualification of the people in the mining areas. To verify the same, Pearson's correlation analysis is conducted. Further the study also revealed incidence of huge loan liabilities in the mining areas compared to the households in the non-mining areas; thus an attempt was made to find whether income has any relationship with the loans taken by the households.

Table 5.42 gives the results of correlation analysis of income and mean years of schooling of the households in the areas. The income here denotes the total income earned by the households. The mean years of schooling is the sum of the total years of schooling of family members in a household divided by the number of family members. The table shows a positive correlation between income and mean years of schooling at $r=.094$, $n=256$, $p>0.05$ in the mining areas; however, the correlation in not a significant one. In the non-mining areas as well, there exists a positive correlation between income and mean years of schooling at r=.204, n=191, p<0.05 which is significant, but the strength is low. In the mining areas the main economic activity practiced by most of the family members was trade/business that does not demand higher educational qualification, while in the non-mining areas most of the family members were employed into service that requires minimum educational qualification. Thus, education was significant to the family members in the non-mining areas compared to the family members in the mining areas.

Table 5.43 gives the correlation analysis between income and loan. The data reveals that there is a positive and significant and a very strong correlation between loan and income in the mining areas at r=.718, n=256, p<.05. The data reveals a positive and a strong correlation between loan and income in the non-mining areas also at r=.507, n=191, p<0.05. The relationship between loan and income is stronger in the mining areas compared to the non-mining areas under study.

This suggests that more the loans higher will be the income for the households in the mining areas, while more the mean years of schooling there is just 93 times chances of increase in income of the households. Thus, education is not an important characteristic for earning income in the mining regions. Nonetheless in the non-mining areas there is 204 times of chance of increase in income with an increase in the mean years of schooling.

Table 5.42

Correlation between income and mean years of schooling

Area			Income	Mean years of schooling
MINING	**Income**	Pearson Correlation	1	.093
		Sig. (2-tailed)		.137
		N	256	256
	Mean years of schooling	Pearson Correlation	.093	1
		Sig. (2-tailed)	.137	
		N	256	256
NON-MINING	**Income**	Pearson Correlation	1	.204**
		Sig. (2-tailed)		.005
		N	191	191
	Mean years of schooling	Pearson Correlation	.204**	1
		Sig. (2-tailed)	.005	
		N	191	191

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.43

Correlation between loan and income

Area			Loan	Income
MINING	**Loan**	Pearson Correlation	1	.718**
		Sig. (2-tailed)		.000
		N	256	256
	Income	Pearson Correlation	.718**	1
		Sig. (2-tailed)	.000	
		N	256	256
NON-MINING	**Loan**	Pearson Correlation	1	.507**
		Sig. (2-tailed)		.000
		N	191	191
	Income	Pearson Correlation	.507**	1
		Sig. (2-tailed)	.000	
		N	191	191

**. Correlation is significant at the 0.01 level (2-tailed).

5.4 Summary

This is the core chapter in the current study that aimed at assessing the impact of mining on the socio-economic characteristics of the households in the mining villages of Bicholim, Sattari, Quepem and Sanguem talukas. For this purpose, 256 households across these four talukas were administered with an interview schedule. The impacts can be noticed when compared with the areas having similar physical and geographical characteristics. Hence, 191 households from the non-mining villages of the same four talukas were also administered with the same interview schedule in order to compare the socio-economic characteristics of the households in the two areas. For the purpose of the study, the hypothesis formulated was that 'there is no significant difference in the socio-economic characteristics of the households in the mining areas with that of the households in the non-mining areas'. The data was analysed using SPSS 21 package and the tools used to compare the characteristics of the two areas were: frequency table, means and ANOVA. Pearson Correlation analysis was also done to find correlation between the socio-economic characteristics. Mann Whitney test was run to compare the economic characteristics of the households in the mining areas with that of the households in the non-mining areas. On the basis of the test run, the study concludes that there is a significant difference in the socio-economic characteristics of the households in the mining and non-mining areas under study with respect to the following characteristics: source of cooking fuel used; participation in economic activities like agriculture and trade/business; economic variables such as household income, household expenditure, household savings and loan instalment; place of shopping; possession of assets such as housing, four wheeler, truck, land owned, tractor, agricultural equipment, television and refrigerators. The study found no significant difference in the following socio-economic characteristics: family size, residential status, mother tongue, highest educated in the family, source of water, place of purchase of daily consumed goods, possession of assets such as two-wheeler and mobile phone as well as in the economic activity such as labour and service. The Pearson correlation analysisis however showed no significant relationship between income and education of the family members in the mining areas under study. However, there was a significant and positive relationship between loan taken and income.

CHAPTER 6

ECONOMIC STATUS OF THE HOUSEHOLDS

6.1 INTRODUCTION

The last chapter revealed that the mining industry has largely influenced the socio-economic characteristics of the households in the mining areas. 61 percent of the households are dependent directly on the mining industry for their livelihoods. In continuation with the same the current objective is a further investigation into the economic status of the households in the mining areas.

For the purpose of determining the economic status of the households in the mining regions two models were run: one based on the variables selected by Mendes (2001) and the second with different variables that have evolved over a period of time with the expansion in mining activities. An enormous increase in mining practices has had an effect on the economic status of the people in the mining areas. Model I determines the per capita income using the following predictors: occupation (agriculture, labour, trade/business and service), mean years of education, participation rate and land ownership. Though past study included size of landholding and working days however the data was inadequate to run the model, hence excluded. Instead land ownership was used as a dummy variable.

6.2 ECONOMIC STATUS OF HOUSEHOLDS IN THE MINING AREAS

Statistical Analysis of Model I:

Table 23.1 showed the results of the multiple linear regression. The coefficients of trade/business in occupation and participation rate are found to be highly significant and contribute positively to the per capita income of the households in the mining areas. The other factors that is agriculture, service and labour as occupation; mean years of education and land had no association with the per capita income. Land owned and labour both contribute negatively to the per capita income of the households in the mining areas. Not all the landowners in the mining areas could practice agriculture and allied activities the reason being the pollution created by the mining companies into the areas. The mean years of education also showed no significant contribution towards the determination of the per capita income of the households due to the nature of activities undertaken that does not require much education as discussed in the first objective.

F value in the model was 23.920 at 7 and 248 degrees of freedom which was significant at .000. However, the significant variables gave only 38.6 percent of the explanation, which means that these variables have not remained the same over a period of time. More and more people have got involved into mining related activities, thus some factors that seemed to favour the per capita income are not supporting the same in the current scenario. Thus the second model is evolved to test the predictors of per capita income with context to the mining areas in Goa.

Table 6.1

Mean and Standard Deviation of the variables used in the economic status function in Model I

Variables	Symbol	Mean	Std. Deviation
Per capita income	Y	106709.676	101638.289
Mean years of education	ME	6.969	2.999
Participation rate	Part	28.664	12.271
Land owned dum	Land	0.418	0.494
Busidum	Busi	0.484	0.501
Serdum	Ser	0.453	0.499
Labdum	Lab	0.227	0.419
Agridum	Agri	0.195	0.397

The above table gives the mean and standard deviation values of the variables used in the per capita income. The mean years of education were 7 years with a deviation of 3 years. The participation rate is 29 percent.

Table 6.2

Correlation Matrix

Variables	PCI	ME	Part	Land	Busi	Ser	Lab	Agri
PCI	1.000							
ME	.145	1.000						
Part	.378*	.200*	1.000					
Land	-.081	.011	.060	1.000				
Busi	.550*	.039	.147*	.134*	1.000			
Ser	.014	.258*	.172*	-.062	-.193*	1.000		
Lab	-.307*	-.222*	-.035	-.061	-.456*	-.253*	1.000	
Agri	.117	-.024	.131*	.262*	.086	-.076	-.172*	1.000

Regression results of economic status function

Equation I:

1. $Y = \alpha + \beta_1 Agri + \beta_2 Lab + \beta_3 Busi + \beta_4 Ser + \beta_5 ME + \beta_6 Part + \beta_7 Land + U_1$

Table 6.3

Results of linear regression

Variables	β-Coefficient	t-value	Sig.
1.Agriculture	10192.429	.688	.492
2.Labour	-12830.635	-.768	.444
3.Business	109386.693	8.007*	.000
4.Service	7935.774	.618	.537
5.ME	1860.517	.954	.341
6.Part	2586.817	5.392*	.000
7.Land	-2787.333	-.241	.810
Constant	-33651.825	-1.635	.103
Adjusted R^2	.386		
Durbin Watson	1.142		

***Significant**

Table 6.4

Summary of association between the variables

Type of association between the variables	Variables
Variables showing positive and significant contribution	Business Participation rate
Variables showing negative contribution	Land Labor
Variables showing no significant association	Agriculture Service Mean years of education

However, over a period of time with rising mining operations and a gradual decline in agriculture and allied activities more people were involved into mining activities by either purchasing trucks by raising loans or other direct employment. Thus it was necessary to include the two variables: asset owned and loan taken as predictors of per capita income.

Statistical Analysis of Model II:

In the second model, the stepwise linear regression method is followed. The modified equation fitted the conditions of regression adequately. Here the variables land owned, labour and mean years of education was excluded and factor loan taken was included. The result of the second model shows that loan taken and participation rate is highly significant and contributes positively to the per capita income. Also business as an occupation shows a significant and positive contribution to per capita income. The variable agriculture however shows a negative and significant contribution to per capita income. Thus the variables agriculture, business, participation rate and loan are the predictors of per capita income in the mining regions. The F value in the final model was 94.738 at 4 and 251 degrees of freedom and found to be significant at .000. The second model could explain 60.2 percent of the variance. The Durbin-Watson value is close to 2 indicating no autocorrelation.

Table 6.5

Mean and Standard Deviation of the variables used in the economic status function in Model II

Variables	**Symbol**	**Mean**	**Std. Deviation**
Per capita income	Y	106709.676	101638.289
Agriculture occupation	Agri	0.195	0.397
Business occupation	Busi	0.484	0.501
Participation rate	Part	28.664	12.271
Loan taken	Loan	15364.570	16663.064

Table 6.6

Correlation matrix

Variables	PCI	Part	Busi	Agri	Loan taken
PCI	1.000				
Part	.378*	1.000			
Busi	.550*	.147*	1.000		
Agri	.034	.131*	.094	1.000	
Loan taken	.569*	.070	.194*	.151*	1.00

Regression results of economic status function

Equation 2:

$$Y=\alpha+\beta_1 Agri+\beta_2 Busi+\beta_3 Part+\beta_4 Loan+U_1$$

Table 6.7

Results of regression

Variables	β-Coefficient	t-value	Sig.
Agriculture	-68565.769	-2.625	.009*
Business	83292.048	3.978	.000*
Part	3122.398	3.699	.000*
Loan	3.883	17.308	.000*
Constant	-47712.354	-1.793	.074
Adjusted R^2		.602	
Durbin Watson		1.913	

***Significant at 95% confidence level**

Table 6.8

Summary of association between the variables

Type of association between the variables	Variables
Variables showing positive and significant contribution	Business Participation rate Loan
Variables showing negative contribution	Agriculture

The regression results show a strong and positive relationship between the socio-economic characteristics and mining activities, thus giving full support to the hypothesis that the socio-economic characteristics of the households in the mining regions is significantly influenced by mining activities. The results give a clear indication that mining has created many business opportunities for the households in the areas and they are largely dependent on these activities. These households have either voluntarily given up or have been compelled to give up agricultural and allied activities. Thus very few are involved into the same though the study shows that a higher average income is earned by the households in the mining areas compared to the non-mining areas from agriculture. Thus the regression result shows negative association between agriculture as an occupation and per capita income. The assets purchased by them have been deployed for the purpose of mining activities, thus the assets purchased has been fruitfully used by the people. Huge amounts of loans are availed for the purpose of purchase of such assets and the high incomes that the people earn are used for the payment towards the loans.

The findings of the study would be useful in providing insight into the importance of factors determining the economic status of the households in the mining areas. However, the study can be generalized only to such mining areas having similar characteristics.

CHAPTER 7

ENVIRONMENTAL QUALITY PERCEPTION OF THE HOUSEHOLDS IN THE MINING AREAS

7.1 INTRODUCTION

The residents in the mining areas have to involuntarily face pollution of all types. This has a direct and indirect impact on their lives, and thus, they are in a position to communicate their perceptions about the environmental quality in the mining areas appropriately. The way the environmental problems are managed by the households in the area and addressed by the mining companies can either make conditions better or worse for them. Their response can aid the operating mining companies to take measures towards controlling the pollution.

For the purpose of studying this objective the following variables were considered by the researcher: air pollution, water pollution, noise pollution and land degradation. The same sample of 256 respondents from the mining talukas under study was selected. The respondents' perceptions about air pollution, water pollution, noise pollution and land degradation were drawn in 21 statements that are rated on a five-point Likert scale. Weighted mean and mean scores of the statements have been obtained to assess the severity of pollution, as already explained in the chapter on research methodology. To test the reliability of the statements Cronbach Alpha was used. The Cronbach Alpha value of 0.961 indicated that the responses are reliable. Further to test whether there is any difference in the perceptions of the respondents with respect to gender, age groups, length of residence, income groups and across talukas, t-test and ANOVA tests were used. The data collected was analysed using SPSS 21 version.

The chapter is divided into four parts. The first part gives an introduction to the chapter; the second part discusses the intensity of air pollution, water pollution, noise pollution and land degradation. The third part assesses whether there is difference in perception of respondents across socio-economic characteristics and across talukas. The last part gives the summary of the chapter.

7.2 INTENSITY OF POLLUTION

Table 7.1 given below provides the perceptions of the respondents rated on a five-point Likert scale, from ‘strongly disagree’ to ‘strongly agree’. The weighted mean and mean scores are obtained, which explain the severity of air pollution, water pollution, noise pollution and land degradation. A mean score between1-2.4 indicates that the pollution perception of the respondents is low, 2.5-3.4 indicates that the respondents pollution perception is medium and 3.5-5 indicates that the respondents pollution perception is serious (Shi, He 2012). The intensity of the pollution is discussed below:

a. Air pollution:

The first four statements (1-4) in Table 7.1 give respondents perception of air pollution. The first three statements have mean score of 3.90, 3.85 and 3.80 respectively, which means they fall in the serious range while statement 4 has mean score of 2.70 indicating that the variable falls in the medium range. The overall mean score of air pollution perception however falls in the serious range with 3.56. This indicates that there is serious air pollution in the areas as perceived by the respondents under study.

Air pollution is prevalent along the mining belt due to extraction, transportation and dumping of ore. A study by **Nayak** (**1994, 1998**) revealed that villagers perceive air pollution as the major problem faced by them due to mining operations. Further according to **TERI (1997),** 90 percent of the population in the mining clusters and corridors are exposed to air pollution, especially RSPM (Respirable Suspended Particulate Matter) over 150µg/m^3, which is beyond the threshold level for industrial areas. People in such areas have expressed their opinion that air pollution resulted in respiratory sicknesses and other health problems, mostly amongst the school-going children and the older people. **Biswas, Tapan; Pitale, S. L.; Ram, Santha A (2003)** found that the RPM and SPM values in the 11 important stations in North Goa exceeded the CPCB limits**. India School of Mines (ISM) 2013,** Dhanbad visited 105 mines in Goa and found that very high transport density and traffic congestion has given rise to increased particulate matter and associated emission levels.

The current study also reveals that air pollution is still a major problem in the mining areas and needs attention.

b. Water pollution:

The statements 5-11 in Table 7.1 below explain respondents' perception of water pollution in the mining areas under study. The mean scores of all the 7 statements in the table given below, lies in between 2.5-3.4 indicating that the perceptions of the respondents of water pollution falls in the medium range. The overall mean score of water pollution perception is 3.04.

Water problems occur in the areas of ore extraction as lot of water is used in the process for washing the ore. In the mining villages of Bicholim and Sattari talukas, a greasy layer was observed in the wells. This water was unfit for domestic use. 38 percent of the households in the mining villages under study in the mining talukas were facing acute water shortage problems as stated in the first objective. The most burdened due to this were the women in these areas, as they take the responsibility for storing water. As stated in the first objective on page no. 123, 8.6 percent of the households were dependent on the tanker water, supplied by the mining companies for their domestic consumption, especially in Pissurlem and Shirgaon villages. A respondent in Shirgaon expressed that they have water shortage throughout the year, but it is worst in summer, during the end of the month of April, when the village celebrates *jatra* of Goddess Lairai, and people from all over Goa come to attend the same. People have relatives staying over in their homes, and hence face inconvenience due to water problems. Though the mining companies provide water tankers to the people, they are not happy with this arrangement, as the water is unhygienic and not fit for drinking. The people have lost their access to clean water due to mining activities. **NEERI (2009)** has reported that large number of mines has been operating below the level of the water table that is 50m below the sea level. This has affected well and irrigation waters in the mining areas.

c. Noise pollution:

The statements 12-14 in Table 7.1 explains noise pollution perception of the respondents under study. Statement 12 and 14 has a high mean score of 3.67, each indicating serious noise pollution, while statement 13 has a mean score of 2.71, falling in the medium range. A high score of 3.67 is given to the respondents' perception that noise pollution is due to plying of trucks that carry iron ore. The overall mean score was 3.35 which meant that the respondents perceive that the noise pollution falls in the medium range.

Within the mining belt where the extraction activities are concentrated, the households face serious noise pollution due to blasting/drilling activities as well as transportation of ore by trucks. With mechanization, there has been an increase in the mining activities and thus the noise pollution due to the operations using machines. During the course of data collection, the respondents in the study area living very close to the mine site that is in Pissurlem, Mulgaon and Cauvrem showed the cracks that had developed on the floors and walls of the houses. The mining operations were causing destruction of properties of these households. Surprisingly, the respondents informed that these problems were not addressed by the mining companies operating in these areas. Secondly, the transportation of the ore by trucks made hearing very difficult for the people in the areas. The school teachers and students find it very difficult to carry out the activity of teaching-learning as reported by one of the respondent in the Cauvrem village. One Mr. Rama Velip from Colomb in Sanguem taluka reported that the mines in his area would start early in the morning at 4:00 a.m. and continue work till 9:00 p.m. in the night, affecting the peace in the vicinity. Thus the study reveals that noise pollution is prevalent in mining sites as well as along the areas of transportation of ore with transportation of ore being the main reason for noise pollution.

d. Land degradation:

The statements 15-21 in Table 7.1 give respondents' perception of land degradation. The mean scores of all these statements fall in between 2.5-3.4, and the overall mean score is 2.90. This score reveals that the respondents' perception of land degradation is medium in the areas under study.

The respondents who are basically into land based agricultural activities and are affected due to mining operations have given high ratings for the perception of land degradation as they have lost their sources of incomes. 32 percent of the households expressed their inability to practice agriculture as the mining silt entered the fields, making them unfit for cultivation, while people away from the mine sites did practice agriculture for self-consumption. Thus the livelihoods of the people were affected due to mining practices.

