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Economic Analysis of Impact of Surface Iron Ore Mining on Natural Resources and Economy of Iron Ore Mining Belt of Eastern India

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ECONOMIC ANALYSIS OF IMPACT OF SURFACE IRON ORE MINING ON NATURAL RESOURCES AND ECONOMY OF IRON ORE MINING BELT OF EASTERN INDIA

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EXECUTIVE SUMMARY

1.0 INTRODUCTION, BACKGROUND AND PROBLEM STATEMENT

Keonjhar, Sundergarh districts of Orissa state & Singhbhum district of Jharkand state occupy important places in the mineral resource map of eastern India. In these adjacent districts high quality iron ore occurs under large tracts of forestland rich in bio-diversity. This forestland is covering major parts of Barajamda – Barbil – Bonai Sal forest range. Entire forest range is dotted with several surface iron ore & manganese ore mines of varying production capacities. Apart from few large mechanized iron ore mines there are several small & medium-sized manual mines scattered over the entire area. Annual production of iron ore from different mines is varying from meager production level at small mines to few millions tonnes at big mines. Lease areas of different mines are also varying from less than hundred hectares to more than thousand hectares. Quality of iron ore is also different in various sectors of the mining belt and market demand of iron ore varies from sector to sector. Small mines are frequently closed down whenever there is lack of demand for low quality ore. Usually contractors are engaged in both small and medium sized mines as well as in certain sections of big mechanized mines. In order to maximize their profit these mining contractors resort to unsystematic mining practices by opening up scattered mine workings and dumping waste in a haphazard manner amid rich forest growth. In the entire area different clusters of mines are located depending on deposits of iron ore below surface. Each cluster comprises of mechanized mines (with varying degree of mechanization) and several scattered manual mines. Ownership of these mines is mostly private barring few mines, which are under public sector company. Iron ore is being marketed in domestic market as well as sent to other countries.

Environmental impacts due to iron ore mining in the area include both cumulative environmental impacts of several contiguous small, medium sized iron ore mines as well as environmental impacts of large mechanized iron ore mining projects. In different study areas environmental impacts of these cluster of mines on forest growth and natural watercourses are of prime concern. Large-scale deforestation has taken place for development of infrastructure & other mine facilities.

Mining is continuing in these areas since early part of the last century. There is influx of people from outside the district as migrant laborers. With increase in population there is more demand on forest timbers for fuel wood and other daily uses. Several decades of mining activities in this area have left the hills in this region with negligible forest growth, scattered mine workings and waste dumps etc. No significant effort (barring only a few mines) has been made to rehabilitate mined out areas through plantation. In recent years after enforcement of certain statutory provisions compensatory plantation work has been done by the mining companies in few isolated patches near the mines (mostly with exotic species).

2.0 OBJECTIVE

- Economic analysis of environmental impacts of three selected clusters of mines in combination with manual, semi mechanized & mechanized iron ore mines under the ownership of public and private companies.
- Development of a knowledge base for economic evaluation of environmental impact for mines operating under similar environmental settings.
- Generation of database for estimation of environmental damage cost in the study areas.
- To evolve a methodology that can be used to reduce subjective decision making on environmental aspects of mines both at the operational stage as well as at the project approval stage.
- Integration of environmental damage cost into private cost – benefit analysis of a mining project
- To suggest certain policy by using market and non-market based instruments to reduce damage cost in different areas.

3.0 METHODOLOGY AND DATA

- Three study areas are selected. Each study area comprises of big mines surrounded by number of small mines.
- Study areas have been selected on the basis of ownership of the mines, presence of small manual mines, production level, environmental settings and

socio - economic condition. As far as possible study areas are selected to represent diverse characteristics of the entire mining belt.

BUFFER AND PERIPHERY ZONES

Area falling within 5 km of the active mining area is defined as buffer zone. Any area falling beyond 5 km is considered as periphery zone. In each study area number of villages are randomly selected. Damage cost estimation is based on zone wise differences in agricultural productivity, annual household NTFP earnings and annual household medical expenses.