Table 7.1

Pollution perception of the respondents in the selected mining areas

Sr. No	POLLUTION TYPES	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Weighted Means	Mean score
1	There is air pollution in your area due to mining activities.	21	21	7	121	86	998	3.90
2	Transportation of ore in trucks pollutes the air in your area.	22	25	8	116	85	985	3.85
3	Transport density led to spm.	26	24	7	118	81	972	3.80
4	Mining dumps gives exposure to dust	96	32	17	75	36	691	2.70
	AIR POLLUTION PERCEPTION						**911.5**	**3.56**
5	Mining activities has prevented access to clean water	36	47	34	85	54	842	3.29

Sr. No	POLLUTION TYPES	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Weighted Means	Mean score
6	Mine run off into the river/pond/stream has polluted the water	44	59	34	76	43	783	3.06
7	Pumping of water from mines has lowered ground water table in the village	45	64	35	67	45	771	3.01
8	Perennial rivers water resources have been affected due to mining	43	63	40	59	51	780	3.05
9	Mining operations are threat to aquatic life	49	64	43	66	34	740	2.89
10	Pumping of water and deep excavation resulted in underground water pollution	56	52	33	69	46	765	2.99
11	Mining operations depletes surface and ground water supplies	56	51	31	68	50	773	3.02
	WATER POLLUTION PERCEPTION						**779.1**	**3.04**
12	Mining operations has led to noise pollution in your area	21	32	23	114	66	940	3.67
13	Noise pollution is due to drilling/blasting noise from machinery	81	51	30	49	45	694	2.71
14	There is noise pollution due to plying of trucks in your area.	22	33	22	109	70	940	3.67
	NOISE POLLUTION PERCEPTION						**858**	**3.35**
15	There is decline in the quality of land due to mining.	53	52	25	70	56	792	3.09
16	Mining operations has led to mining run offs into the fields.	52	61	27	58	58	777	3.04
17	Mining run off in to the fields has affected the fertility of soil.	53	67	24	57	55	762	2.98
18	There are threats of landslides/mudslides in your area.	92	71	27	34	32	611	2.39
19	There is loss of vegetation due to mining operations in your area.	57	71	20	55	53	744	2.91
20	Forest cover in the mining areas has been lost in a big way due to mining.	57	64	19	64	52	758	2.96
21	Good quality horticulture land has been adversely affected due to mining.	56	70	21	55	54	749	2.93
	LAND DEGRADATION PERCEPTION						**741.9**	**2.90**
	OVERALL POLLUTION PERCEPTION						**822.6**	**3.21**

Source: Primary Survey

The mean score of overall pollution perception as shown in the table above is 3.21 that fall in the medium range. The study reveals that according to the perception of the respondents air pollution is the most serious, with a mean score of 3.56, followed by noise pollution with a mean score of 3.35, water pollution with a mean score of 3.04 and land degradation with a mean score of 2.90 in the mining areas under study. In the mine sites and transport routes, air and noise pollution are very common and thus highly rated by the respondents. Water pollution and land degradation is rated high by the respondents residing close to the areas of extraction of ore.

7.3 DIFFERENCE IN ENVIRONMENTAL POLLUTION PERCEPTIONS OF THE RESPONDENTS

The differences in the perceptions of the people depend on many socio-economic factors and region in which they live as well. Thus the differences in perceptions are studied across the socio-economic characteristics of the respondents as well as across talukas.

7.3.1 Environmental pollution perceptions across socio-economic characteristics:

The perceptions and views of the people are influenced by many socio-economic factors, and hence they differ from that of a policy maker. People are influenced by the way they think; the way they see things around in the environment and that is how they frame their perceptions. For the purpose of studying the differences in the pollution perceptions of the respondents under study the following socio-economic characteristics are used:

a. Gender:

Table 1.1 in Appendix III gives the gender-wise mean score of pollution perception and Table 1.2 gives the results of t-test that compares the means of pollution perception between male and female. Table 1.1 reveals that the mean score of perception of air pollution of males is 3.46 and females is 3.63 depicting very small difference in the perception. The mean score of perception of water pollution is 3.05 and 3.04 respectively for the male and female respondents. The mean score of perception of noise pollution was 3.32 and 3.38 respectively for males and females while it was 2.84 and 2.94 with respect to the mean score of land degradation. The result of t-test reveal no significant difference in the respondents' perception of air pollution, water pollution, noise pollution and land degradation with respect to gender with t values of 1.200, .065, .369 and .578 respectively at $p>.005$ in the mining areas as shown in Table 7.2 below. This means that the male respondents as well as the female respondents have similar perception about the environmental pollution in the mining areas under study.

b. Age:

Age of a person is important when a change in phenomena has to be studied as the respondent witnesses the same and is in a better position to answer. Table 2.1 gives the mean scores of pollution perception across age groups of the respondents under study. The table depicts that the respondents in the age group of 60 years and above have given higher rating as indicated by the mean score of 4.16, 3.83, 3.71 and

3.60 respectively for air pollution, water pollution, noise pollution and land degradation when compared to the respondents in the other age groups. The entire mean scores fall under serious range. These respondents have spent their lives in the area and have seen a change in the environment with the increase in the mining activities and hence feel that the environmental pollution is serious. The study revealed a significant difference in the perception of air pollution and water pollution, across age groups with F values of 3.287 and 2.537 respectively at $p<.005$ as shown in table 2.2 in Appendix 4. However, the study revealed no significant difference in respondents perception of noise pollution and land degradation across age groups with F values of 1.295 and 2.011 respectively at $p>.005$.

c. Length of residence:

The longer the stay at a particular place the better the ability of oneself to express their perception of the environment of that place. Table 3.1 in appendix III displays the mean score of pollution perceptions of the respondents in the mining areas across length of residence in the areas. The ANOVA test was run to further give a proper analysis of the data the results of which is displayed in table 3.2, appendix IV. The results show a significant difference in the respondents perception of noise pollution with F value 3.231 at $p<.005$, while there is no significant difference in perceptions with respect to air pollution, water pollution and land degradation with F values .459, 2.228 and 2.132 at $p>.005$. The Post hoc Scheffe test was used to find the significant difference. The results of which showed a significant difference in the perception of noise pollution between respondents residing for ten years and those residing for more than 50 years with a difference of .994 in the mean score, significant at p=.028. The last decade has seen a drastic increase in the mining operations in the regions so as to meet the increasing demand for iron ore; thus the extraction and transportation activities have increased. The machines that the mining companies use to extract ore created lot of noise for the people who lived close to the areas of extraction.

d. Total income:

Studies have revealed that mining has an influence on the economic activities of the households in the areas of operation. Thus the incomes earned by the households in the mining areas may have an influence on their pollution perceptions. Thus mean score of perceptions of the respondents across the income groups are obtained to see whether there is any difference in the perceptions of the households in the mining areas across different income groups. Table 4.1 in Appendix III displays the mean scores of the respondents across income groups. The ANOVA test is run to find whether there is any statistically significant difference in the perceptions of the respondents within age groups in the areas under study. The results of ANOVA are shown in Table 7.2 below. The test result shows no significant difference in the perception of respondents across income groups with respect to air pollution, water pollution and noise pollution, with F value of 1.344, 1.787 and 2.005 respectively at $p>.005$ as also displayed in table 7.2 below. However, there was a significant difference in the perception of respondents across income groups with respect to land degradation, with $F= 4.909$ at $p<.005$. The respondents mainly dependent on land based activities have expressed their concern for the land in the areas. These respondents were dependent on their lands for their livelihoods, prior to the mining activities. As a consequence of expansion in the mining activities, their land were affected and thus their incomes.

Table 7.2

Differences in perceptions across socio-economic variables

Factors	Socio-economic variables			
	Gender	**Age**	**Length of residence**	**Total income**
Air pollution	-1.200	3.287*	.459	1.344
Water pollution	.065	2.537*	2.228	1.787
Noise pollution	-.369	1.295	3.231*	2.005
Land degradation	-.578	2.011	.082	4.909*

*Significant @5%(95% confidence level)

7.3.2 Environmental pollution perception across taluka:

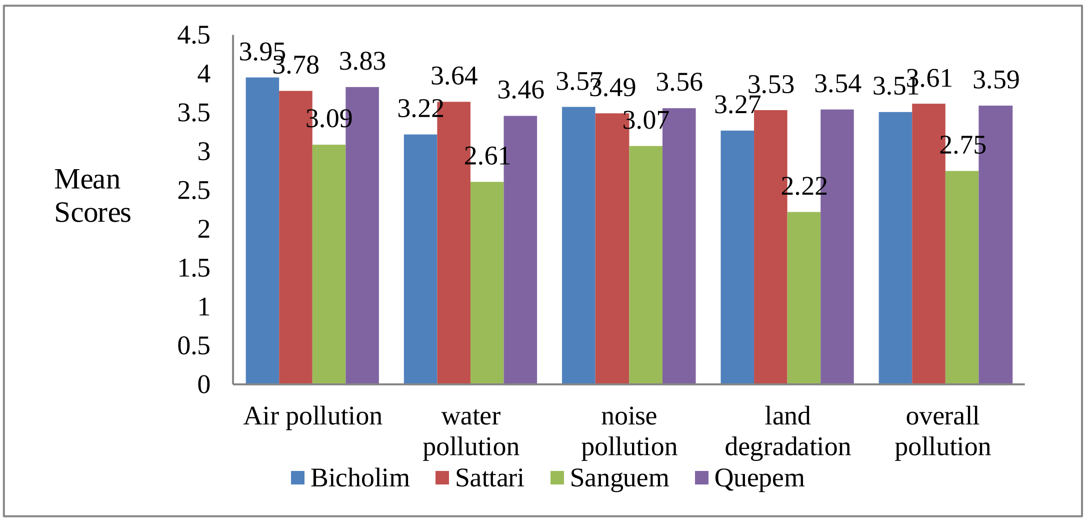
The environmental pollution perception of air, water, noise and land degradation of the respondents across the mining talukas under study was assessed to find whether there is any significant difference in the same. Mining has been mainly concentrated in the Bicholim talukas in the early years of its start but has later made way into the other iron ore rich talukas that is Sattari, Sanguem and Quepem. The last decade has seen a rampant increase in the iron ore activities. Within the four talukas rich in iron ore, Sanguem has the maximum area under mining followed Bicholim, Sattari and Quepem. From the point of view of mineral production Bicholim contributes close to 60 percent of the total value of mineral production followed by Sanguem.

Fig. 7.1 shows the environmental pollution perceptions of the respondents in the mining areas across the talukas under study. The figure displays that the perception of air pollution of the respondents is serious in Bicholim taluka with the highest mean score of 3.95, followed by Quepem with 3.83, Sattari with 3.78 and Sanguem with 3.09. The mean score of perception of water pollution of the respondents is highest in Sattari taluka at 3.64, followed by Quepem at 3.46, Bicholim at 3.22 and Sanguem at 2.61. The mean score of perception of noise pollution is highest in Bicholim with 3.57, followed by Quepem with a very close mean score of 3.56, Sattari with 3.49 and Sanguem with 3.07. With respect to land degradation, Quepem scores the highest mean of 3.54, followed by Sattari with 3.53, Bicholim with 3.27 and Sanguem with 2.22. With respect to the overall pollution perception of the respondents, the highest mean score by Sattari of 3.61 shows that the taluka is the most polluted compared to the other three talukas under study. This is followed by Quepem taluka with a score of 3.59, Bicholim with a mean score of 3.51 and Sanguem with a mean score of 2.75. Further the ANOVA Table 7.3 displays a significant difference in the pollution perceptions of the respondents across the mining talukas with respect to air pollution, water pollution, noise pollution and land degradation. The study reveals that at 95 percent confidence level, the F ratio for respondents perception of air pollution is 11.651 significant at $p<0.005$, the F ratio for perception of water pollution is 7.650 significant at $p<0.005$, the F ratio for perception of noise pollution is 3.792 significant at $p<0.005$ and the F ratio for perception of land degradation is 17.408 significant at $p<0.005$. Further the mean differences and the results of Post hoc Scheffe test for air pollution, water pollution, noise pollution and land degradation is displayed in table nos. 5.1, 5.2, 5.3, 5.4 and 5.5 respectively in appendix IV. The Scheffe's Post hoc test results for difference in the perception of air pollution of the respondents across talukas reveals a mean difference of .86316 between Sanguem and Bicholim taluka significant at $p=.000$, a mean difference of

.68538 between Sanguem and Sattari talukas significant at p=.027 and a mean difference of .74371 between Sanguem and Quepem talukas significant at p=.013. The post hoc results of respondents perceptions with respect to water pollution shows a mean difference of .60430 between Sanguem and Bicholim talukas significant at p=.015, a mean difference of -1.026 between Sanguem and Sattari talukas significant at p=.002, and a mean difference of -.84497 between Sanguem and Quepem talukas significant at p=.020. The post hoc Scheffe results for the respondents perception of noise pollution shows a mean difference of .50820 between Bicholim and Sanguem talukas significant at p=.024. The post hoc Scheffe results for the respondents perception of land degradation shows a mean difference of -1.048 between Sanguem and Bicholim talukas significant at p=.000, a mean difference of 1.312 between Sanguem and Sattari talukas significant at p=.000 and a mean difference of 1.317 between Sanguem and Quepem talukas significant at p=.000.

Fig. 7.1

Environmental Pollution Perceptions of Respondents across Talukas



Source: Primary data

Table 7.3

ANOVA table showing differences in pollution perception across talukas

		Sum of Squares	df	Mean Square	F	Sig.
Air pollution	Between Groups	40.966	3	13.655	11.651	.000
	Within Groups	295.346	252	1.172		
	Total	336.312	255			
Water pollution	Between Groups	38.166	3	12.722	7.650	.000
	Within Groups	419.089	252	1.663		
	Total	457.255	255			
Noise pollution	Between Groups	14.915	3	4.972	3.792	.011
	Within Groups	330.349	252	1.311		
	Total	345.263	255			
Land degradation	Between Groups	85.387	3	28.462	17.488	.000
	Within Groups	410.144	252	1.628		
	Total	495.531	255			
Overall perception	Between Groups	39.891	3	13.297	15.853	.000
	Within Groups	211.369	252	.839		
	Total	251.260	255			

A further analysis with respect to the respondents' perception of pollution was done to know the most environmentally affected village amongst the villages under study. The mean scores of the pollution perceptions of the respondents in the 12 mining villages under study areas was calculated for the purpose as is depicted in Table 7.3 below. The mean scores displayed in the table revealed that the air pollution is the most severe in Shirgaon village of Bicholim taluka with the highest mean score of 4.50. With respect to the respondents perceptions of water pollution, noise pollution as well as land degradation also, the perception was rated high with mean scores of 4.53, 4.43 and 4.43 respectively in the Shirgaon village, all scores falling in the serious range. A lot of extraction as well as transportation of iron ore takes place in Shirgaon, thus the residents are exposed to pollution of all types mentioned above. The mean score of overall pollution perception is 4.50 in Shirgaon indicated that it is the most polluted village, ranking first amongst the 12 villages under study, followed by Pale village with a mean score of 3.91 and Pissurlem with a mean score of 3.61, all the scores falling under the serious range.

Bicholim and Sattari talukas have large mines and good quality ore, while Quepem and Sanguem talukas have inferior quality ore; yet in order to meet the demand, this ore was also exported on a large scale. Thus, extraction, transportation as well as dumping of overburden takes place in these areas, with an exception of the villages in Sanguem taluka under study, namely Calem, Uguem and Sanvordem, where mainly transportation of ore takes place. Thus, Sanguem has a lower pollution perception compared to the other talukas. Within the four types of pollution perception in Sanguem taluka, the perception of air pollution is higher with a mean score of 3.09, followed by noise pollution with a mean score of 3.07, which is mainly due to transportation.

Table 7.4

Mean scores of Pollution perception of respondents in the selected mining villages under study

Taluka	Mining villages	Air pollution	Water pollution	Noise pollution	Land degradation
Bicholim	SHIRGAO	4.5000	4.5388	4.4318	4.4371
	MULGAON	4.1136	2.7014	3.6668	3.2664
	VELGUEM	3.2609	2.5343	3.0291	2.4970
	PALE	4.3500	3.9700	3.6020	3.7420
	KUDNEM-DIGNEM	4.2917	3.0950	3.0000	2.8100
Sattari	SURLA	3.8971	3.3024	3.5294	3.1759
	PISSURLEM	3.7750	3.6380	3.4890	3.5337
Sanguem	RIVONA	3.2938	3.0783	3.6665	3.3400
	CALEM	2.6667	2.0886	2.5714	1.4967
	SANVORDEM	2.9400	2.3372	2.8004	1.5944
	UGUEM	3.3125	2.5710	2.7170	1.5285
Quepem	CAUVREM	3.8333	3.4567	3.5553	3.5380

Table 7.5

Village-wise mean scores of overall pollution perceptions of the respondents in the mining areas

Villages	N	Mean Scores	Range	Rank
SHIRGAO	17	4.5024	Serious	I
MULGAON	22	3.4377	Medium	VI
VELGUEM	23	2.8309	Medium	IX
PALE	5	3.9140	Serious	II
KUDNEM-DIGNEM	6	3.2983	Medium	VIII
SURLA	17	3.4765	Serious	V
PISSURLEM	30	3.6093	Serious	III
RIVONA	40	3.3445	Medium	VII
CALEM	21	2.2067	Low	XII
SANVORDEM	25	2.4192	Medium	XI
UGUEM	20	2.5295	Medium	X
CAUVREM	30	3.5927	Serious	IV
Total	**256**	**3.2148**	**Medium**	

Source: Primary Survey

7.4 SUMMARY

This chapter assesses the environmental quality perception of the respondents in the mining areas under study. For this purpose, the perceptions of air pollution, water pollution, noise pollution and land degradation of the respondents were obtained through 21 statements that were rated on a five-point Likert scale. Composite scores with means were used to find the intensity of pollution perception of the respondents. The study revealed that amongst the four environmental factors, air pollution is perceived as the most serious by the respondents in the mining areas, with a mean score of 3.56 followed by noise pollution with a mean score of 3.35, water pollution with a mean score of 3.04 and land degradation with a mean score of 2.90. Amongst the four talukas under study, the most affected with respect to pollution is Sattari taluka with an overall mean score of 3.61. Amongst the 12 mining villages under study, the overall environmental pollution perception is the highest in Shirgaon village of Bicholim taluka, with a mean score of 4.50 indicating that it is the most polluted village. The study concludes that air pollution has remained a serious problem and needs to be tackled by the mining industry. The main reason for the air pollution is the heavy transportation of iron ore by trucks. Pollution in any area can affect the social as well as the economic characteristics of the inhabitants in the mining areas in the name of development, neglect of which is highly unethical on the part of the companies. Understanding the perceptions of people and their opinions about the environmental pollution in the mining areas will help in addressing their problems, and will subsequently improve their living conditions.

CHAPTER 8

IMPACT OF MINING BAN ON THE SOCIO-ECONOMIC LIVES OF THE PEOPLE IN THE MINING AREA: A COMPARATIVE ANALYSIS

8.1 INTRODUCTION

The mining areas under study have seen a boom in the mining activities in the last decade, with the state export of iron ore to the tune of over 54.45 million metric tonnes in 2010-11, indicating highest by any state in the country. As depicted in the Chapter 5, the socio-economic characteristics of the respondents in the mining areas have been influenced by the mining industry. Further, it is also observed that with the increase in the mining operations there has been negative impact on the environment in the study area. As result the environmentalists, anti-mining activists, social activists and other NGOs have constantly shown their protest against environmental hazards. Petitions were filed by the NGOs and the affected people in the areas against the mining companies for the destruction they caused to the people and the environment in the area. The result of this long protest was seen in the Order passed by the Supreme Court to ban the iron ore mining activities in the small state of Goa in September 2012 by taking note of Shah Commission Report.

With this background, the current study aims at assessing the impact of the sudden ban on the mining industry on the socio-economic characteristics of the households in the mining areas under study. For the purpose of current study, 256 respondents were interviewed in the four talukas namely; Bicholim, Sattari, Sanguem and Quepem. The data was processed with the help of SPSS 21 software and the analysis was drawn with the help of simple percentages, average, t-test and ANOVA.

In this part of the study, an attempt is made to analyze the impact of mining ban on the local economic activities. Economic variables such as monthly household income, monthly household expenditure, monthly household savings and the loan liabilities of the households are considered; further study also attempts to investigate into the impact of mining activity on the health of the household under study.

8.2 IMPACT OF MINING BAN

To study the impact of mining ban on the socio-economic lives of the people in the study area, the researcher has taken the following analyses in the study:

a. Impact on the local economic activities

b. Impact on the economic status of the households

c. Impact on the health of the households

a. Impact on the local economic activities:

As stated in Chapter 5, with respect to economic activities in the mining areas, the study reveals that a large number of respondents (45.7 percent) were involved in trade/business activities as a result of direct and indirect opportunities created by the mining sector in study area. The mining activities have also facilitated migration, which has led to further pressure on the availability of housing facility and other basic necessities like latrine, electricity and water. With the ban on mining industry, the mining operations were at a standstill, and majority of the migrant labor left for their native places. Thus, the economic activities of the respondents were dependent on the functioning of the mining companies, and due to this the migrants were adversely affected.

Table 8.1 reflects a change of main economic activities practiced by the respondents before and after mining ban in the study area. As per the analysis depicted in the table, it is evident that the agriculture activities of the respondents have enhanced to 13.7 percent in post-mining ban as compared to 5.9 percent before the mining ban, due to shifting of economic activity of the respondent to the traditional farming and allied activities. Further, the table reveals that, there has been a decline in the labour by 9 percent in the post-mining ban, the service activities of the households has enhanced to 41 percent in the post mining ban as compared to 29.3 percent before the mining ban as some of the educated members of the respondent have taken up service in private, government, semi-government and co-operative sectors. The analysis as depicted in the table shows that the trade activity in the post mining ban has declined by 33.6 percent , the other trade activities indirectly related to the mining like garage, tea stalls, hotels, grocery shops have suffered losses and their receivables have turned into bad, resulting in loss to the business. The analysis reveals that before the mining ban, 2.7 percent of households were not involved in any economic activity which has enhanced up to 25.8 percent in post-ban period. The study also reveals that there is substantial loss (23.1 percent) in their main source of livelihoods in the post mining ban period. Further, it has also condensed the scope for trade/business opportunities, as migrant labour has left to their native land due to lack of livelihood opportunities in the study area.

Table 8.1

Main economic activities practiced before and after mining ban in mining areas

Occupation	**Before Mining ban**		**After Mining ban**	
	No. of households	**Percentage**	**No. of households**	**Percentage**
Agriculture	15	5.9	35	13.7
Labor	42	16.4	19	7.4
Service	75	29.3	105	41
Trade/Business	117	45.7	31	12.1
None	7	2.7	66	25.8
Total	**256**	**100**	**256**	**100**

Source: Primary data

Further, this part of the study makes an attempt to analyze economic activities of the respondents before and after mining ban, particularly mining economic activities and non-mining economic activities. To study impact on mining and non-mining economic activities, the variables considered are mining labour, employment in the mining company and mining contracts for trucks/mining machinery/vehicles with mining companies, whereas non-mining economic activities include agriculture and allied activities, labour (excluding mining labour), service (excluding people employed by mining companies) and trade/business (excluding direct trade/business with the mining industry).

Table 8.2 displays the multiple responses of economic activities of the households in the mining areas, before and after the mining ban. The analysis depicted in the table clearly indicates that there has been increase in agriculture and allied activities after the mining ban from 13.5 percent to 19.3 percent. The analysis depicts that labour in non-mining has shown a marginal increase from 6.2 percent to 7.8 percent; the respondents involved in service has increased by 19.8 percent in post ban period whereas trade/business activities unrelated to mining have shown substantial increase of 11.4 percent in post-ban period. Further analysis depicted in Table 8.3 clearly reveals that there is huge decline in the mining related activities to 13.4 percent from 42 percent, indicating that the respondents in the study area reverted to their traditional activities and took up services in non-mining sector in post-ban period. Further analysis concludes that the mining operation dependents in the study area are largely affected due to ban.

Table 8.2

Impact of ban on economic activities before and after mining ban

Economic activities	**Before mining ban**			**After mining ban**		
	Responses		**% of cases**	**Responses**		**% of cases**
	Frequency	**%**		**Frequency**	**%**	
Agriculture and allied activities	50	13.5	20.1	62	19.3	27.6
Labor	23	6.2	7.2	25	7.8	11.1
Service	100	27	40.2	118	36.8	52.4
Trade/business	42	11.3	16.9	73	22.7	32.4
Mining related	156	42	62.7	43	13.4	19.1
Total	**371**	**100**	**149**	**321**	**100**	**142.7**

Dichotomy group tabulated at value 1.

Source: Primary survey

To analyze the impact of ban on mining and non-mining activities, 256 respondents were administered with the open-ended questionnaire. In this part of the study, an attempt is made to analyze the impact of mining ban on mining activities and non-mining activities, considering the following variables: labour, service and trade/business. The study represents 5 percent of total households in the four selected talukas of the state of Goa. According to Table 8.3, it is clear that out of the total respondents, 35 respondents worked as labour, involved in the mining activities, but with the ban on mining, it declined to only 2 household; whereas labour in non-mining related activities has increased by 2, from 23 to 25 respondents, indicating a shift into some other economic activity to earn their livelihood, such as service in the private company. The table also highlights the impact of mining ban on the respondent family members who were employed with the mining companies and otherwise. The study clearly reveals that out of 15 respondent household members who were employed with the mining companies, 8 members of the respondent household were forced to leave their job as they were on a temporary basis; further table makes it clear that the number of services in non-mining companies have increased to 118 from 100 in post-mining ban period. The analysis depicted in the table makes it clear that the trade/business activities related to the mining has drastically declined to 31.13 percent in post-mining ban, indicating the impact on the economic activities in the study area; on the other hand, there has been drastic enhancement in non-mining related trade/business to 173.81 percent (from 42 respondent to 73 respondent), indicating that the post-mining ban period has forced the respondents in the mining areas to take up jobs into non-mining activities. The researcher confirmed that though some respondents were willing to revert to agricultural activities, they could not practice the same due to the dump of rejection and silt in the agricultural land that affects the agricultural productivity.

Table 8.3

Impact of ban on mining and non-mining activities

Economic activities	**Mining related activities(frequency)**		**Not mining related activities(frequency)**	
	Before ban	**After ban**	**Before ban**	**After ban**
Labour	35	2	23	25
Service	15	8	100	118
Trade/Business	106	33	42	73
Total	**156**	**43**	**75**	**216**

Source: Primary survey

b. Impact on economic status

The mining ban has influenced the economic activities of the households in the study area. The mining areas under study had witnessed a drastic change in the economic pattern of the household due to the mining ban. This had serious impact on the economic status of the respondents in the mining areas in particular. The respondents were forced to divert to other income avenues for their livelihoods. In this part of the study, an attempt is made to assess the impact of the mining ban on the economic status of the respondents in the mining areas.

In order to study the impact of economic status, the researcher has considered the following variables: monthly household income, monthly household expenditure, monthly household savings and loan instalments.

The economic status is covered in Table 8.3, which showed that 42 percent of the households were directly involved into mining related activities in the mining areas. Table 8.1 revealed that as many as 59 (that is from 7 to 66) households had lost their economic activities in the post-ban period.

Monthly Household Income

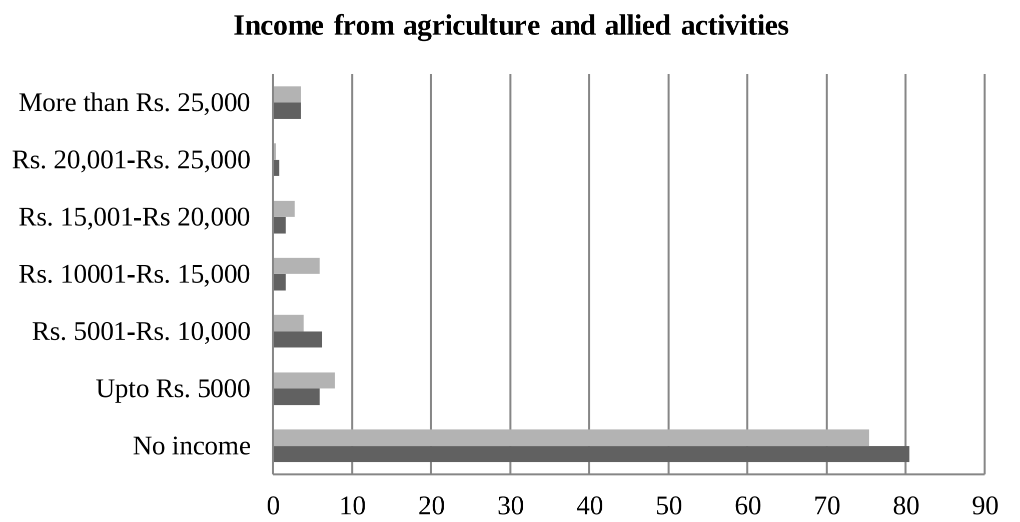
Earnings in the form of income have a huge impact on the economic status, purchasing power, and also reflect the social status. Higher the income, the more enhanced is the social status, because with income the asset possession also increases which further influences the esteem value in the society. In this part of the study, an attempt is made to analyze the impact of mining ban on the monthly incomes of the households from different sources in pre and post mining ban. The study considered different sources of income: income from agriculture and allied activities, labor income, salary income and income from trade/business. The study attempts to understand the impact on total income from all the sources in the pre and post mining ban period.

According to Fig. 8.1, the study reveals that 3.5 percent of the total respondents earned more than Rs. 25,000 per month in pre as well as post ban period. Further, 80.5 percent of the respondents earned no income from agriculture and allied activities, which has marginally declined to 75.4 percent in the post ban period; there has been marginal growth of 1.9 percent income from agricultural and allied activities up to Rs. 5000, but there has been decline in income between Rs. 5001-Rs.10000 from 6.2 percent to 3.9 percent in post-ban period. The study also indicates that there is substantial increase in the agriculture and allied income between Rs. 10,001 –Rs. 15,000 (from 1.6 percent to 5.9 percent) in post-ban period. The earning between Rs.15001 to Rs.20,000 has also shown an improvement from 1.6 percent in pre ban period to 2.7 percent in post ban period, whereas there is substantial decline in income between Rs. 20,001 to Rs. 25,000 from 0.8 percent to 0.4 percent in post ban era.

This indicates that there has been marginal (5.8 percent, see Table 8.2) increase in the number of the respondents who reverted to agricultural activity in the post-ban period and the income from the agriculture and allied activities, though increased by snail rate, has shown positive sign.

Fig. 8.1

Income from agriculture and allied activities



	No income	Upto Rs. 5000	Rs. 5001-Rs. 10,000	Rs. 10001-Rs. 15,000	Rs. 15,001-Rs 20,000	Rs. 20,001-Rs. 25,000	More than Rs. 25,000
After ban	75.4	7.8	3.9	5.9	2.7	0.4	3.5
Before ban	80.5	5.9	6.2	1.6	1.6	0.8	3.5

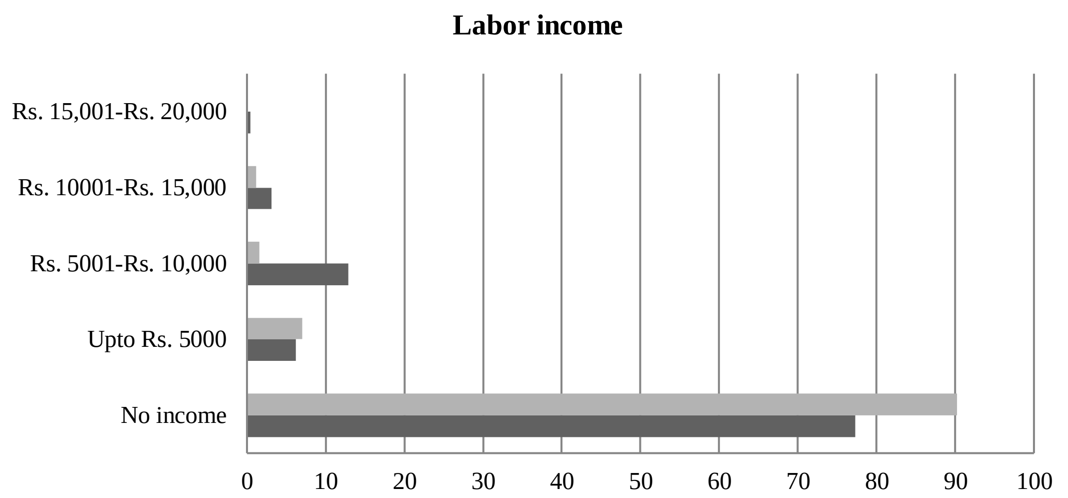
Source: Primary data

Labour income

Labour indicates the manual worker involved in the mining industry or non-mining sector and is basically paid on a regular or contractual basis for their labour. Fig. 8.2 shows the wage income of labour in the mining areas. Wage income as indicated in the figure reflects negative trend from 0.4 percent of wage income in the income range of Rs. 15,001 to Rs. 20,000. Further analysis indicates that wage income in non-mining is comparatively less than the mining labour wage income. As a result, the labour force involved in mining activities was inclined towards mining as compared to agriculture. With the mining ban the study reveals that there has been shift in the economic activity from mining activities to agriculture and allied traditional occupations, thus influencing the labour income. The figure also shows a decline in the income range of Rs. 5001-Rs. 10,000 from 12.9 percent to 1.6 percent, income range of Rs. 10,001-Rs. 15,000 from 3.1 percent to 1.2 percent.

Fig. 8.2

Income from labour



	No income	Upto Rs. 5000	Rs. 5001-Rs. 10,000	Rs. 10001-Rs. 15,000	Rs. 15,001-Rs. 20,000
After ban	90.2	7	1.6	1.2	0
Before ban	77.3	6.2	12.9	3.1	0.4

Source: Primary data

Income from service

Service implies white collar jobs in mining or non-mining sector which demands minimum suitable qualification and qualities, that are compensated based on their quality of services at particular level in the hierarchy of job. Analysis in Fig. 8.3 depicts that there has been a marginal decline in the income from service by 1.3 percent (from 55.1 percent to 53.9 percent); further analysis clearly reveals that there has been overall increase in the service income in the lower group, particularly in the income group of upto Rs. 5,000 in the post-mining ban period, whereas the service income in the higher income group of Rs. 10,001 and more has shown diminishing trend except in salary income range between Rs. 5001 and Rs. 10,000 and income more than Rs. 25,000. Further, it can be concluded that, even in income range of Rs. 25,000 the trend in the post-mining ban has declined though it is more than 10 percent of the respondent in this range of income group.

Fig. 8.3

Income from salary

	No income	Upto Rs. 5000	Rs. 5001-Rs. 10,000	Rs. 10001-Rs. 15,000	Rs. 15,001-Rs. 20,000	Rs. 20,001-Rs. 25,000	More than Rs. 25,000
After ban	53.9	8.6	12.1	6.3	4.7	3.5	10.9
Before ban	55.1	2.7	11.3	10.5	5.1	3.9	11.3

Source: Primary data

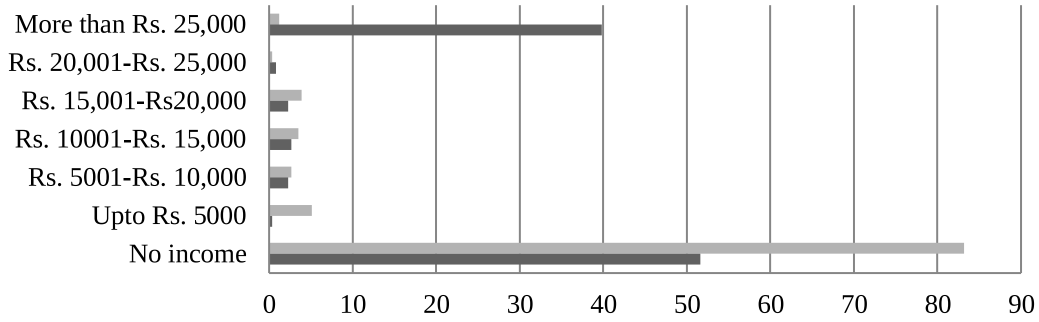
Income from trade/business:

Trade/business activities are carried out to earn an income from the profits gained by conduct of such activities by an individual or a group of individuals, and also bear the risk of loss suffered, if any. Table 8.1 shows that trade/business was the most practiced economic activity in the mining area prior to the mining ban, with 45.7 percent of the household members involved into the same. However the post-ban period had seen a decline in the trade/business activities to 12.1 percent, indicating that the mining ban affected the scope of these activities. The impact of this decline in the trade/business activities is reflected in Fig. 8.4. The analysis in figure shows a severe increase in the percentage of households with no income from trade/business by 31.6 percent (that is from 51.6 percent to 83.2 percent) indicating a decline in income from trade/business in the study area. The figure shows an increasing trend in the income from trade/business activities in the income groups from upto Rs. 5000 by 4.7 percent, in the income group of Rs. 5001 to Rs. 10,000 from 2.3 percent to 2.7 percent, in the income group of Rs. 10,001 to Rs. 15,000 from 2.7 percent to 3.5 percent and in the income group of Rs. 15,001 to Rs.20,000 from 2.3 percent to 3.9 percent respectively. Further, the figure shows a marginal decline in the higher income group of Rs. 20;001 to Rs. 25,000 from 0.8 percent to 0.4 percent but a drastic decline in the income group of Rs. 25,000 and above from 39.8 percent to 1.2 percent. Table 8.3 rightly shows the shuffling of trade/business activities from mining related to non-mining related and the impact of the same is reflected in the incomes of the households. Thus the study concludes that the income from trade/business activities was largely influenced by the presence of the mining industry in the study area and was affected in the post-mining ban period.

Fig. 8.4

Income from trade/business

Income from trade/business



	No income	Upto Rs. 5000	Rs. 5001-Rs. 10,000	Rs. 10001-Rs. 15,000	Rs. 15,001-Rs20,000	Rs. 20,001-Rs. 25,000	More than Rs. 25,000
After ban	83.2	5.1	2.7	3.5	3.9	0.4	1.2
Before ban	51.6	0.4	2.3	2.7	2.3	0.8	39.8

Source: Primary data

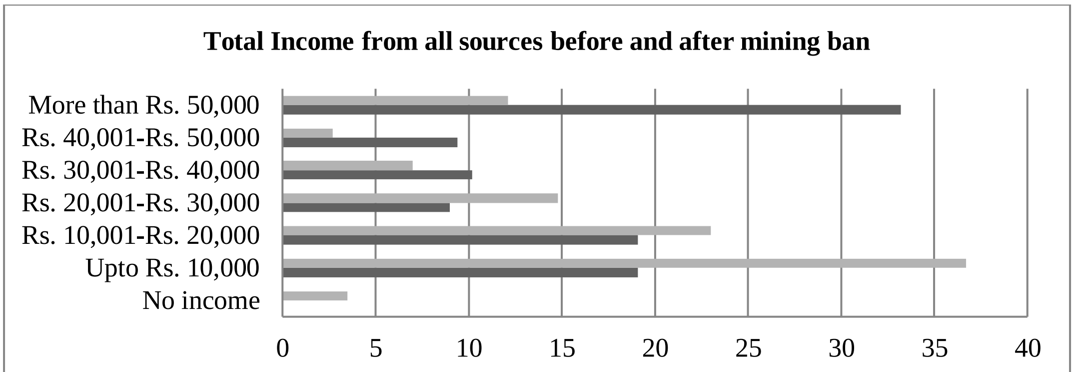
Total monthly household income from all sources

This part of the study aims at assessing the impact of mining ban on the total household income from all sources in the study area. The total monthly household income includes income from the economic activities as depicted in Table 8.1, remittances from family members abroad, and other income. Fig. 8.5 reveals that no household in the mining area under study was without any income prior to the mining ban; however the post-mining ban period witnessed a loss of income by 3.5 percent of the respondents. Further the figure shows an increase in the income in the income groups of upto Rs. 10,000 from 19.7 percent to 36.7 percent, in the income group of Rs. 10,001 to Rs. 20,000 from 19.1 percent to 23 percent and in the income group of Rs. 20,001 to Rs. 30,000 from 9 percent to 14.8 percent, thus indicating an increasing trend. Nonetheless, the figure indicates a decline in the higher income groups of Rs.