SAMPLE DESIGN:

- Sample villages are selected at random from list of villages (accessible by jeep). Non inclusion of inaccessible villages is a limitation of this study.
- At the initial stage of survey, lists of households of the selected villages were prepared. Variation in primary occupation at household level is quite significant; therefore stratification is done on the basis of primary occupation.
- Four major strata that could be identified at village level in regard to primary occupation of households are furnished below:
- Mining labour.
- Cultivator.
- Agriculture wage earner.
- Others.
- The sample survey has been conducted by filling up detailed questionnaire in about 20% of the listed households under each stratum. Households have been selected at random taking samples from all human settlements falling under the same village.
- In three study areas forty-one villages are selected for random stratified survey.
- In total 853 households are covered by filling detailed comprehensive questionnaire.

- The questionnaires comprise of thirty one items covering detailed household information on various household wise socioeconomic variables, household earnings from traditional sources, respondents perception about reasons for loss of earning from traditional sources, earning from mining jobs, incidence of various diseases and medical expenses, respondents perception regarding quality of potable water and water for regular use & activities of rural development societies etc.

DATA ANALYSIS

- Descriptive statistics (e.g. tables, charts, averages, dispersions etc.) as well as econometric regression techniques have been used to extract relevant information from available data. Eighty tables, eighteen regression estimates charts & six graphs have been prepared.

EARNING FROM TRADITIONAL SOURCES

- It was observed during field survey that mining activities have caused degradation of natural resources in buffer zone. Extensive land damage and pollution of natural water courses are also reported by the respondents in buffer zone. Also there is significant drop in earning from pre-existing sources (agriculture, NTFP) One reason for this decline in earning could be zone wise variations in socio economic parameters. Several tables are prepared to show frequency distribution of household earning (from agriculture, NTFP) with respect to various household characteristics e.g. household land holdings, family size, and literacy rate, annual household earnings, per capita annual household income. Data reveals that irrespective of various household characteristics average income from agriculture and NTFP earning are low in the buffer zone.

- Decline in earning is being temporarily compensated by cash earning from casual mining jobs under petty contractors. All mines are having a finite life and thus these mining jobs can only provide short-term benefits.

- It is also found that agricultural earning per acre from unaffected land (land not damaged by mining) in buffer zone is similar to that in the periphery zone. This could have never been possible if the villagers (near to mines) would have neglected their agriculture work due availability of mining jobs.

- Tabular data interpretation fits well with regression results. Distance dummy (nearness to mines) & household earnings from agriculture show statistically significant relationship. Similar relationship could be also established with household NTFP earning and distance dummy.
- Tabular analysis as well as regression results corroborate well with field observations and respondent's perception of the problem. Degradation of natural resources in the buffer zone can thus explain decline in earning from preexisting sources in the buffer zone.

ANNUAL HOUSEHOLD MEDICAL EXPENSES

- In buffer villages there is high incidence of bronchial diseases and stomach trouble. Zone wise difference in medical expenses could be found for all classes of socioeconomic variables like literacy level, annual household expenses, family size, per capita household income etc. Thus increase in medical expenses near mines may not be explained by any socioeconomic features In this case also regression results show good data fit with distance dummy (distance from active mining zone) & household annual medical expenses which is similar to the findings of data analysis. Degradation of environmental quality in the buffer zone is found to be the prime reason for increase medical expenses in mining areas.

RURAL DEVELOPMENT

In one study area a private company has set up a rural development society to reinvest some of it's profit in renewable resources in the surrounding areas. Several charts are drawn to illustrate the respondent's perception about rural welfare measures implemented by society.

4.0 ECONOMIC ANALYSIS OF ENVIRONMENTAL IMPACT

- Damage cost is calculated on the basis of household sample survey data covering forty-one villages in different study areas.
- Environmental economic components that are selected for the purpose of damage cost calculation are as follows:
- Loss of annual agricultural earning of households falling in the buffer zone.