30,001 to Rs. 40,000 by 3.2 percent, in the income group of Rs.40,001 to Rs. 50,000 by 6.7 percent and in the income group of Rs. 50,000 and above by 21.1 percent. The study thus reveals that the mining industry gave opportunities to the household members to earn high incomes.

Fig. 8.5

Total Income from All Sources Before and After Mining Ban



	No income	Upto Rs. 10,000	Rs. 10,001-Rs. 20,000	Rs. 20,001-Rs. 30,000	Rs. 30,001-Rs. 40,000	Rs. 40,001-Rs. 50,000	More than Rs. 50,000
After ban %	3.5	36.7	23	14.8	7	2.7	12.1
Before ban %	0	19.1	19.1	9	10.2	9.4	33.2

Source: Primary data

To further strengthen the findings, an attempt is made to compare the total household income earned from different sources in the study area before mining ban with the income earned after the mining ban. For this purpose, a detailed table of income from different sources before and after the mining ban is presented in the Table 8.6. The study reveals an increase in the income from agriculture and allied activities by 14.1 percent in the post-mining ban period. This is because in post-mining ban period, 12 households (that is from 50 to 62) in the study area reverted to agriculture and allied activities as depicted in Table 8.2, while some who practiced on a small scale now had started on a large scale. The non-mining labour shows a negligible increase in the income in the post-mining ban period that is 0.6 percent. The study also reveals an increase in the salary income from private/government job by 8.5 percent in the post-mining ban period. The dual reason for this is that in the post-mining ban period, some of the respondents' family members who lost their income sources took up jobs in private/government undertakings (that is 18 members of the respondent family as shown in Table 8.3) and secondly there has been an increase (yearly increment) in the salary income of the employees. Nevertheless, the mining labour shows a drastic decline in their wage income by 93.4 percent in the post-mining ban period. Likewise, the mining employees have also witnessed a decline in their salary income by 69.4 percent. This is due to the fact that 7 out of 15 employed respondents had lost their temporary jobs, while the rest had witnessed a decline in the income. The income from trade/business activities, specifically with respect to the income received by the truck owners/vehicle owners/machine owners shows a tremendous decline of 99.3 percent in the post-mining ban period. This indicates that the household members who were directly involved into trade/business activities with the mining companies were largely affected. The study further reveals that the income received from other trade/business activities showed a decline by 49.6 percent in the post mining ban period. The income received from the other sources also shows a decline by 14.5 percent in the post-mining ban period. Other income also includes the compensation that the mining companies offered to the households in the study area, which stopped after the mining ban. A financial relief package was offered by the government to the truck owners subject to their registration in the mining areas. The overall income of the households in the study area showed a drastic decline by 58.4 percent in the post-mining ban period. Thus the study concludes that the mining ban has affected the incomes of the households in the mining areas under study in the post-mining ban period.

Table 8.4

Impact of ban on total income from different sources

Variable	**Before Mining ban**	**After Mining ban**	**Change in income (%)**
Sources of income	**Monthly Income(Rs.)**	**Monthly Income(Rs.)**	
1.Agriculture and allied activities	757800	864800	+14.1
2.a.Mining Labor	235610	15500	-93.4
2.b.Non-mining Labor	179490	180500	+0.6
3.a.Salaried employment in mining companies	408810	125000	-69.4
3.b.Salaried employment in other companies/govt. servant	2063190	2237700	+8.5
4.a.Income from trade/business (Truck/machine owners/vehicle employed for mining companies)	6776330	50000	-99.3
4.b.Other Trade/business/profession	874670	440500	-49.6
5. Remittances from family members abroad	159000	174000	+9.4
6. Other income	388510	332000	-14.5
7. Financial package from government as compensation*	-	512000	-
Total	**11843410**	**4932000**	**-58.4**

Source: Primary survey

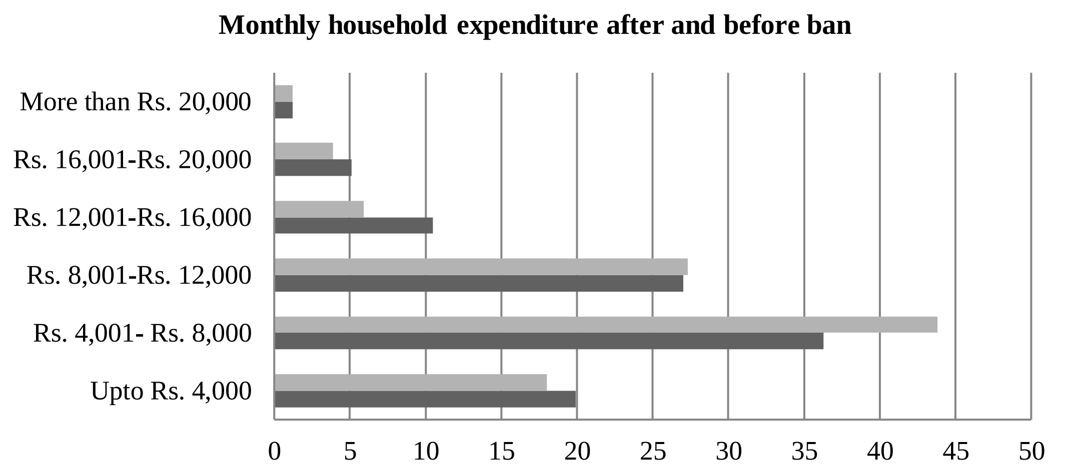
*Financial package received from the government for relief from the financial crisis faced by the truck owners after the mining ban.

Monthly household expenditure:

Loss of income has an adverse impact on the economic status of the affected individual. The post-mining ban period has witnessed a decline in the household income. The current variable thus assesses the impact of this ban on the monthly household expenditure in the mining areas under study.

The decrease/loss in the incomes of the households during the post-ban period did have an impact on the monthly household expenditure. Fig. 8.6 below shows the monthly expenditure of the households before and after mining ban in the mining areas under study. The figure shows a decline in the monthly household expenditure in the higher range of Rs. 12,000 and above from17.8 percent to 11 percent and a simultaneous increase in the lower range that is between Rs. 4000 –Rs. 12,000 from 63.3 percent to 71.1 percent. An increase is seen in the range of Rs. 4001-Rs. 8000 from 36.3 percent to 43.8 percent while there is a fall in the range of Rs. 12,001- Rs. 16,000 from 10.5 percent to 5.9 percent. This clearly indicates that the post mining ban period has affected the monthly household expenditure in the mining areas.

Fig. 8.6
Monthly expenditure of the household before and after mining ban



	Upto Rs. 4,000	Rs. 4,001- Rs. 8,000	Rs. 8,001- Rs. 12,000	Rs. 12,001- Rs. 16,000	Rs. 16,001- Rs. 20,000	More than Rs. 20,000
After ban %	18	43.8	27.3	5.9	3.9	1.2
Before ban %	19.9	36.3	27	10.5	5.1	1.2

Source: Primary data

Table 8.6 shows the mean and standard deviation of the monthly household expenditure in the mining areas before and after mining ban. The mean shows a decline from Rs. 8520 to Rs. 7990. This very well reflects the impact of mining ban on the spendings of the households in the area. Further, paired sample t-test was used to verify whether there is any significant difference in the monthly household expenditure before and after mining ban in the mining areas. The results of the test as depicted in Table 8.7 revealed a significant difference in the monthly household expenditure before and after mining ban with t value=3.199 at p<.005.

Table 8.5

Mean and standard deviation of monthly household expenditure before and after mining ban

	Before Mining Ban		After Mining Ban	
Variables	**Mean(Rs.)**	**Standard deviation(Rs.)**	**Mean(Rs.)**	**Standard deviation(Rs.)**
Monthly Expenditure	8520	4800	7990	4490

Source: Primary data

Table 8.6

Results of paired sample t-test for monthly household expenditure before and after mining ban

Variable	Test critical value	Significance	Decision
Monthly household expenditure	3.199	.002*	Reject

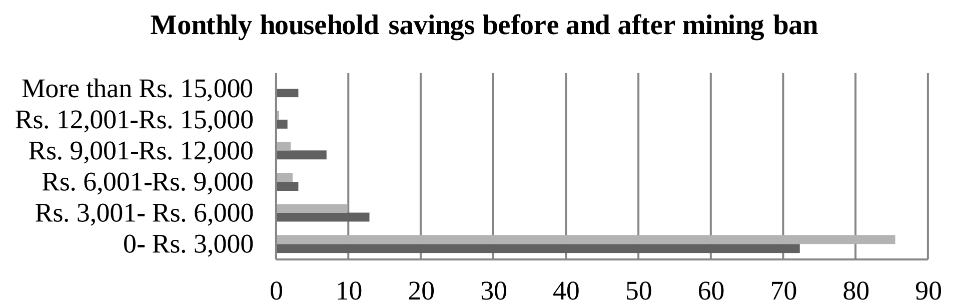
***Significant @5%(95% confidence level)**

Monthly household savings:

Savings is the amount that remains after meeting all the household consumption. The capacity of the households to save part of the incomes earned by them denotes their economic status. The monthly household savings in the mining areas under study before and after the mining ban is depicted in Fig. 8.7. The figure shows an increase in the monthly household savings in the mining area under study in the lower savings range, that is upto Rs. 3000 from 72.3 percent upto 85.5 percent. However, a simultaneous decline is revealed in the higher savings range from Rs. 3000 onwards that is from 27.7 percent to 14.5 percent. The study concludes that the monthly savings of the households are adversely affected in the post-mining ban period.

Fig. 8.7

Monthly household savings before and after mining ban



	0- Rs. 3,000	Rs. 3,001- Rs. 6,000	Rs. 6,001- Rs. 9,000	Rs. 9,001- Rs. 12,000	Rs. 12,001- Rs. 15,000	More than Rs. 15,000
After ban %	85.5	9.8	2.3	2	0.4	0
Before ban %	72.3	12.9	3.1	7	1.6	3.1

Source: Primary data

Impact on loan:

This part of the study aims at assessing the impact of mining ban on the loan liabilities of the households in the areas under study. The details of loan taken and the purpose have already been stated in table 5.32 (Chapter 5 page number 154). Table 8.5 shows the impact of mining ban on the payment of loan liabilities of the respondents' family members in the mining areas under study. The table shows that out of 256 households under study, there were 139 households who had monthly loan installments in the mining areas. Of these 139 households under study, 71 that 51.1 percent of the loan takers were unable to meet their financial obligation in the post-mining ban period, while the rest could pay the same. Further Table 8.6 shows that out of the 71 defaulters, 4 were labour, 6 were salaried employees and 61 were involved into trade/business activities in the areas under study. The study reveals that more number of households involved in trade/business as their main activity had loans, and that their large dependence on the mining industry for their incomes affected their ability to meet the loan liabilities in the postmining ban period.

Table 5.32 in Chapter 5 very clearly shows that 28.1 percent of the households in the mining areas under study had taken loan for vehicle purchase while another 28.1 percent had taken loan for the purchase of truck/mining machinery/vehicle to be employed with the mining industry. The table further displayed that 54.9 percent of the total average annual loan in the mining areas was diverted towards purchase of truck/mining machinery and vehicle. This strengthens the findings that the households' earnings, with trade/business as their main economic activities, were largely affected by the mining ban, and were thus unable to meet their huge financial liabilities.

Table 8.7

Default in payment of monthly loan installment after mining ban

Whether defaulted loan payment	Frequency	Percent
Yes	71	51.1
No	68	48.9
Total loan takers	139	100

Source: Primary data

Table 8.8

Defaulter by occupation

Occupation	Frequency	Percent
Labor	4	5.6
Service	6	8.5
Trade/Business	61	85.9
Total	71	100

Source: Primary data

c. Impact on Health:

Mining leads to pollution of all types such as air, water, noise, and land degradation, as already stated in the previous chapter. This affects the health of the inhabitants in the areas of mining operation. Thus an attempt is made to assess the impact of mining on the health of the respondents in the mining areas before and after the mining ban. For the purpose of assessing the impact on the health of the households in the mining areas, two variables were used: monthly medical expenditure and respondents perceptions of health before and after the mining ban. The monthly medical expenditure incurred by the respondents' family in the mining areas under study before and after mining ban was compared to assess whether there is any improvement in the health of the family members. Further, the respondents' perception about their health status before and after mining ban was rated on a five-point Likert scale, and paired sample t-test was used to find whether there is any difference in the perception of the respondents before and after mining ban.

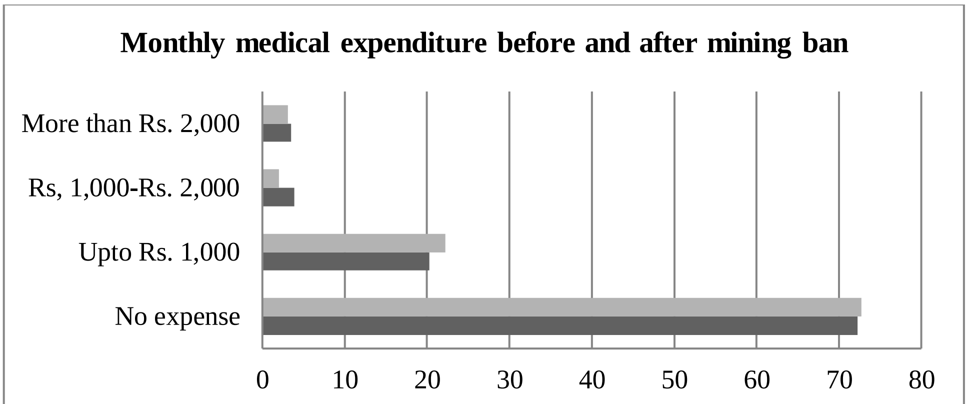
Monthly medical expenditure:

With context to the monthly medical expenditure incurred by the household family members in the mining areas under study, a comparison is done to assess whether there is any difference in the monthly medical expenditure before and after mining ban. A decrease in the monthly household expenditure would mean an improvement in the health of the family members and vice-versa.

Fig. 8.8 shows the monthly medical expenditure incurred by the family members of the households under study, before and after mining ban. The Fig. revealed that 72.3 percent of the respondents did not incur any medical expenditure prior to the mining ban; while the post mining ban period showed a negligible increase to 72.7 percent. Of these, 32 percent of the households availed the medical facilities offered by the mining companies in their respective areas as depicted in Table 5.40 (page number 172 Chapter 5). The study revealed an increase in the medical expenditure in the range of upto Rs. 1000 from 20.3 percent to 22.2 percent. However, there was a decrease in the higher range of Rs. 1000 to Rs. 2000 by 1.9 percent (that is from 3.9 percent to 2 percent) as well as in the range of more than Rs. 2000 by 0.4 percent (that is from 3.5 percent to 3.1 percent). Although the decrease in medical expenditure shows a marginal decrease, it may be noted that the improvement in health cannot be spontaneous and requires time. Further, as already mentioned above, this marginal decline has taken place inspite of the withdrawal of the medical benefits offered by the mining companies in post-mining ban period.

Fig. 8.8

Monthly household expenditure on health before and after mining ban



	No expense	Upto Rs. 1,000	Rs, 1,000-Rs. 2,000	More than Rs. 2,000
After ban %	72.7	22.2	2	3.1
Before ban %	72.3	20.3	3.9	3.5

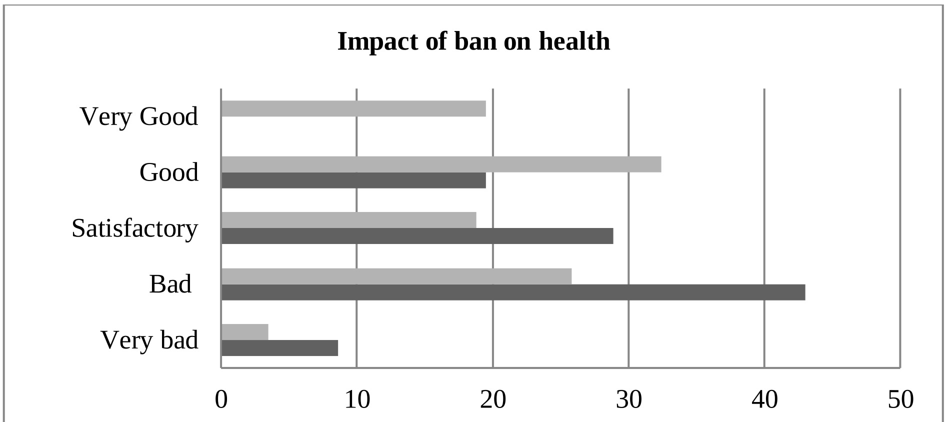
Source: Primary data

Perception of health status

For obtaining respondents perception about the health status of the family members, five-point Likert scale was used with ratings ranging from 1(very bad) to 5 (very good). The same is clearly depicted in Fig. 8.9. The figure shows that 8.6 percent of the respondents perceived that their health is very bad prior to the mining ban, which came down to 3.5 percent in the post-mining ban period. Likewise, the perception that the health status is bad was given by 43 percent of the respondents, that came down to 25.8 percent in the post mining ban period. Furthermore, satisfactory rating was given by 28.9 percent of the respondents under study which also declined to 18.8 percent; while there were 19.5 percent of the respondents who perceived that their health was good prior to the mining ban, in the post-mining ban period the percentage went up to 32.4. There was no respondent who rated their family health status with a 'very good' rating prior to the mining ban; however after the mining ban 19.5 percent of the respondents rated their health status as 'very good'. This indicates that there has been an improvement in the overall health status of the household members in the mining villages after the imposition of mining ban. To verify the findings, paired sample t-test was run, which revealed a significant difference in the perception of health status of the respondents in the mining areas before and after mining ban. Table 8.11 shows the mean and standard deviation of the perception of health status given by the respondents before and after the mining ban. The mean score prior to the mining ban was 2.33 that is close to 2, indicating that the respondents perceived their health status before the mining ban as bad. The mean score of post-mining ban period was 3.06, which was close to satisfactory, indicating that there is an improvement in the health status of the respondents' family members. Table 8.12 showed results of paired sample t-test which indicates a significant difference in the health status of the respondents family members in the mining areas before and after mining ban with $t=10.237$ at $p<.005$.

Fig. 8.9

Impact of ban on health



	Very bad	Bad	Satisfactory	Good	Very Good
After ban %	3.5	25.8	18.8	32.4	19.5
Before ban %	8.6	43	28.9	19.5	0

Source: Primary data

Table 8.9

Paired Samples Statistics

		Mean	N	Std. Deviation
Pair 1	**Health rate before ban**	2.33	256	1.149
	Health rate after ban	3.06	256	1.499

Table 8.10

Results of paired sample t-test for health rating before and after mining ban

Variable	Test critical value	Significance	Decision
Health status	-10.237	.000*	Reject

***Significant @5%(95% confidence level)**

The decrease in the medical expenditure and the improvement in the health status as revealed by the test very well indicate that there has been an improvement in the health status of the households in the mining areas post the mining ban.