- Loss of annual household NTFP earning of households falling in the buffer zone.
- Increase in medical expenses of households in the buffer zone.
- Damage cost is estimated from inter zonal differences in household earnings (agriculture & NTFP) & medical expenses.
- Several major environmental economic components which have been left out of the purview of the research work (as per final project proposal) are as follows:
- Loss of bio diversity
- Loss of wild life habitat & its consequent damage on human settlements and crop lands
- Loss of timber products
- Deterioration of aesthetic beauty of the area
- Deterioration of quality of water available for regular use and drinking purposes.
- As the present study does not take into consideration some of the major environmental economic components damage cost estimation may be treated as only benchmark estimate.
- Damage costs are estimated for only five mining areas (two study areas & three clusters of the other study area). This number is quite insufficient for any econometric analysis. Thus no further econometric analysis is attempted. Instead, on the basis of results of data analysis specific characteristics of the study areas are examined. Ultimate aim is to arrive at a broad policy frame work for the entire mining belt.
- The study areas are further divided into five categories. The clusters / study areas are categorized on the basis of level of mechanization, ownership of mines and social welfare activities undertaken by the company (based on the respondent perception).

- Damage cost per year is significantly low in those parts of the study areas where mine excavations are restricted by adopting mechanized mining operations and the same is highest in case of scattered manual mines.
- Damage cost for each area is also expressed as per unit output & per household basis. These figures also reveal similar trend.

FINACIAL ANALYSIS

- In case of small manual mines fixed cost is low mainly due to minimum investment, negligible overhead & low establishment cost. Overhead expenses in case of big manual mines are high & total mining cost is higher than mechanized mine (running at it's full production capacity).

INVESTMENT ANALYSIS

- As stated earlier that small mines are run through contractors without making any significant initial investment in mineral exploration, machinery purchase, infrastructure development etc. Initial investment made at these mines is only few lakhs.
- Most of the big manual mines are run through contractors. At these mines departmental labours are mostly engaged for waste removal. Investments were made long back mostly on machines & township development. Historical cost figures are not presently available.
- To develop a mechanized mine with ore beneficiation facility & other infrastructure investment will be above 300 crores.
- An alternative way to reduce initial investment is by deploying rental machines and engaging a monopoly contractor. Required investment will be few crores. .

BENEFIT

- Benefit estimation is not included in the terms of reference of this project. However an attempt is made to make only a rough estimate of project benefit taking into account only number of mining jobs created in each study area.
- All manual mines provide contractual mining jobs to the villagers. However the short-term benefits accrued from mining jobs will not be perceptible after mine

closure. On longer term it appears that the society will continue to bear damage cost for several years even after mine closure (till the mine is naturally reclaimed).

- In case of mechanized mines major mining operations mechanized there is limited scope of direct employment at mines. Several contractual transportation & loading jobs are available.
- Other benefit like infrastructure development in remote mining areas is not taken into account in the present estimation. This may be noted as limitation of the present study.

SOCIAL COST-BENEFIT ANALYSIS AND POLICY RECOMMENDATIONS

An attempt is made to integrate damage costs, benefits with private costs and benefits of various mines. SCBA results provide only a snap shot view hence non-availability of time series data is another limitation of the present study.

- Values. of ratio of both social benefit/ social cost ratio as well as benefit / damage cost are low in case of manual mines. . On the other hand mechanized mines (running at almost full capacity) show high value of the above ratios. Also estimated values of damage costs are high values in case of manual mines. Certain policy reform is thus essential to restrict manual mining. Based on past experiences it can be opined that command and control measures will not be very effective in filling up any of the existing policy vacuum. It appears that use of market-based instruments can be an effective tool for future policy implementation.
- One of the policy options could be to tax the mine operators on the basis of damage cost the society will have to bear for environmental degradation. In that case the manual mines would have to bear high tax burden. High taxation in such cases may act as an incentive for mine operators to adopt improved technology, which will ultimately reduce both damage cost, tax imposed on them along with total mining cost.
- Mechanization is precisely absent in case of small and medium sized mines, which contribute most to the environmental damage. Results also provide

ample evidence to show that mechanized mining can set a balance between economic gains from mines and degradation of natural resources.

- One of the major constraints in use of economic instruments for inducing these mines to adopt mechanization is huge investment requirement. Imposition of taxes will only eliminate small mine operators that can be one policy option. Loss of meager production from these manual mines can be met by intensification of mining activities at big mechanized units.
- Total mining costs of big manual mines are higher than mechanized mine running at almost full capacity. Imposition of taxes will initially deflate their profit margin during mine restructuring period. On long term basis by restructuring their units average variable cost will decline as is evident from financial data of mechanized mines Also it is seen that through good financial performance, capacity utilization & increasing managerial efficiency a private mining company could significantly reduce per unit fixed cost. By restructuring their units the mine operators will thus be able to enhance private benefit from the present level and also build up enough surplus for reinvestment in welfare of the local people who are adversely affected by mining.
- Restructuring of unit operations will require certain level of investment. Tax imposition will enforce elimination of small unit operation and promote amalgamation of units under collective ownership.
- As an additional force to induce the small mines to adopt mechanization the prevailing restriction on area of operation by MOEF needs to be continued.
- Mine operators are mostly attracted to operate small mines to earn quick profit by making very low investment. This necessitates that permission for any manual mining can only be granted in such cases where SCBA indicate high social benefit on longer term. However as mining is having several site-specific variables such policy implementation may be judged as per local geo mining conditions. Implementation of such policies should also take note of the fact that all mineral deposits are not amenable to mechanization
- In future permission for manual mining may be strictly restricted to minerals with low national inventory. In such cases exploitation of small scarce mineral resources (not amenable to mechanization) might be necessary to meet raw

material requirement of the country. Such policy exemption is not applicable to iron ore as nature has endowed this country with abundant iron ore reserve. It seems that imposition of restriction on small iron ore mines will not significantly affect the consuming industries except non-availability of iron ore at cheap price. Since at these mines production level is meager the policy outcome will not adversely hit the consuming industries. This calls for inclusion of social cost–benefit analysis in decision-making framework.

- On comparison between the financial performances of two mechanized mines it is found that following factors, require needful consideration in policy design.
- In spite of huge investment at public sector mechanized mine it is seen that it's overall performance is distinctly different from a private sector mechanized mine both in respect to financial performance & capacity utilization etc. It is reported that the reasons may be administrative. Difficult geo mining conditions cannot be the major contributing factor for the above performance as the property was explored well in advance before making such huge investment decisions. (Further discussion on this aspect is beyond the scope of this study.)
- Use of economic instruments is likely to fail if the companies cannot record efficiency gains .The companies should attain certain level of efficiency in operation so that the company can build infrastructure for rural development. Incentive for the company to make technology changes to attain the above level of efficiency may be provided in form of tax relief.
- In the present study SCBA could be conducted for only three study areas, which is quite insufficient for drawing any marginal cost curves to assess the rate of taxation. This major limitation, which has restricted any scope of further econometric analysis. With the limited data available a broad policy framework could be only recommended. Further intensification of research for design of tax structure is essential.
- As discussed earlier that a private sector mine could transfer some of its efficiency gains to the society through reinvestment in renewable resources of the area like agriculture, forestry etc. Necessary infrastructure has been built for the purpose. Social benefits in this case are being generated on a long

term basis. Future generation being deprived of iron resources (in that particular area) will make higher earning from agriculture, forestry etc. In order to adopt the above principle of sustainable development any future policy should aim at inducing the mine operators to invest in renewable resources of the area.

- Hartwick (1977), Solow (1986), Hassan et.al (2002) and others opined that some part of the proceeds from the exploitation of non renewable resources may be reinvested in other forms of capital assets that are capable of providing at least the same stream of benefits in the future. As discussed earlier this is attempted on a very limited scale in S3 area by reinvesting some of the proceeds of sales revenue for better management of agriculture and forest resources. Needless to say that there is scope for further improvement by intensification of welfare activities and mobilization of funds from other agencies.
- In order to preserve traditional livelihood of the area a modified form of model of rural development society could replicate in other mining areas too. The modification that needs to be introduced is to be a collective action of small and medium sized mine owners. Since there is a problem of collective action here the solution may come as an administrative command and control policy. Alternatively these small mine owners could be asked to contribute according to their area of operation to a common fund which could operated either by some institutions e.g. elected body of their own or autonomous NGO etc. Government may also transfer a part of the royalty collected from these mines to such restoration activity.
- International and government agencies may be encouraged to canalize their available welfare funds to these rural development societies.
- It is essential that the rural development society will give priority to the management of water and land in the area as well as form save forest management groups to enhance earning of the local villagers from traditional means of livelihood of the area.
- Further improvements in the model are suggested here, which include participation of local community or their representative in the decision making,

planning and implementing different welfare scheme. Local people should be involved to know about the perception of problems existing in the area