Thus the study observed a statistically significant difference in the socio-economic characteristics of the households in the mining areas before and after the mining ban, with respect to most of the variables, except agricultural income and labour income.

8.3 COPING STRATEGIES ADOPTED BY THE HOUSEHOLDS IN THE MINING AREAS

The households as part of their coping strategy resorted to the following measures:

1. 5 percent of the households who have large lands reverted to agriculture.
2. 19 percent of the households applied for financial packages of the government, granted to those who had their truck registrations completed.
3. Around 5 percent took up service outside the villages while some others ventured into small businesses.
4. Around 10 percent of the households used their savings to meet their daily requirements, while 4 percent of the people borrowed money from their friends and relatives.
5. 11 percent of the households applied for various government schemes offered to widow/senior citizens/housewives for a source of income.

8.4 SUMMARY

This part of the study covered the impact of mining ban on the socio-economic characteristics of the households in the mining areas under study. The following socio-economic variables are included for the purpose of assessing the impact of mining ban: impact on the economic activity, impact on the economic status and impact on the health status of the respondents under study. With respect to the economic activity, the study revealed a change in the pattern of economic activity in the post-mining ban period. The mining ban led to a shift in the economic activity from trade/business as the most practiced economic activity, to service as the most practiced economic activity in the post-mining ban period. The positive outcome was nonetheless seen in people reverting to their traditional activities. This indicates that the mining industry largely influenced the economic activities of the households in the mining areas. With respect to the economic status, the mining ban affected the incomes of the mining operation dependents in the mining areas. The economic status of the households who were directly involved in mining activities as well as households involved in trade/business activities in the mining areas were adversely affected. Thus, the overall incomes of the households in the area had shown a decline. This finding reveals that the mining industry influenced the economic status of the households in the mining areas. With respect to the health status of the household in the mining areas, the study revealed an improvement in the post-mining ban period, which is evident from a decrease in the monthly household expenditure on medicines, despite the decline in the medical facilities provided by the mining companies. Further, the findings of paired sample t-test also revealed an improvement in the health status of the households under study in the post-mining ban period.

CHAPTER 9

FINDINGS, CONCLUSION AND SUGGESTIONS

9.1 INTRODUCTION

The study was an attempt towards understanding the socio-economic characteristics of the households in the four mining talukas of Goa. To know the impact that the mining industry has had on the people in the areas, it was necessary to compare these villages in the mining areas with the villages in the same talukas without any mining practices. Therefore, the two strata under comparison were the mining villages and the non-mining villages in the four mining talukas namely; Bicholim, Sattari, Sanguem and Quepem. The comparison of socio-economic characteristics of the households in the two areas is one of the major objectives of this study.

The mining industry had shown a fast growth, and there was a lot of change in the local economic activities of the people in the mining areas, on which their income was dependent. Thus a need to study the economic status of the households in the mining areas was felt.

Further, the study also collected people's responses with respect to their perception about the environment in which they live. The mining ban that was announced following the protests and petitions filed by many anti-mining groups gave an opportunity to further assess the impact of this ban on the socio-economic characteristics of the households in the mining areas. The following null hypotheses were examined for the purpose of the current study:

a. There is no significant difference in the socio-economic characteristics of the households in the mining areas and the non-mining areas within the same talukas.

b. There is no significant difference in the economic status of the households in the mining areas before and after mining ban.

The iron ore mines are located in the four talukas as mentioned above, and hence these were the areas that were taken for study. The selection of villages in the mining areas was subject to their proximity to the mines and permission from the Sarpanch of the respective villages for the purpose of the study. The interview schedule, complete in all respects were 256 households in the mining areas and 191 in the non-mining areas. Necessary official records at the state and village levels were obtained for the purpose of the study. Meeting and discussions with the mining officials, government officials and social activists were held for the purpose of the study.

9.2 MAJOR FINDINGS OF THE STUDY

The major findings of the each of the objective under study are presented below:

A. A Comparative Analysis of Socio-economic characteristics of the households in the mining and the non-mining areas under study:

In this part, the demographic profile of the respondents and the socio-economic characteristics of the households in the mining and the non-mining areas is analysed as follows:

1. With respect to the demographic profile of the respondents in the mining and the non-mining areas, there is no significant difference in the gender, age, marital status and family size; however, there is a significant difference in the educational status of the respondents in the two areas. The analysis shows that both the areas are female dominated, the mean years of respondents was 43 years and most of the respondents were married. The average family size was 5.4 and 5.6 respectively in the mining and the non-mining areas under study while the average respondents in the mining areas were educated upto secondary while the average respondents in the non-mining areas were educated upto primary level.

Further, from the analysis drawn of the socio-economic characteristics of the households in the mining and the non-mining households under study, it is observed that:

2. There is no significant difference in the residential status of the households in the mining and the non-mining areas under study. 99.2 percent and 99.5 percent of the households in the mining and the non-mining areas respectively were permanent residents
3. The study also observed that 97.3 percent in the mining and 98.4 percent in the non-mining areas speak Konkani. The means test with ANOVA result shows no significant difference in the mean of the respondents with respect to the mother tongue in the two areas under study.

4. With respect to the educational status of the family members in the mining and the non-mining areas is concerned, there seems to be a significant difference in the illiteracy rates of the households in the two areas as well as the primary level education as indicated by the results of ANOVA. However there seems to be no significant difference with respect to higher education in the two areas under study. The overall literacy rate of the sample under study is 83.53 percent in the mining areas and 80.72 percent in the non-mining areas. Further analysis done to find the highest educated in the family in the mining and the non-mining areas revealed that the mean years of highest educated in the family in the mining areas was 13.20 while it was 12.82 years in the non-mining regions indicating that the mean of highest educated in both the regions is either HSSC/Diploma/Vocational level.
5. The analysis with respect to access to natural resources such as water resources and cooking fuel used shows that there is no significant difference in the main source of water used by the households in the mining and the non-mining areas understudy. In both the regions, tap water is the main source of water used. In case of the source of cooking fuel used, the study reveals a significant difference in the mean scores of the fuel used in the two areas. While the main source of cooking fuel in the mining regions is gas cylinder, in the non-mining regions it is firewood.
6. With respect to the main economic activity, trade/business was the main economic activity practiced by the households in the mining regions with

the highest percentage of 45.7; while in the non-mining regions employment by way of service in private/government concerns was the main economic activity of 46.1 percent of the sample under study. Specifically in the mining areas, 42 percent of the households were directly involved into mining related activities while 6.6 percent of the households under study were influenced by mining in the non-mining areas.

7. Amongst the various sources of income in the mining and non-mining areas under study, income received from trade/business contributed the highest that is 46.7 percent in the total average annual income of the households in the mining regions while in the non-mining regions, salary income contributed 39.6 percent in the total annual average income of the households which was the highest. With respect to the total income from all sources, the result of Mann Whitney U test indicated a significant difference in the distribution of income in the mining and the non-mining areas in the study with z value of 8.069 at $p < .000$.
8. The study reveals that the monthly household expenditure is higher in the mining regions with a mean of Rs. 8520 compared to the mean of Rs. 7000 in the non-mining areas. The results of the Mann-Whitney U test also denotes a significant difference in the monthly household expenditure in the mining and the non-mining areas under study as indicated by z value of 4.375 significant at $p < .000$.
9. The study has shown that the households in the mining areas had higher monthly savings compared to the households in the non-mining areas

under study with a mean rank of 253.40 and 184.59 respectively in the mining and the non-mining areas. The results of the Mann Whitney U test also revealed a significant difference in the monthly household savings of in the mining and the non-mining areas under study with a z value of 5.812 at p< .000.

10. The study further reveals that huge loans were raised by the households in the mining areas compared to the loans raised by the households in the non-mining areas as verified by the mean ranks of 246.96 and 193.23 in the mining and non-mining areas respectively. The results of the Mann Whitney test revealed a significant difference in the monthly household loan between the two areas with z value of 5.036 at p< .000. The study further brought to light that while 28.1 percent for each of the loans were diverted towards purchase of assets such as vehicles and mining truck/machinery in the mining areas, 41.2 percent of the households had their loan diverted towards house repair/renovation.

11. It was observed that in both the mining as well as the non-mining areas under study, the households met their daily required goods from nearby villages as revealed by the means test and verified by the ANOVA table with f value of .529 at p> .000. However, with respect to the place of shopping of convenience goods/ fast moving consumer goods, the means test with ANOVA results indicated a significant difference in the mining and the non-mining areas under study with f value of 47.532 at p<. 000. Thus the study reveals that the household members in the mining areas

visited main cities to meet their requirement and the household members in the non-mining areas visited the nearby villages for the same.

12. As far as possession of assets in the two areas is concerned, it is observed that there is a significant difference in housing, possession of four wheeler, truck, land ownership, possession of tractor and other agricultural equipments, possession of television sets and refrigerator; while no significant difference was revealed in the possession of two-wheeler and mobile phone.
13. Owing to the presence of mining industry in the mining areas, the households in the mining areas enjoyed the following benefits: improved medical facilities, job preferences, educational support, compensation and like benefits. 60.9 percent of the total number of respondents in the mining areas expressed that there were improved medical facilities however, only 32 percent of the total number of households availed of the same.
14. The major problems faced by the respondents family members in the mining areas is traffic congestion and road accidents, water scarcity and destruction of agricultural land while in the non-mining areas the major problems faced by the people are lack of infrastructural development, employment opportunities and water scarcity problems.
15. Further the results of correlation analysis revealed that there is no significant relation between income and the mean years of schooling in the mining areas with r= .093 at p> .137, while there is a significant correlation between the two in the non-mining areas with r= .204 at

p=.005. The results of correlation analysis between loan and income reveals a positive and strong relation with r=.718 at p< .000 in the mining areas. In the non-mining areas also there exists a positive relationship between loan and income with r=.507 at p<.000. However the relationship is stronger in the mining areas.

B. Economic Status of the Households in the Mining Areas:

A multiple regression analysis was run to determine the per capita income of the households in the mining areas using the variables agriculture and business as dummy as well as participation rate and loan taken.

16. The regression equation could explain 60.2 percent of the variation in the per capita income of the households in the mining areas under study. The study revealed that trade/business, participation rate and the loan taken are significant determinants of per capita income, while agriculture showed a negative yet a significant contribution to per capita income.

C. Environmental Quality Perception of the Respondents in the Mining Areas:

The pollution perceptions of the respondents were obtained with respect to variables like air pollution, water pollution, noise pollution and land degradation. The perceptions were drawn in 21 statements that are rated on a five point Likert scale. The study covers the intensity of environmental pollution in the mining areas and tests whether there is any significant difference between the environmental perception of the households and the socio-economic characteristics of the respondents under study.

17. According to the respondents perception of environmental quality with respect to air pollution, water pollution, noise pollution and land degradation, air pollution was perceived to be serious amongst others with a mean score of 3.56, followed by noise pollution with a mean score of 3.35, water pollution with a mean score of 3.04 and land degradation with a mean score of 2.90.
18. A taluka-wise analysis shows a significant difference in the pollution perceptions of the respondents across the four talukas namely, Bicholim, Sattari, Sanguem and Quepem. Amongst the four talukas under study air pollution was severe in Bicholim with a mean score of 3.95. With respect to intensity of water pollution, Sattari taluka was the most affected 1with a mean score of 3.64; Bicholim taluka faced severe noise pollution as indicated by the mean score of 3.57 and land degradation was found to be most serious in Sattari taluka with a mean score of 3.64. Overall the analysis showed that the pollution was the most serious in Sattari taluka with a mean score of 3.61.
19. Amongst the 12 mining villages under study, the mean score of overall pollution perception of the respondents under study reveals that Shirgao is the most polluted mining village with respect to air, water noise pollutions and land degradation as well.

D. Impact of Mining Ban on the Socio-economic Lives of the People in the Mining Areas: A Comparative Analysis

This objective aims at answering the impact of mining ban on the socio-economic characteristics of the households in the mining areas under study.

The researcher has taken the following analyses in the study: impact on the local economic activities, impact on the economic status of the households and impact on the health of the households. To study the impact of the mining ban a comparative analysis has been done.

20. The post mining ban period has witnessed a change in the main economic activity practiced by the households in the mining areas from trade/business to service. The study shows an increase in the number of households practicing agriculture and allied activities from 15 to 35, a decline in the number of households involved into labour from 42 to 19, an increase in the number of households involved into service from 75 to 105, and a drastic decline in the number of households practicing trade/business activities from 117 to 31. It was further observed that 22.7% of the households who were mainly dependent on mining-related activities had lost their source of livelihood.
21. The post mining ban period has shown a decline in the total monthly household income by 58.4 percent. This has resulted in an adverse impact on the monthly household expenditure as revealed by a decline in the mean from Rs. 8520 to Rs. 7990. The results of paired sample t-test also reveal a significant difference in the monthly household expenditure before and after mining ban with t value of 3.199 at $p < .005$.
22. The adverse impact of the mining ban on the income had further affected the payment towards loan liabilities of the households in the mining areas. Out of 139 households who had loan liability in the mining areas, 71 were

unable to meet their loan obligations. Of these defaulters, 61 were trade/business people, 6 were into service and 4 were labour.

23. The study further observed an improvement in the overall health of the respondents family members. The data revealed a marginal decline in the monthly medical expenditure by 0.4 percent and a decline in the same in above Rs. 1,000 range from 7.4 percent to 5.1 percent inspite of withdrawal of the medical benefits offered by the mining companies to the people in the mining areas in the post mining ban period. Further the respondents revealed an improvement in the health status as verified by the results of paired sample t-test with t-value of 10.237 at $p < .005$.

9.3 DISCUSSION

The current study revolves around the socio-economic characteristics of the households in the mining and non-mining regions. Past studies show that mining regions rate better in terms of the socio-economic indicators as compared to the non-mining regions.

There has been a change in the source of livelihood in the mining regions which has happened either due to necessity, as people lost their lands and had no other alternate source of income; and in some cases due to people's personal choice for an attractive income. This change in income should have helped in improving the lives of the households; unfortunately the overall picture does not seem very bright. This is discussed below.

Mining is a flourishing industry in the Goan scenario, as people earned huge incomes. With the state having a high literacy rate of 87.50 percent, it was interesting to note that the literacy rate in the four talukas was above 80 percent. However, with respect to higher education, not many have attained the same in the mining areas inspite of earning good incomes as compared to the non-mining areas. This implies that the people were content with basic education and the income earned through mining, and thus did not have any motivation for higher education. Mendes (2001) and Noronha, et al (2005) had also revealed high literacy rates in the mining areas. But even in recent years, no significant difference is found in the attainment of higher education in the two areas, which is a cause of concern and needs to be seriously dealt with. This negligence on the part of the people only means that they overlook the long-term benefits for the lucrative short-term income. The government takes care of primary education in all the talukas (though the facilities are not up to the mark), but further initiative seems to be lacking.

Another observation was that although the mining areas owned more assets, the number of newly constructed houses was just 2 percent, while it was 1 percent in the non-mining areas. This also creates a curiosity as to why the people have not invested into the housing in spite of earning good incomes as revealed in the current study. Assets such as four wheelers and trucks were purchased to further invest into the mining industry for monetary benefits. This was important for the current study because it reveals that apart from trade/business and participation rate, loan taken was also a significant contributor towards the determination of economic status of the households in the mining regions, and this factor has evolved over time with the expansion in mining activities.

As it is evident from past studies that is by Mendes (2001) and the findings of the current study, mining areas fare better in terms of economic status; however it is also found that within the mining areas there were huge disparities in the incomes of the households. People directly/indirectly involved into mining-related activities earned higher incomes than the others. Furthermore, due to migration, the locally available food items were expensive and not affordable for the ones with low income as was also revealed by Petkova et al (2009). Thus, there was no equity in the distribution of income and no serious thought was given to improve the economic conditions of those who tried to make the ends meet.

People were earning through mining and reinvesting into the same for easier and direct monetary gains, and hence there was huge dependency on the mining industry for their income. This dependency on the mining industry drew more people into mining and consequently there was alienation from the traditional activities. Alienation was also due to the harmful effects mining operations had on the traditional activities. As revealed in the study by Zaman (2011) the huge income that the mining industry fetches for the people makes them give up their traditional occupations.

As people enjoy good income, there is a flow of income from the mining areas to the main cities for purchase of convenience goods, due to lack of facilities in the mining areas. Thus, a lot of income flows outside the mining villages.

The mining companies boast of having improved the infrastructure and extended many benefits to the households in the area. However, the question remains as to why people had to shell out money to meet their medical expenses. This implies that the mining companies have been biased and unjustified in providing benefits to all. It is a known fact that mining has many adverse effects on the environment, which have to be involuntarily faced by all; then why there is a distinction in distribution of benefits is a pertinent question. The industry has not only brought on a lot of pollution but also leads to traffic congestion, road accidents and respiratory sicknesses as also pointed out by TERI (2004).

The post mining ban period has left the people all shattered due to their overdependence on the mining industry, while the ones who had alternate source could somehow manage to cope with the situation. The economic status of some households was badly affected with the inability to meet their loan instalments. As revealed by Noronha et al (2005), closure of mines diverts people back to their traditional activities. Thus, in this case too, people have reverted to their traditional occupations. People in the mining areas have taken up service and other trade/business activities. But it would be difficult to say whether they have actually learnt a lesson from the mining ban, because they feel that mining industry was their main support for income and it should start legally without giving the consideration to the ill-effects it had on the environment. This was revealed by many studies, one of them being Obiri et al (2006), that environmental considerations are often overlooked for economic gains.

9.4 CONCLUSION AND SUGGESTIONS

The study has come up with many observations, major of them being, that mining industry has brought ample of trade/business opportunities to the households in the mining areas. This coupled with many economic benefits and infrastructural development of the area is not seen in the non-mining areas. But there were huge disparities observed in the benefits, whether monetary or others, within the mining areas. The most disappointing observation was that in spite of having huge income, not much has been spent towards attainment of higher education.

People had given up their traditional occupations and depended largely on non-productive activity that is mining for high economic gains. The environmental issues were affecting the traditional activities of the households and social lives as well.

Huge income was drawn by the people in the mining regions, but the incomes were diverted outside the villages as the local market for convenience goods was not developed. This happened despite the fact that there were migrants residing within the areas.

The sustainability aspects were overlooked for lucrative but exhaustive avenues of income. The result of the same was experienced by the households in the post-ban period, when they were left onto themselves to handle their situation, with only the government coming to their aid. The overdependence of the people on the mining industry for their livelihoods had adversely affected their economic status and subsequently their ability to meet the financial obligations. Environmental issues have always existed, which implies that they have not been sufficiently addressed. Eventually with the sudden closure of mining industry, there was a simultaneous decline in the benefits as well. However, people had seen positive impact on the health and a decline in the environmental pollution. The other positive outcome was people reverting to their traditional activities.

In light of this, the following suggestions are provided to mitigate the above issues:

1. First and foremost, there is a strong need to divert efforts in promoting higher education in the mining areas. This may be done by creating awareness among people in the areas about the importance of higher education. People may be informed about the educational loan schemes available and such initiatives may be undertaken by the Panchayat. The procedures for the same may be simplified so that the people are motivated. Necessary transport arrangements may also be made for the students for ease of travelling. Provision for scholarships at the local level may be done, with funding coming from the state government. The government in collaboration with the mining companies may also take up this venture.
2. Secondly, the community benefits as well as any other CSR activities undertaken by the mining companies for the households in the mining areas may be extended to all those who are affected by the adverse effects of mining operations, as their interests need to be protected. The CSR activities should aim towards the upliftment of the households in the area. The government may

monitor these facilities to see that investment is done in true sense and that the people are benefitted.

3. Thirdly, there is a need to develop alternate livelihood opportunities, considering the nature of mining industry. As the mining activities scale down, the government may take initiative to invest into tourism projects. In the meantime, people may be provided required training to equip themselves for the same. This calls for a lot of initial investment. Therefore all the mining companies and the government may work in unison towards the same. The government may work upon the tourism and related projects, while the mining companies may provide necessary training and development programmes. The areas where agricultural practices are feasible, the government may provide necessary facilities to increase the production and connect to the other markets.
4. The protests and agitations taking place in Goa, the result of which is seen by way of mining ban, brings out the fact that there is a need for local representation in the mining companies to communicate the problems faced due to mining operations, and thus work towards the protection of their interests. As suggested by researchers, the mining companies need to consult the affected people in the mining areas in case of any new development, so that their concerns and problems are heard and necessary precautionary steps are taken to overcome the same.
5. To sum up, the Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) may be taken up seriously by the mining companies, as this will help identify and address major problems of the households in the area.

The government may appoint a monitoring agency for effective conduct of mining operations, and the mining companies may give necessary cooperation.

An interdisciplinary research on the impact of mining is required to capture the view of the industry from all angles. In the Goan context it is seen that lack of clarity in the environmental laws has been the main reason for the mining companies to encroach into those areas that are actually not to be mined, thus there is a need to study the existing environmental laws and the flaws in them to overcome the environmental issues. There is a need to study the impact of mining on the occupations and incomes of the households covering a larger sample size to get better results. Also at this juncture what are the community benefit programmes undertaken by the mining companies for the upliftment of the people and whether people are satisfied with the same needs to be studied.

BIBLIOGRAPHY

Books:

Arondekar, S. D., & Bhanumurthy, I. (2016). *Impact of Mining Ban on Households Livelihoos: A Study of Iron Ore Mining Areas in Goa.* (D. S. Naik, Ed.) Goa, India: APH Publishing House.

Biswas, Tapan; Pitale, S. L.; Ram, Santha A;. (2003). Environmental Aspects of Mining and Waste Recoveries: Case Study of Impact Assessment in Goa and Sukinda- India. *Mining in 21st Century-QUO VADIS.* New Delhi.

Journals:

Arondekar, S. D., & Bhanumurthy, I. (2017, May). A Socio-economic Analysis of Mining v/s Non-Mining Villages Within same Talukas in Goa. *International Journal of Research in Commerce & Management, 8*(5), 20-26.

Arondekar, S. D., & Bhanumurthy, I. (2017, March). A Study on the Socio-economic Impact of Mining Ban on the Households in Goa's Mining Belt. *SDMIMD Journal of Management, 8*(1), 11-19.

Arondekar, S. D., & Bhanumurthy, I. (2017, February). Impact of Mining BAn on the Households in the Mining Areas of Sattari Taluka, Goa. *Scholars World International Refereed Multidisciplinary Journal of Contemporary REsearch*(Special Issue), 120-126.

Asare, B. K., & Darkoh, M. (2001, June). Socio-Economic nd Environmental Impacts of Mining in Botswana: A Case Study of the Selebi-Phikwe Copper-Nickel Mine. *XVII*(02), p. 41.

Balanay, R. M., Yorobe Jr., J. M., Reyes, S. G., Castanos, A. M., Maglente, O. K., Panduyos, J. B., et al. (2014, June). Analyzing the Income Effects of Mining with International Variables for Poverty Reduction Implications in Caraga REgion, Philippines. *Journal of International and Global Economic Studies, 7*(1), 20-31.

Bandopadhyay, S. (2014). Crucial Factors Influencing Environmental Degradation: A Case Study on Raniganj Coal Mine Belt, West Bengal India. *International Journal of Environmental Development and Research, 3*(1).

Behera, P. K. (2015). Socio-Economic Impact of Industrialisation and Mining on the Local Population: A Case Study of NALCO Industrial Area, Koraput. *International Journal of Economics and Management Sciences, 4*(8), 9.

Borah, K. C. (1985). Land Relations and Cropping Pattern. In K. C. Borah, *Income, Expenditure and Saving in Rural India: A Micro Level Study* (pp. 41-69). Mittal Publications.

Brasier, K. J., Filteau, M. R., McLaughlin, D. K., Jacquet, J., Stedman, R., Kelsey, T. W., et al. (2011). Residents' Perceptions of Community and Environmental Impacts from Development of Natural Gas in the Marcellus Shale: A Comparison of Pennyslvania and New York Cases. *Journal of Rural Social Sciences, 26*(1), 32-61.

Bury, J. (2002). Livelihood, Mining and Peasants Protests in the Peruvian Andes. *Journal of Latin American Geography, 1*(1), 3-19.

Bury, J. (2004, March). Livelihood in Transition: Transnational Gold Mining Operations and Local Change in Cajamarca, Peru. *The Geographical Journal, 170*(1), 78-91.

Chauhan, S. S. (2010). Mining, Development and Environment: A Case Study of Bijolia Mining Area in Rajasthan, India. *Journal of Human Ecology, 31*(1), 65-72.

Clarke, L., & MacDonald, A. (2013). Chilean Copper Mines Begin to lose favor. *The Wall Street Journal*.

D.Brody, S., Highfield, W., & Alston, L. (2004). Does Location Matter? Measuring Environmental Perceptions of Creeks in Two San Antonio Watersheds. *Environment and Behaviour*, 229-250.

Galay, K. (2008). Socio-economic and Environmental Impact Analysis of Khothagpa Gypsum Mine. *Journal of Bhutan Studies, 18*, 50-81.

Gokhale, K., Sawant, D. N., & Ugavekar, N. (2014, October). Goa:Tourism and Socio-cultural Implications A Study of Selected Tourist Destination of South Goa District, Goa-India. *IOSR Journal of Humantities and Social Science, 19*(10), 36-41.

Ingelson, A., Holden, W., & Bravante, M. (2009). Philippine Environmental Impact Assessment, Mining and Genuine Development. *Law, Environment and Development Journal(LEAD), 5/1*.

Ivanova, G., Rolfe, J., Lockie, S., & Timmer, V. (2007). Assessing Social and Economic Impacts Associated with changes in the Coal Mining Industry in the Bowen Basin, Queensland, Australia. (C. f. Research, Ed.) *Management of Environmental Quality: An International Journal, 18*(2), 211-228.

Kahn, K. (2003). Mining and Indigenous Communities in Fiji and the Northern Territory of Australia. 1-14.

Kitula, A. G. (2005, April 26). The Environmental and Socio-economic Impacts of Mining on Local Livelihoods in Tanzania: A Case Study of Geita District. *Journal of Cleaner Production, 14*, 405-414.

Martin, A. R., Diaz, M. R., & Ruiz San Roman, J. A. (2014, March). Measure of the Mining Image. *Resource Policy, 41*, 23-30.

Nayak, G. N. (1994). *Impact of mining on environment in Goa - Present status.* Ministry of Environment and Forests, Govt. of India, India.

Nayak, G. N. (1998). Impact of Mining on the Environment in Goa: A Review. *Environment Geochem*, 97-100.

Mishra, P. C., Sahu, H. B., & Patel, R. K. (2004). Environmental Pollution Status as a Result of Limestone and Dolomite Mining - A Case Study. *Pollution Research, 23*(3), 426-432.

Murthy, A., & Patra, H. S. (2006). *Ecological, Socio-Economic and Health Impact Assessment Due to Coal Mining- A Case Study of Talabira Coal Mines in Orissa.* Orissa: Vasundhara.

Nayomi, G., & Gnanapala, W. A. (2015). Socio-Economic Impacts on Local Community through Tourism Development with Special Reference to Heritance Kandalama. *Tourism, Leisure and Global Change, 2*, pp. 57-73. Kandalama.

Noronha, L., & Nair, S. (2005, Jan 1). Assessing Quality of Life in a Mining Region. *Economic & Political Weekly, 40*(01), pp. 72-78.

Obafemi, A. A., Eludoyin, O. S., & Akinbosola, B. M. (2012, September). Public Perception of Environmental Pollution in Warri, Nigeria. *Journal of Apllication in Science and Environmental Management, 16*(2), 233-240.

Obiri, S., Mattah, P. A., Mattah, M. M., Armah, F. A., Osae, S., Adu-kumi, S., et al. (2016). Assessing the Environmental and Socio-Economic Impacts of Artisanal Gold Mining on the Livelihoods of Communities in the Tarkwa Nswaem Municipality in Ghana. *International Journal of Environmental Research and Public Health*, 1-15.

Onwuka, S. U., Duluora, J. O., & Okoye, C. O. (2013, July). Socio-economic Impacts of Tin Mining in Jos, Plateau State, Nigeria. *International Journal of Engineering Science Invention, 2*(7), 30-34.

Patra, H. S., Meher, M. K., & Sethy, M. K. (2015, June). Socio-Economic Profile and Quality of Life of Villages in and aroun Mining Area of Keonjhar District, Orissa,India. *International Research Journal of Social Sciences, 4*(6), 31-39.

Petkova, V., Lockie, S., Rolfe, J., & Ivanova, G. (2009, October). Mining Developments and Social Impacts on Communities: Bowen Basin Case Studies. *Rural Society, 19*(3), 211-228.

Popker, S. M. (2014, July-December). Impact of the Mining Sector on Locals: A Case Study of Goa. (P. N. Dhopeshwar, Ed.) *Spurthi- IMSR Journal of Management Thoughts, IV*(11), 33-38.

Priyanath, H. (1999). Socio-economic and Environmental Impact of Gem Mining Industry in Sri Lanka: A Case Study of Hunuwala village in Ratnapura District. *Sabaragumawa University Journal, 2*(1), 101-109.

Sahoo, M. (2013, March). Mining in Odisha- A Pathway for Economic Development. *Indian Journal of Applied Research, 3*(3), 72-74.

Saviour, M. N. (2012). Environmental Impact of Spoil and Sand Mining: A Review. *International Journal of Science, Environment and Technology, 1*(3), 125-134.

Shi, X. (2015, January). Factors Influencing the Environmental Satisfaction of Local Residents in the Coal Mining Area, China. (S. I. Research, Ed.) *120*, 67-77.

Shi, X., & He, F. (2012, August). Environmental Pollution Perception of Residents in Coal Mining Areas: A Case Study in the Hancheng Mine Area, Shaanxi Province China. *Environmental Management, 50*, pp. 505-513.

Singh, D. M. (2015, April-June). Mining and its Impact on Tribals in India: Socio-economic and Environmental Risks. *International Journal of Social Science and Humanities Research, 3*(2), pp. 429-439.

Singh, G. (2006). Environmental and Social Challenges Facing the Coal Industry. *International Coal Congress and EXPO 2006*, (pp. 301-310). New Delhi.

Singh, G., & Perwez, A. (2015). Depreciation in Ambient Air Quality in Iron Ore Mining Region of Goa. *Current World Environment, 10*(1), 149-160.

Sreenivasa, & R V, R. R. (2014, April). Socio-Economic and Environmental Perception of Inhabitants of A Quarry Area- A Case Study of Bidadi, Bangalore Rural District. *International Journal of Engineering Science Invention, 3*(4), 11-22.

Temeng, V. A., & Abew, J. K. (2009). A Review of Alternative Livelihood Projects in Some Mining Communities in Ghana. *European Journal of Scientific Research, 35*(2), 217-228.

Virginia, N., Rhoades, R., Bontoyan, E., & Flora, G. (1998, Summer). Defining indicators which make sense to local people: intra-cultural variation in perceptions of natural resources. *Human Organization, 57*(2), pp. 159-170.

News Article:

Aghor, A. (2011, September 30). Mining in Goa: Damage to the environment greater than los of revenue.

Maad, G. K., & Shetye, M. (2013). *Goa mines: green belt goes in the red.* Times of India.

Webpages:

www.timesofindia.com/city/goa/Mining-closure-Vedanta-CSRactivities/articleshow/46973174.cm. (2005, April 19). Retrieved October 7th, 2016

www.portal.gsi.gov.in, *Detailed Information Dossier(DID) on Iron Ore in India.* (2010).

Under-mining health? Local Impacts of Iron Ore Mining in India. (2010). Retrieved from www.indiaportal.org. (2012). *Iron Ore and Pellets.* http://www.vale.com/en/business/mining/iron-ore-pellets/pages/default.aspx.

www.csr21.org/content/goan-communities-demand-more-mining. (2014, June 13). Retrieved October 7th, 2016

(2012, August). Retrieved from www.gga.org.

(2016). Retrieved from www.statisticssolutions.com/mann-whitney-u-test-21.

(2016, January 22). Retrieved fromhttp://pseudonomist.wordpress.com.

Bhanumathi, K. (n.d.). *Status of women affected by Mining in India.* Mines, Minerals and PEOPLE, India.Retrieved from www.samataindia.org.in

Bhaumik, P. (n.d.). Illegal mining threatens Goa. https://currentnews.in//illegal-mining-threatens-goa/

Devi, S. C. (2009). *https://books.google.co.in>books.* Retrieved 2016

D'Mello, P. (n.d.).Goa's mining logjam *www.epw.in/node/130648/pdf*. Retrieved October 10, 2016

Gauns, R. (2011). Mining havoc:Impact of mining on water resources in Goa. *Dams, Rivers and People*.www.indiawaterportal.org

News, H. G. (2012, October 10th). *www.goa4u.com/2012/10/12/agriculture-bites-the-dust-in-the-mining-talukas*. Retrieved October 7th, 2016

Nick. (2012, December 29). *The ban on iron mining in Goa*. Retrieved from www.ejolt.org.

Niranjan, S., & Nair, S. (n.d.). A Socio-Demographic Analysis of the Size and Structure of the Family in India. Retrieved from demoscope.ru.

Rao, S. R. (2008, April 23). Retrieved from www.citeman.com.

TERI. (1997). *Area-wide Environmental Quality Management(AEQM) plan for the Mining Belt of Goa.* Retrieved from http://www.teriin.org/teri-wr/projects/aeqm.htm.

Thesis:

Das, N. (2015). *Socio-economic Impact of Mining on Rural Communities: A Study of the Ib Valley Coalfield in Odisha.* Ph.D Thesis, National Institute of Technology, Rourkela, Dept. of Humanities & Social Sciences , Odisha.

Huang, G. (2008). *Mining and Tourism: Comparing Spatial Patterns, Socioeconomic Contributions and Environmental Impacts in China.* PhD Thesis, University of Vermont, Faculty of Graduate College.

Mendes, G. (2001). *A Socio-Economic Analysis of Mining Industry: A Case Study of Bicholim Taluka in Goa.* Ph.D Thesis, Utkal University, Dept. of Economics.

Mengwe, M. S. (2010). *Towards Social Impact Assessment of Copper-Nickel Mining in Botswana.* Thesis, Nelson Mandela Metropolitan University, Faculty of Science.

Dissertations:

Ackley, M. (2008). *Evaluating Environmental Risks in Mining: A Perceptual Study at the Vatukoula Gold Mine in Fiji.* Dissertation, University of Vermont, Natural Resource Department, Degree of Master of Science.

Adjei, E. (2007). *Impact of Mining on Livelihoods of of Rural Households: A Case Study of Farmers in the Wassa Mining Region, Ghana.* MPhil dissertation, Norwegian University of Science and Technology, Department of Geography.

Gonzalez, A. (2013). *Mining Impacts on Agricultural Lands and Food Security- A Case Study of Towns in and around Kyebi in the Eastern Region of Ghana.* Turku University of Applied Sciences . Ignitious Tetteh Ocansey.

Kangwa, P. K. (2008). *An Assessment of the Economic, Social and Environmental Impacts of the Mining Industry: A Case Study of Copper Mining in Zambia.* Dissertation, LUND University, Social and Economic Geography.

Tiainen, H. (2012). *A Case Study on Social Sustainability in the Kyrgyz Mining Industry.* Dissertation, University of Eastern Finland, Faculty of Social Sciences and Business Studies.

Willett, E. V. (2011). *Assessing the Perceptions of Environmental Pollutants, Health and Nutrition Behaviour to improve Risk Communications in Kentucky.* University of Kentucky Master Theses.

Zaman, K. (2011). *The Socio-Economic Impact of Local Community Managed Coal Mines: A Case Study of Village Qasam Khel, Darra Adam Khel, FR Kohat, Pakistan.* Dissertation, Swedish University of Agricultural Sciences, Rural Development and Natural Resource Management, Uppsala.

Yeboah, J. Y. (2008). *Environmental and Health Impact of Mining on Surrounding Communities: A Case Study of Anglogold Ashanti in Obuasi.*

Conference Proceedings:

Abdala, F. (2010, August 5). Sustainable Juruti: a Proposed Model for Mining and Local Development. *Paper at 6th Brazilian Mining Congress*. Belo Horizonte.

Fernandes, M. P. (2016, April 1st). Mining in Goa: The Road Ahead. Panaji, Goa, India: 4th Adv. Luis Caraciolo Memorial Lecture 2016.

Kamat, K., Chen, R., D'Mello, C., Scaglione, M., Weiermeir, C., & Pillai, S. K. (2014). Resident Attitudes Towards Casino Development in Goa. *64th AEIST Conference, Plzen*, (pp. 1-14).

Mehta, P. (2002). The Indian Mining Sector: Effects on the Environment and FDI inflows. *International Conference on FDI and the Environment.* Global Forum on International Investment.

Sahoo, A. K., & Sahu, N. C. (2013). Investigating the presence of resource curse hypopthesis in Mining sector in India. *International Conference on Advances in Civil, Structural and Environmental Engineering-ACSEE* (pp. 67-71). Institute of Research Engineers and Doctors.

Reports:

(2000). *Undermining the Forests: The Need to Control Transnational Mining Companies: A Canadian Case Study.* Forest Peoples Programme; Philippine Indigenous Peoples Links; World Rainforest Movement.

(2009). *The Economic Impact of Ferrous and Non-Ferrous Mining on the State of Minnesota adn on the Arrowhead Region and Douglas County, WI.* Bureau of Business and Economic Research; UMD Labovitz School of Busienss and Economics. University of Minnesota Duluth.

Mining in Africa: Managing the Impacts. (2011). *Bulletin*.

Akabzaa, T., & Darimani, A. (2001). *Impact of Mining Sector Investment in Ghana: A Study of the Tarkwa mining region.* SAPRI.

Barclay, M. A., Everingham, J.-A., Cheshire, L., Brereton, D., Pattenden, G., & Lawrence, G. (2012). *Local Government, Mining Companies and Resource Development in Regional Australia: Meeting the Governance Challenge.* Sustainable Minerals Institute. Brisbane: Centre for Social Responsibility in Mining.

Brereton, D., & Forbes, P. (2004, October). Monitoring the Impacts of Mining on Local Communities: A Hunter Valley Case Study. University of Queensland: CSRM.

Brown, T. J., Wrighton, C. E., Raycraft, E. R., Shaw, R. A., Deady, E. A., Rippingale, J., et al. (2013). *World Mineral Production.* Natural Environment Research Council, British Geological Survey.

Bury, J. (2005). Mining Mountains: Neo Liberalism, Land Tenure, Livelihoods and the New Peruvian Mining Industry in Cajamarca. *Environment and Planning, 37*, 221-239.

Carrington, K., & Pereira, M. (2011). *Social Impact of Mining Survey: Aggregate Results Queensland Communities.* School of Justice, QUT, Brisbane.

Chhibber, P., Rogers, R., & Milkereit, N. (2011). *Case Studies Human Rights Violation By Transnational Corporations in Goa and Chattisgarh.* New Delhi: Human Rights Law Network.