IMPROVED MINING TECHNOLOGY

Iron ore mining is essential to meet raw material requirement of the society but it runs the risk of environmental degradation. By adoption of improved mining technology suggested below it is possible to mitigate environmental damages to a certain extent.

- Basic objective of any improved technology is to adopt environmentally sustainable mining practices. It is essential to both restrict the size of mine excavation and also to attain the desired output level, quality requirement of the end users. This calls for systematic mine planning. Prerequisite mine planning is development of database on subsurface iron ore occurrence. To develop such database costly iron ore exploration will have to be undertaken. In order to maximize their profit margin owners of small and medium sized mines usually avoid exploratory work. In absence of subsurface database small and medium sized mines haphazardly extract iron ore without any fore planning. Scattered excavations are made and in case no iron ore is found these excavations are abandoned and fresh ones are made. These scattered mine workings cause extensive degradation of natural resources of the surrounding areas. Since these small leaseholds are contiguous the cumulative impact of these small mines is quite significant. Thus it is essential to restrict mining operations in leaseholds where there is insufficient subsurface database. Barring a few big mechanized mines this database is not available with most of the mine operators.
- To restrict sizes of mine workings as well as achieve desired output mine operations will have to be mechanized by deploying excavators, matching capacity of dumpers and large diameter drills.
- Mine planning software may be used for precise demarcation of the excavation areas.
- Unless strict supervision can be ensured engagement of contactors may be restricted to the extent possible.

- At most of the mines several old mine excavations exist. These are prone to severe erosion for several years. Thus immediate decision may be taken on future working / abandonment of these discontinued mine workings.
- Waste dumps degrade the surrounding environment. Improved waste dump management can be done by digging diversion drains all around the dumps, flattening of dump slope, constructing retaining walls and garland drains, terracing of waste dumps, planting quick growing grass on dump surface to check soil erosion etc.
- As far as possible creation of external dumps may be avoided. Instead effort may be made to backfill the old abandoned excavations after confirming presence or absence of iron ore at depth.
- Arrangements may be made to divert surface runoffs from the mined watershed to settling tanks before discharging muddy water to surrounding areas.
- Green belt may be developed around the active mining zone to control air & noise pollution.
- Water discharged from tailing dams may be periodically checked. In case of overflow during monsoon dams will have to be progressively heightened keeping safety norms in view.
- Check dams may be erected on all natural watercourses flowing in the area.
- Diversion drains may be also dug all around the active mining area to prevent water from surrounding areas from entering into the mines. This will reduce the rate of flow of muddy water from active mine workings.
- Crusher units will have to be installed in covered areas with proper water spraying arrangements at dust generating points.
- As far as practicable several smaller crusher units may be replaced by high capacity crushers (located centrally) to cater to the needs of several small mining units.
- Virgin forest patches may be left intact on areas where no iron ore exists below ground.

- Township and other mine facilities may be located as far as practicable in non-forest land

CONCLUSION

Mining to extract non-renewable resources played a crucial role in economic development of any country. India has a large resource base of iron ore and is also playing a significant role to meet iron ore demand of both domestic & world markets. Mining activities in the region has substantially contributed to economic growth of the country by providing raw material essential for industrial development. But it runs a risk of environmental degradation. In case too much of the environment is being consumed through depletion of forest resources and down stream pollution of water bodies etc. it will create an external cost to the society in form of water, air & soil pollution. Economic development and sound environmental management are complementary aspects of the same agenda. Future productivity can be jeopardized if development results in soil degradation and destroys natural eco system.