Chupezi, T. J., Ingram, V., & Schure, J. (2009). *Impacts of Artisanal Gold and Diamond Mining on Livelihoods and the Environment in the Sangha Tri-National Park Landscape.* Center for International Forestry Research(CIFOR), Bogor, Indonesia.

Devotta, S. (2006). *Towards Sustainable Mining Industry in India-Challenges.* Nagpur: National Environmental Engineering Research Institute.

Digby, C;. (2012). Mine Closure Through the 21st Century Looking Glass. In *Mine Closure 2012* (pp. 33-38). Brisbane, Australia: Australian Centre for Geomechanics, Perth.

Directorate of Planning, S. a. (2004). *Economic Survey 2003-04.* Panaji: Government of Goa.

Directorate of Planning, S. a. (2011). *Economic Survey 2011*. Goa

Directorate of Planning, Statistics and Evaluation. (2006). *Agricultural Census.* Panaji: Government of Goa.

Directorate of Planning, Statistics and Evaluation. (2015). *Economic Survey 2014-15.* Porvorim, Goa: Government of Goa.

Dongre, S. M. (2013). *Research Project on Assessing Quality of Environmental Impact Assessment(EIA), Compliance of Environmental Clearance(EC) Conditions and Adequacy of Environemntal Management Plan (EMP) of Mining Industry in Goa.* The Department of Science, Technology and Environment, Centre for Environment Education.

E, C. J., & R, P. B. (2004). Poverty, perceptions and planning: why socio-economics matterin the management of Mexican reefs. *Ocean and Coastal Management*.

ERM India Pvt. Ltd. (2011). *Sustainable Development Framework(SDF) for Indian Mining*. Ministry of Mines, India.

Export-Import Bank of India. (2008). *Indian Mineral Sector and its Export Potential.* Quest Publication.

Firoz, A. S. (2008). *Mineral Policy Issues in the Context of Export and Domestic Use of Iron Ore in India.* Indian Council for Research on International Economic Relations.

Fonseca, H. (Ed.). (2004). *Mining Social and Environmental Impacts.* World Rainforest Movement.

Forest Survey of India. (1985). *Report on Resources Survey of Goa Forests* . Nagpur: Ministry of Environment and Forests.

Haney, M., & Shkaratan, M. (2003). *Mine Closure and its Impact on the Community: Five Years after Mine Closure in Romania, Russia and Ukraine.* Infrastructure and Energy Development, Europe and Central Asia, Social Development Department. World Bank.

Hazra, A. K., Chauhan, S., Gupta, A., & Sharma, E. (2013). *Development of Indian Mining Industry - The Way Forward.* FICCI, Mines and Metals Division.

Hentschel, T., Hruschka, F., & Priester, M. (2002). *Global Reporting on Artisanal and Small Scale Mining.*

Howells, M. I., Alfstad, T., Cross, N., & Jeftha, L. C. (2002). *Rural Energy Modelling.* Working Paper, Energy Research Institute, Department of Mechanical Engineering , South Africa.

Jorge, T., De Sa, H., & Jain, P. (2013). *Survey of Environmental, Socio-Economic Impacts of Interim Ban on Mining in Goa.* EIA Resource and Response Centre(ERC) Goa, India. Legal Institute for forest and Environment(LIFE).

Joyce, S. A., & MacFarlane, M. (2001). *Social Impact Assessment in the Mining Industry: Current Situation and Future Directions.* Mining, Minerals and Sustainable Development(MMSD). International Institute for Environment and Development(IIED); World Business Council for Sustainable Development(WBCSD).

(June 2006). *Poverty and Social Impact Analysis of Mining Sector Reform in Romania: A Policy Note.* Report No. 32772-RO, Economic and Sector Work Summaries, Social Development Department.

Lahiri-Dutt, K. (2006). *Gendered Livelihoods in Small Mines and Quarries in India: Living on the edge.* Working Paper, Australia South Asia Research Centre, Canberra , Rajiv Gandhi Institute for Contemporary Studies, New Delhi.

Lahiri-Dutt, K., & Mahy, P. (2007). *Impacts of Mining on Women and Youth in Indonesia: Two Mining Locations.* The Australian National University. Resource Management in Asia Pacific.

Larsen, E. J., Kassibo, B., Lange, S., & Samset, I. (2006). *Socio-Economic Effects of Gold Mining in Mali: A Study of the Saiola and Morila Mining Operations.* CMI Report, Norway.

Lins, C., & Horwitz, E. (2007). *Sustainability in the Mining Sector.* Brazilian Foundation for Sustainable Development(FBDS), Brazil.

M/s. Steel Authority of India Ltd., Kolkata. (2007). *Development of Clean Technology for Iron Ore Mines and Development of Environmental Standards.* Central Pollution Control Board,(Ministry of Environment and Forest) Government of India.

Mallya, K., & D., S. (2010). *Mining in Goa: Retrospect, Prospect and Perspect in the Environmental Context.* Goa: Vanashakti.

(n.d.). Local Communities and Mines. In MMSD. The Mining, Minerals and Sustainable Development Project(MMSD).

Mwaipopo, R., Mutagwaba, W., Nyange, D., & Fisher, E. (2004). *Increasing the Contribution of Artisanal and Small Scale Mining to Poverty Reduction in Tanzania.* Department of International Development(UK).

O'Neil, M., Kaye, L., & Trevithick, M. (2013). *Impact of Mining and Resource Development: A Case Study for Eyre Peninsula Councils.* Local Government Association of South Australia, The South Australian Centre for Economic Studies, South Australia.

Opoku-Ware, J. (2010). *The Social and Environmental Impacts of Mining Activities on Indigenous Communities: The Case of Newmont Gold(Gh) Ltd. (Kenyasi) in Ghana.* University of Adger, Norway, Centre for Development Studies.

Pascual, X. L., Cascallar, M. P., Calle, M. P., Rodes, E. P., & Casau, C. S. (2013, July). Iron Mining in Goa(India) an interdisciplinary Study. Barcelona.

Remy, F., & MacMahon, G. (2002). *Large Mines and Local Communities: Forging Partnerships, Building sustainability.* World Bank and International Finance Corporation. World Bank Group's Mining Department.

Sills, E., Pattanayak, S. K., Saha, S., Yand, J.-C., Sahu, P., & Singha, A. (2006). *Mine over Matter? Health, wealth and forests in a mining area of Orissa.* Government of Orissa.

Sosa, I., & Keenan, K. (2001). *Impact Benefit Agreements Between Aboriginal Communiites and Mining Companies: Their use in Canada.* Environmental Mining Council of British Columbia, the Canadian Environmental Law Association and CooperAccion: Accion Solidaria para el Desarrollo.

Stark, J., Li, J., & Terasawa, K. (2006). *Environmental Safeguards and Community Benefits in Mining: Recent Lessons from the Phillipines.* USAID and FESS(Foundation for Environmental Security and Sustainability).

Steinweg, T., & Schuit, A. (2014). *Impacts of the Global Iron Ore Sector-Case Study: Altain Khuder in Mongolia.* Centre for Research on Multinational Corporations. Amsterdam: Stichting Onderzoek Multinationals Ondernemingen.

Tata Research Energy Institute. (2001, Oct). *Overview of Mining and Mineral Industry in India.* Project Report, New Delhi.

TERI. (2002). *Environmental and Social Performance and Sustainability Markers in Minerals Development: Reporting Progress towards Improved Ecosystem Health and Human Well-being Phase III.*

TERI. (2012). *Directions, Innovation and Strategies for Sustainable Development in Goa-Executive Summary.* New Delhi: The Energy and Resources Institute.

Terminski, B. (2012). *Mining-Induced Displacement and Resettlement: Social Problem and Human Rights Issue(A Global Perspective).*

Ticci, E. (2011). *Extractive Industries and Local Development in the Peruvian Highlands: Socio-Economic Impacts of the MId-1990s mining boom.* European University Institute. Robert Schuman Centre for Advanced Studies(RSCAS).

Twerefou, D. K., Tutu, K., Afriyie, J.-O., & Mantey, K. A. (2015). *Attitudes of local people to mining policies and intervention.* International Growth Centre.

Vandenbroucke, E. (2008). *Environmental and Socio-Economic Impacts if Mining in Guatemala: The Role of Local Communities and The Ecological Justice Movement.* Dissertation, Human Ecology and Sustainable Development.

Weber-Fahr, M. (2002). *Treasure or Trouble? Mining in Developing Countries.* World Bank & International Finance Corporation. World Bank Group Mining Department.

Zimbizi, G. (2001). *Study on Socio-Economic Status of Children and Women on Commercial Farms, Mining and Peri-Urban Areas.* UNICEF.

APPENDICES

Appendix I

INTERVIEW SCHEDULE (for households)

Schedule No. _________________ Date: _________________
Taluka: _________________
Village: _________________

Objective: To compare the socio-economic status of the households in the mining areas with that of the non-mining areas.

(Kindly tick wherever applicable)

1. DEMOGRAPHIC PROFILE:

a. Name of the head of the family____

b. Residential Status: Temporary ☐ Permanent ☐

c. No. of years residing at the current place: _____________________________yrs.

d. Mother tongue: ____________________

e. Family profile:

Sr. No.	Gender of family members		Age	Marital status	Educational qualification
	Male	Female			

f. Main source of water:

Well	Tap	Pond/stream	Any other

g. Main source of cooking facility:

Gas cylinder	Firewood	Kerosene Stove	Any other

2. INCOME

Occupation	**Income(monthly in Rs.)**	
	2012(Before mining ban)	**2014(After mining ban)**
a)Agriculture		
b)Non agriculture labour		
c)Agriculture labour		
d)Business		

e)Private service		
f)Government service		
g)Mining labor		
h)Mining transport		
i)Mining related employment, plz specify		
h)Remittances from family members working abroad		
i)Others		

3. HOUSEHOLD EXPENDITURE:

a) Expenditure per month(Rs.):

2012(Before mining ban)	2014(After mining ban)

b) Place of purchase of daily household requirements(veg., fish and grocery items):

Local market	Outside village	Main cities	Any other(plz mention)

c) Place for shopping(household gadgets, clothing, luxuries):

Local market	Outside village	Main cities	Any other(plz mention)

d)Frequency in shopping:

Daily requirements		**Luxury items**	
Daily		Monthly	
Weekly		Quarterly	
Monthly		Half yearly	
		Yearly	

4. LOANS TAKEN:

Year	Amt. (in Rs.)	Purpose of loan	Mthly instalment(Rs.)

b)Are you a defaulter?

Yes	
No	

c)If yes, since when(yr):

____

5. SAVINGS AND INVESTMENT:

a)Organised sector ☐ b) Unorganised sector ☐

c)Both ☐

Savings per month(in Rs.):

2012(Before mining ban)	**2014(After mining ban)**

6. ASSET OWNERSHIP:

a) House	• Traditional	
	• Repaired/renovated	
	• New construction	
b) Two wheeler(No.)		
c) Four wheeler(No.)		
d) Truck(No.)		
e) Barge(No.)		
f) Land (in acres)/Yes or No		
g) Tractor		
h) Any other agricultural equipment		
i) Domestic animals		
j) Television		
k) Refrigerator		
l) Mobile phone(No.)		
m) Any other asset (please mention)		

7. POLLUTION AND HEALTH:

a) Are you affected by any pollution in your area?

Yes	
No	

b) If yes, what type of pollution do you experience here?

Air	Water	Noise	Land	All mentioned

c) What is the extent of pollution?

Pollution type	Very high	High	Average	Low	Very low
Air					
Water					
Noise					
Land					

d) How would/do you rate your health status?

-Before ban

Very good	Good	Satisfactory	Bad	Very bad

-After ban

Very good	Good	Satisfactory	Bad	Very bad

e) Did you experience any of the following in your area?

• Death in family due to road accident	
• Major disability to family member due to road accident	
• Minor disability to family member due to road accident	
• Respiratory sickness	
• Any other health problem(plz mention)	

e) Monthly expenditure incurred on medicines:

2012(Before mining ban)	2014(After mining ban)

8.PROBLEMS FACED:

a) Do you experience any of the following problems?

• Traffic congestion	
• Water problems	
• Road accidents	
• Agriculture affected	
• Extra burden on women	
• Any other, please mention	

9. DO YOUR FAMILY RECEIVE THE FOLLOWING BENEFITS BY BUSINESS ORGANISATIONS IN YOUR VILLAGE:

Benefits	Provided	Availed
a) Medical facilities provided		
b) Preference given for employment		
c) Scholarship to children		
d) Any compensation received		
d) Any other benefit provided(plz mention)		

10. HOW WOULD YOU PERCEIVE YOUR QUALITY OF LIFE?

Very good	Good	Average	Bad	Very bad

11.Any suggestions/problems you would like to place before us, we would be glad to know:

____

____

____

____

\-----------------------

Objective 3: To understand the perception of the people on the quality of environment in the mining areas.

Kindly tick the most appropriate number on the scale that shows how much you agree or disagree with the following statements:

Sr. No.	Factors	Scales				
		Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree(5)**
I	**Air Pollution**					
1.	There is air pollution in your area due to mining activities.					
2.	Transportation of ore in trucks pollutes the air in your area.					
3.	Increase in transport density has led to increase in spm(suspended particulate matter) levels.					
4.	Mining dumps located close to your house gives exposure to dust.					
II	**Water Pollution**					
1.	Mining activities has prevented access to clean water.					
2.	Mine run off into the river/pond/stream has polluted the water.					
3.	Pumping of water from mines has lowered ground water table in the village.					
4.	Pumping of water from mines and deep excavation of ore from the mining areas has resulted in underground water pollution.					
5.	Perennial rivers/water resources have been affected due to mining operations in the area.					
6.	Mining operations are a threat to aquatic life.					
7.	Mining operations depletes surface and groundwater supplies.					
III	**Noise Pollution**					
1.	Mining operations has led to noise pollution in your area.					
2.	Noise pollution is due to drilling/blasting/noise from machinery in the mining areas.					
3.	There is noise pollution due to plying of trucks in your area.					
IV	**Land Degradation**					

1.	There is decline in the quality of land due to mining.					
2.	Mining operations has led to mining run offs into the fields.					
3.	Mining run off into the fields has affected the fertility of soil.					
4.	There are threats of landslides/mudslides in your area.					
5.	There is loss of vegetation due to mining operations in your area.					
6.	Forest cover in the mining areas has been lost in a big way due to mining.					
7.	Good quality horticulture land has been adversely affected due to mining industry.					

QUESTIONNAIRE(for Panchayats)

Schedule No. ________________ Date: ________________

Taluka: ________________

Village: ________________

TITLE: MINING AND ITS IMPACT ON THE ECONOMY: A CASE STUDY OF GOA

Objective: To compare the socio-economic status of the households in the mining areas with that of the non-mining areas.

1. No. of wards in the village:____
2. No. of households:____
3. No. of houses repaired (upto 2010):______________________________________
4. No. of new constructed houses (upto 2010): ____________________________
5. Do you have the following facilities in your village?

	Kindly tick
a. Transportation and Communication:	
-local transport	
-rail	
-private transport	
-proper road	
-landline connection	
-telephone booth	
-mobile phone connectivity	
-postage and telegraph	
-internet facilities	
-any other, please specify____________________________	
b. Medical facilities:	
-Primary health centre	
-private doctors	
-maternity clinic	
-medical store	
-any other, please specify____________________________	
c. Educational facilities:	
-pre-primary schools	
-primary schools	
-secondary schools	
-higher secondary schools	
-vocational centres	
-any other, please specify____________________________	

d. Water supply ☐
e. Electricity ☐
f. Sports facilities ☐
g. Cemetery/Crematorium ☐
h. Temple/Mosque/Church ☐
i. Banks/Other financial institutions ☐
j. Market outlets ☐
k. Any other, please specify____________________________ ☐

6. Are any infrastructural facilities provided by the business companies in your area?

Yes ☐ No ☐

7. If yes, please specify____

8. Name the perennial rivers/streams/ponds in your village(if any)________________

9. Are they still existing:

Yes	
No	

10. No. of wells with water in the village: In 2000___________ In 2010______

11. Area used for agriculture in the village: In 2000___________ In 2010_________

12. Main crop/plantation grown: ____

13. Yield(production): In 2000________________ In 2010_____________________

14. Use of pesticides/fertilizers by the farmers: In 2000_____________In 2010_____

15. No. of liquor shops: In 2000____________________________In 2010___________

16. Milk production: In 2000 ____________________________In 2010___________

17. Do you think there have been negative effects on the natural environment due to set up of business organisation?

Very much	Much	Not at all	Little	Very little

18. If yes, which of the following effects have you observed in your village?

Land degradation ☐
Loss of vegetation ☐
Water pollution ☐
Air pollution ☐
Noise pollution ☐

19. What could be the causes of land and vegetation degradation?

____

20. Has this affected the agriculture in the village? Yes ☐ No ☐

21. If yes, to what extent

Very much	Much	Not at all	Little	Very little

22. Causes of water pollution:

____

23. Extent of water pollution

Very much	Much	Not at all	Little	Very little

24. Is sufficient water available in the village for the following:

a) Domestic use	
b) Agricultural purpose	

25. Causes of air pollution:

____

26. Extent of air pollution

Very much	Much	Not at all	Little	Very little

27. Causes of noise pollution:

____

____

28. Extent of noise pollution

Very much	Much	Not at all	Little	Very little

29. Any compensation received monthly by the households for tacklingpollution related problems by the following?

Business organisation ☐

Government ☐

None ☐

Any other, please specify______________________________ ☐.

Objective I:

Demographic profile

Mother Tongue

		Mining areas		Non-mining areas	
		Frequency	Percent	Frequency	Percent
Valid	KONKANI	249	97.3	188	98.4
	MARATHI	2	.8	2	1.1
	HINDI	3	1.2	1	0.5
	KANNADA	2	.8	0	0
	Total	256	100.0	191	100

Results of Mann Whitney U Test:

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	agricultural income	50	2000	35000	12670.00	9469.936
	Valid N (listwise)	50				
NON-MINING	agricultural income	92	800	14200	3346.20	3063.533
	Valid N (listwise)	92				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of agricultural income is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .0

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	labour income	23	500	15000	4652.17	3584.800
	Valid N (listwise)	23				
NON-MINING	labour income	46	1000	7000	3904.35	1675.836
	Valid N (listwise)	46				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of labour income is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.883	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	service	100	3000	100000	20630.00	17282.212
	Valid N (listwise)	100				
NON-MINING	service	96	2000	100000	19881.25	16168.041
	Valid N (listwise)	96				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of service is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.970	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	business/trade/profession	42	2000	70000	24166.67	18206.025
	Valid N (listwise)	42				
NON-MINING	business/trade/profession	29	1000	32000	15400.00	8247.770
	Valid N (listwise)	29				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of business/trade/profession is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.072	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	mining related service	156	4000	180000	43173.72	37102.517
	Valid N (listwise)	156				
NON-MINING	mining related service	12	1000	175000	25666.67	48347.856
	Valid N (listwise)	12				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of mining related service is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.004	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	total income from all sources	256	1500	220000	42844.20	39852.612
	Valid N (listwise)	256				
NON-MINING	total income from all sources	191	2000	277000	18275.13	23457.659
	Valid N (listwise)	191				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of total income from all sources is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	household expenditure bef ban	256	300	30000	8521.09	4801.726
	Valid N (listwise)	256				
NON-MINING	household expenditure bef ban	191	1000	30000	6998.95	5107.600
	Valid N (listwise)	191				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of household expenditure bef ban is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	investment bef ban	162	200	18000	4090.52	4148.911
	Valid N (listwise)	162				
NON-MINING	investment bef ban	92	100	15500	1442.83	2841.301
	Valid N (listwise)	92				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of investment bef ban is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Descriptive Statistics

Area		N	Minimum	Maximum	Mean	Std. Deviation
MINING	loan taken	113	1000	530000	33906.19	65806.433
	Valid N (listwise)	113				
NON-MINING	loan taken	51	500	20000	5773.53	4127.728
	Valid N (listwise)	51				

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of loan taken is the same across categories of Area.	Independent-Samples Mann-Whitney U Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Appendix III

Environmental factors:

1. Air pollution(variance explained: 58 %)

Table : Residents perceptions on air pollution							
Statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**Std dev.**
Air Pollution						**3.56**	**1.15**
There is air pollution in your area due to mining activities.	21(8.2)	21(8.2)	7(2.7)	121(47.3)	86(33.6)	3.90	1.19
Transportation of ore in trucks pollutes the air in your area.	22(8.6)	25(9.8)	8(3.1)	116(45.3)	85(33.2)	3.85	1.23
Transport density led to spm (suspended particulate matter).	26(10.2)	24(9.4)	7(2.7)	118(46.1)	81(31.6)	3.80	1.26
Mining dumps gives exposure to dust.	96(37.5)	32(12.5)	17(6.6)	75(29.3)	36(14.1)	2.70	1.55
Figures in the parenthesis denotes percentage and outside the parenthesis denotes frequency							
							Sample size: 256
							Source: Primary data

2. Water pollution: (variance explained: 13.60%)

Table: Residents perceptions on water pollution							
Statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**Std. dev.**
Water pollution						**3.04**	**1.50**
Mining activities has prevented access to clean water.	36(14.1)	47(18.4)	34(13.3)	85(33.2)	54(21.1)	3.29	1.36
Mine run off into the river pond/stream has polluted the water.	44(17.2)	59(23.0)	34(13.3)	76(29.7)	43(16.8)	3.06	1.38
Pumping of water from mines has lowered ground water table in the village.	45(17.6)	64(25.0)	35(13.7)	67(26.2)	45(17.6)	3.01	1.39
Perennial rivers water resources have been affected due to mining.	43(16.8)	63(24.6)	40(15.6)	59(23.0)	51(19.9)	3.05	1.40
Mining operations are threat to aquatic life.	49(19.1)	64(25.0)	43(16.8)	66(25.8)	34(13.3)	2.89	1.34
Pumping of water and deep excavation resulted in underground water pollution.	56(21.9)	52(20.3)	33(12.9)	69(27.0)	46(18.0)	2.99	1.44
Mining operations depletes surface and groundwater supplies.	56(21.9)	51(19.9)	31(12.1)	68(26.6)	50(19.5)	3.02	1.50
Figures in the parenthesis denotes percentage and outside the parenthesis denotes frequency							
							Sample size: 256
							Source: Primary data

3. Noise pollution(variance explained:11%)

Table: Residents perceptions on noise pollution							
Statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**Std. dev.**
Noise pollution						**3.35**	**1.16**
Mining operations has led to noise pollution in your area.	21(8.2)	32(12.5)	23(9.0)	114(44.5)	66(25.8)	3.67	1.22
Noise pollution is due to drilling/blasting noise from machinery.	81(31.6)	51(19.9)	30(11.7)	49(19.1)	45(17.6)	2.71	1.51
There is noise pollution due to plying of trucks in your area.	22(8.6)	33(12.9)	22(8.6)	109(42.6)	70(27.3)	3.67	1.24
Figures in the parenthesis denotes percentage and outside the parenthesis denotes frequency Sample size: 256 Source: Primary data							

4. Land degradation(variance explained: 5%)

Table 26.4:Residents perceptions on land degradation							
Statements	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**Mean**	**Std. dev.**
Land degradation						**2.90**	**1.40**
There is decline in the quality of land due to mining.	53(20.7)	52(20.3)	25(9.8)	70(27.3)	56(21.9)	3.09	1.48
Mining operations has led to mining run offs into the fields.	52(20.3)	61(23.8)	27(10.5)	58(22.7)	58(22.7)	3.04	1.48
Mining run off in to the fields has affected the fertility of soil.	53(20.7)	67(26.2)	24(9.4)	57(22.3)	55(21.5)	2.98	1.49
There are threats of landslides/mudslides in your area.	92(35.9)	71(27.7)	27(10.5)	34(13.3)	32(12.5)	2.39	1.41
There is loss of vegetation due to mining operations in your area.	57(22.3)	71(27.7)	20(7.8)	55(21.5)	53(20.7)	2.91	1.50
Forest cover in the mining areas has been lost in a big way due to mining.	57(22.3)	64(25.0)	19(7.4)	64(25.0)	52(20.3)	2.96	1.49
Good quality horticulture land has been adversely affected due to mining.	56(21.9)	70(27.3)	21(8.2)	55(21.5)	54(21.1)	2.93	1.49
Figures in the parenthesis denotes percentage and outside the parenthesis denotes frequency Sample size: 256 Source: Primary data							

Table1.1 Means and standard deviation of pollution perception across gender				
	Gender	**N**	**Mean**	**Std. Deviation**
Air pollution	Male	115	3.4652	1.21390
	Female	141	3.6383	1.09031

Water pollution	Male	115	3.0495	1.30202
	Female	141	3.0385	1.37318
Noise pollution	Male	115	3.3219	1.09205
	Female	141	3.3760	1.22219
Land degradation	Male	115	2.8422	1.38461
	Female	141	2.9435	1.40490

Table 1.2
Results of two independent sample t-test for testing difference in environmental perception

Environmental Perception	t value	Sig.
Air pollution	-1.200	.231
Water pollution	.065	.948
Noise pollution	-.369	.712
Land degradation	-.578	.564

***Significant @5%(95% confidence level)**
Source: Primary data

Table 2.1
Mean score of pollution perception of the respondents across age groups

Pollution perception	Age groups	N	Mean	Std. Deviation
Air pollution	Upto 30	41	3.7256	.99500
	31-40	75	3.2700	1.14694
	41-50	74	3.6385	1.17052
	50-60	43	3.4535	1.25506
	Above 60	23	4.1630	.86474
	Total	256	3.5605	1.14842
Water pollution	Upto 30	41	2.8327	1.27802
	31-40	75	2.9031	1.31369
	41-50	74	3.0962	1.27891
	50-60	43	2.9798	1.47772
	Above 60	23	3.8261	1.26728
	Total	256	3.0434	1.33909
Noise pollution	Upto 30	41	3.3334	1.15005
	31-40	75	3.1468	1.03268
	41-50	74	3.4597	1.28777
	50-60	43	3.3488	1.28891
	Above 60	23	3.7100	.84289
	Total	256	3.3517	1.16360
Land degradation	Upto 30	41	2.7388	1.35207
	31-40	75	2.7029	1.40563
	41-50	74	2.9595	1.39118
	50-60	43	2.9109	1.30722
	Above 60	23	3.5961	1.47337
	Total	256	2.8980	1.39401

Table 2.2 ANOVA table showing difference in perception across age groups						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Air pollution	Between Groups	16.740	4	4.185	3.287	.012
	Within Groups	319.571	251	1.273		
	Total	336.312	255			
Water pollution	Between Groups	17.768	4	4.442	2.537	.041
	Within Groups	439.487	251	1.751		
	Total	457.255	255			
Noise pollution	Between Groups	6.979	4	1.745	1.295	.273
	Within Groups	338.284	251	1.348		
	Total	345.263	255			
Land degradation	Between Groups	15.388	4	3.847	2.011	.093
	Within Groups	480.142	251	1.913		
	Total	495.531	255			
***Significant @5%(95% confidence level) Source: Primary data**						

Table 3.1 Mean and standard deviation of pollution perception across years of residence				
Pollution perception	**Length of residence**	**N**	**Mean**	**Std. Deviation**
Air pollution	Less than 10 years	21	3.5238	1.25475
	10 - 20 years	22	3.5682	1.21788
	20 -30 years	22	3.5909	1.28532
	30 -40 years	12	3.9375	.61353
	40 - 50 years	18	3.2917	1.46340
	More than 50 years	161	3.5621	1.10504
	Total	256	3.5605	1.14842
Water pollution	Less than 10 years	21	2.4900	1.36380
	10 - 20 years	22	2.9350	1.33571
	20 -30 years	22	2.5005	1.19862
	30 -40 years	12	3.0950	1.25948
	40 - 50 years	18	2.8167	1.21993
	More than 50 years	161	3.2261	1.34666
	Total	256	3.0434	1.33909
Noise pollution	Less than 10 years	21	2.5238	1.17673

	10 - 20 years	22	3.1368	1.12060
	20 -30 years	22	3.1968	.95200
	30 -40 years	12	3.8333	.74604
	40 - 50 years	18	3.4078	1.35999
	More than 50 years	161	3.4680	1.15555
	Total	256	3.3517	1.16360
Land degradation	Less than 10 years	21	2.4424	1.31783
	10 - 20 years	22	2.6100	1.28210
	20 -30 years	22	2.5264	1.41252
	30 -40 years	12	3.2617	1.45001
	40 - 50 years	18	2.4050	1.27326
	More than 50 years	161	3.0756	1.39962
	Total	256	2.8980	1.39401

Table 3.2
ANOVA table showing difference in perceptions across length of residence

		Sum of Squares	Df	Mean Square	F	Sig.
Air pollution	Between Groups	3.057	5	.611	.459	.807
	Within Groups	333.255	250	1.333		
	Total	336.312	255			
Water pollution	Between Groups	19.509	5	3.902	2.228	.052
	Within Groups	437.746	250	1.751		
	Total	457.255	255			
Noise pollution	Between Groups	20.955	5	4.191	3.231	.008
	Within Groups	324.308	250	1.297		
	Total	345.263	255			
Land degradation	Between Groups	20.262	5	4.052	2.132	.062
	Within Groups	475.268	250	1.901		
	Total	495.531	255			

Table 4.1
Mean and standard deviation of pollution perception across income groups

Pollution perception	Income Groups	N	Mean	Std. Deviation
Air pollution	Upto Rs.10,000	49	3.5255	1.24085
	Rs10,001-Rs.20,000	49	3.5663	1.11427
	Rs.20,001-Rs.30,000	23	3.2391	1.54750
	Rs.30,001-Rs.40,000	26	3.2981	1.07940
	Rs.40,001-Rs.50,000	24	3.9792	.83379
	More than Rs. 50,000	85	3.6265	1.07017
	Total	256	3.5605	1.14842
Water pollution	Upto Rs.10,000	49	2.7139	1.17962
	Rs10,001-Rs.20,000	49	3.1343	1.23451
	Rs.20,001-Rs.30,000	23	2.8570	1.39609
	Rs.30,001-Rs.40,000	26	2.6985	1.43276
	Rs.40,001-Rs.50,000	24	3.3929	1.51938
	More than Rs. 50,000	85	3.2384	1.35504
	Total	256	3.0434	1.33909
Noise pollution	Upto Rs.10,000	49	3.1429	1.18079
	Rs10,001-Rs.20,000	49	3.3743	1.21644
	Rs.20,001-Rs.30,000	23	2.9713	1.43518
	Rs.30,001-Rs.40,000	26	3.3981	1.25067
	Rs.40,001-Rs.50,000	24	3.9163	.80044
	More than Rs. 50,000	85	3.3884	1.06261
	Total	256	3.3517	1.16360
Land degradation	Upto Rs.10,000	49	2.2827	1.10486
	Rs10,001-Rs.20,000	49	2.9890	1.57417
	Rs.20,001-Rs.30,000	23	2.5474	.99630
	Rs.30,001-Rs.40,000	26	2.5492	1.27518
	Rs.40,001-Rs.50,000	24	3.5775	1.47428
	More than Rs. 50,000	85	3.2100	1.38532
	Total	256	2.8980	1.39401

Table 4.2 ANOVA table showing differences in pollution perceptions across income groups						
		Sum of Squares	df	Mean Square	F	Sig.
Air pollution	Between Groups	8.804	5	1.761	1.344	.246
	Within Groups	327.507	250	1.310		
	Total	336.312	255			
Water pollution	Between Groups	15.781	5	3.156	1.787	.116
	Within Groups	441.474	250	1.766		
	Total	457.255	255			
Noise pollution	Between Groups	13.310	5	2.662	2.005	.079
	Within Groups	331.954	250	1.328		
	Total	345.263	255			
Land degradation	Between Groups	44.305	5	8.861	4.909	.000
	Within Groups	451.226	250	1.805		
	Total	495.531	255			

Fig. 1

Mean score of pollution perceptions of select mining villages under study

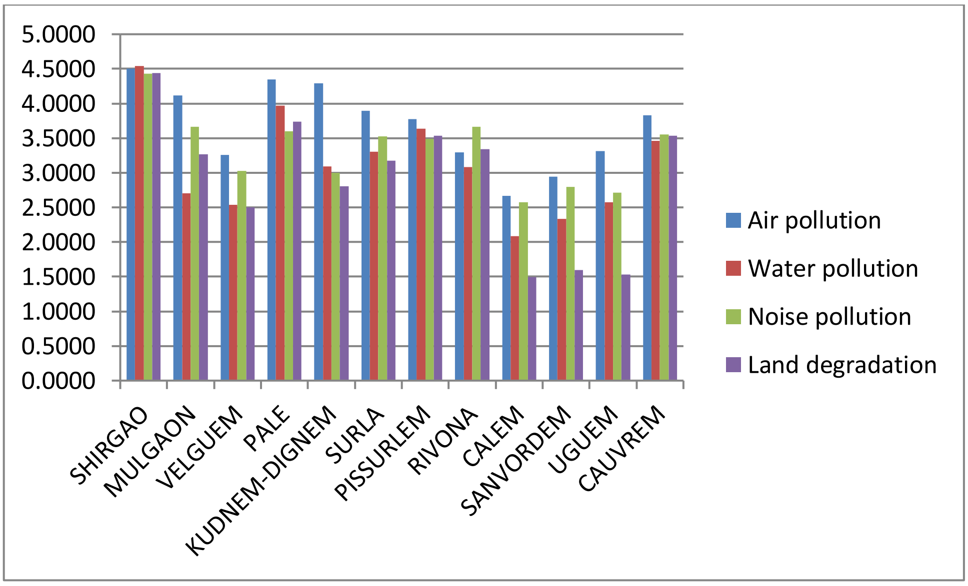


Table 5.1 Multiple Comparisons							
Post hoc Scheffe test to find mean difference in pollution perception of the respondents in the four talukas							
Dependent Variable	**(I) Taluka**	**(J) Taluka**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
						Lower Bound	**Upper Bound**
Air pollution	BICHOLIM	SATTARI	.17778	.22823	.895	-.4646	.8201
		SANGUEM	.86316*	.15517	.000	.4264	1.2999
		QUEPEM	.11944	.22823	.965	-.5229	.7618
	SATTARI	BICHOLIM	-.17778	.22823	.895	-.8201	.4646
		SANGUEM	.68538*	.22388	.027	.0553	1.3155
		QUEPEM	-.05833	.27952	.998	-.8450	.7284
	SANGUEM	BICHOLIM	-.86316*	.15517	.000	-1.2999	-.4264
		SATTARI	-.68538*	.22388	.027	-1.3155	-.0553
		QUEPEM	-.74371*	.22388	.013	-1.3738	-.1136
	QUEPEM	BICHOLIM	-.11944	.22823	.965	-.7618	.5229
		SATTARI	.05833	.27952	.998	-.7284	.8450
		SANGUEM	.74371*	.22388	.013	.1136	1.3738
Water pollution	BICHOLIM	SATTARI	-.42200	.27187	.493	-1.1872	.3432
		SANGUEM	.60430*	.18484	.015	.0841	1.1245
		QUEPEM	-.24067	.27187	.853	-1.0058	.5245
	SATTARI	BICHOLIM	.42200	.27187	.493	-.3432	1.1872
		SANGUEM	1.02630*	.26669	.002	.2757	1.7769
		QUEPEM	.18133	.33297	.961	-.7558	1.1185
	SANGUEM	BICHOLIM	-.60430*	.18484	.015	-1.1245	-.0841
		SATTARI	-1.02630*	.26669	.002	-1.7769	-.2757
		QUEPEM	-.84497*	.26669	.020	-1.5956	-.0944
	QUEPEM	BICHOLIM	.24067	.27187	.853	-.5245	1.0058
		SATTARI	-.18133	.33297	.961	-1.1185	.7558
		SANGUEM	.84497*	.26669	.020	.0944	1.5956
Noise pollution	BICHOLIM	SATTARI	.08533	.24138	.989	-.5940	.7647
		SANGUEM	.50820*	.16411	.024	.0463	.9701
		QUEPEM	.01900	.24138	1.000	-.6603	.6983
	SATTARI	BICHOLIM	-.08533	.24138	.989	-.7647	.5940
		SANGUEM	.42287	.23678	.365	-.2435	1.0893
		QUEPEM	-.06633	.29562	.997	-.8984	.7657
	SANGUEM	BICHOLIM	-.50820*	.16411	.024	-.9701	-.0463

		SATTARI	-.42287	.23678	.365	-1.0893	.2435
		QUEPEM	-.48920	.23678	.237	-1.1556	.1772
	QUEPEM	BICHOLIM	-.01900	.24138	1.000	-.6983	.6603
		SATTARI	.06633	.29562	.997	-.7657	.8984
		SANGUEM	.48920	.23678	.237	-.1772	1.1556
Land degradation	BICHOLIM	SATTARI	-.26389	.26895	.810	-1.0209	.4931
		SANGUEM	1.04846*	.18286	.000	.5338	1.5631
		QUEPEM	-.26822	.26895	.803	-1.0252	.4887
	SATTARI	BICHOLIM	.26389	.26895	.810	-.4931	1.0209
		SANGUEM	1.31235*	.26383	.000	.5698	2.0549
		QUEPEM	-.00433	.32940	1.000	-.9314	.9228
	SANGUEM	BICHOLIM	-1.04846*	.18286	.000	-1.5631	-.5338
		SATTARI	-1.31235*	.26383	.000	-2.0549	-.5698
		QUEPEM	-1.31668*	.26383	.000	-2.0592	-.5741
	QUEPEM	BICHOLIM	.26822	.26895	.803	-.4887	1.0252
		SATTARI	.00433	.32940	1.000	-.9228	.9314
		SANGUEM	1.31668*	.26383	.000	.5741	2.0592

*. The mean difference is significant at the 0.05 level.

Table 5.2
Air pollution

Scheffe[a,b]

Taluka	N	Subset for alpha = 0.05	
		1	2
SANGUEM	106	3.0896	
SATTARI	30		3.7750
QUEPEM	30		3.8333
BICHOLIM	90		3.9528
Sig.		1.000	.892

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 45.865.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 5.3

Water pollution

Scheffe[a,b]

Taluka	N	Subset for alpha = 0.05	
		1	2
SANGUEM	106	2.6117	
BICHOLIM	90	3.2160	3.2160
QUEPEM	30		3.4567
SATTARI	30		3.6380
Sig.		.172	.485

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 45.865.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 5.4

Noise pollution

Scheffe[a,b]

Taluka	N	Subset for alpha = 0.05
		1
SANGUEM	106	3.0661
SATTARI	30	3.4890
QUEPEM	30	3.5553
BICHOLIM	90	3.5743
Sig.		.213

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 45.865.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 5.5
Land degradation

Scheffe[a,b]

Taluka	N	Subset for alpha = 0.05	
		1	2
SANGUEM	106	2.2213	
BICHOLIM	90		3.2698
SATTARI	30		3.5337
QUEPEM	30		3.5380
Sig.		1.000	.798

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 45.865.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.