Prerequisite to environmentally sustainable development of iron ore resources is integration of environmental issues in decision-making process both at the project approval stage and operational stage. It is essential to use economic instruments to reduce subjectivity in decision-making. This can be only achieved by integration of damage costs and benefits, if any, to private cost – benefit analysis of a project. Lack of comprehensive database on various project externalities presently restricts use of social cost – benefit analysis for the said purpose. It is also discussed earlier that there is an urgent need to make shifts in polices and priorities to ensure sustainable development of iron ore resources. Future policies should aim at reduction of damage cost. Extensive research work on economic analysis of varied project externalities is essential before making any such policies changes. Unfortunately no information on any significant research work in that direction is presently available.

In view of very limited scope of the present study, remoteness of the study area, adverse field survey conditions etc. comprehensive environmental economic components could not be accommodated in this study. Future research can be directed towards 1) a more comprehensive SCBA of mining projects based on time series & or larger cross section information; 2) economic analysis to identify policy measures to provide incentives for mining companies to invest and adopt cost

effective pollution control technologies; 3) Incentive to mining companies in taking compensatory & corrective social welfare schemes.

CHAPTER I : Introduction, Background And Problem Statement

Keonjhar, Sundergarh districts of Orissa state and Singhbhum district of Jharkand state occupy important places in the mineral resource map of eastern India. In these adjacent districts high quality iron ore occurs under large tracts of forestland rich in bio-diversity. This forestland is covering major parts of Barajamda – Barbil – Bonai Sal forest range. Entire forest range is dotted with several surface iron ore & manganese ore mines of varying production capacities. Apart from few large mechanized iron ore mines there are several small & medium-sized manual mines scattered over the entire area. Production of iron ore from different mines is varying from meager production level at small mines to few millions tonnes at big mines. The lease areas of different mines are also varying from less than hundred hectares to more than thousand hectares. Quality of iron ore is also different in various sectors of the mining belt and market demand of iron ore varies from sector to sector. Small mines are frequently closed down whenever there is lack of demand for low quality of ore. Usually contractors are being engaged in both small and medium sized mines as well as at certain sections of big mechanized mines. In order to maximize their profit these mining contractors resort to unsystematic mining practices by opening up scattered mine workings and dumping waste in a haphazard manner amid rich forest growth. In the entire area different clusters of mines are found depending on nature of deposit of iron ore. Each cluster comprises of mechanized mines (with varying degree of mechanization) and several scattered manual mines. Ownership of these mines is mostly private barring few mines, which are under a public sector company. Iron ore is being sent to domestic market and also to other countries.

Environmental impacts due to iron ore mining in the area include cumulative environmental impact of several contiguous small, medium sized iron ore mines as well as large mechanized iron ore mining projects. In the study areas environmental impacts of these cluster of mines on forest growth and natural watercourses are of prime concern. Large-scale deforestation has taken place for development of infrastructure & other mine facilities.

Mines usually have a finite life span depending on the subsurface reserve of iron ore. In extensive mined out areas irreversible damages on rich and diverse forest ecosystem have taken place. Derelict lands left behind after mining is discontinued, becomes a source of environmental degradation for several years. Loss of forest cover results in severe soil erosion from extensive mined out areas and scattered waste dumps to adjacent agriculture lands which are covered by red mud during monsoon season. Eroded materials from these de-vegetated mining areas are allowed to flow into the natural watercourses where large quantities of silt accumulate over several years. Villagers are often forced to drink water from these nallahs because number of wells & tube wells provided at their villages are quite insufficient. Moreover the existing ones are frequently inoperative. These adverse environmental impacts bring some irreversible changes in the local environment around the mines as well as sharp decline in household earning from traditional sources like agriculture & forest produces etc.

Mining is continuing in these areas since early part of the last century. There is also influx of people from outside the district as migrant laborers. With increase in population there is more demand on forest timber for fuel wood and other daily uses. Several decades of mining activities in this area have left the hills in this region with negligible forest growth and scattered with mine workings, waste dumps. No significant effort (barring only a few mines) has been made to rehabilitate mined out areas through plantation. In recent years after enforcement of certain statutory provisions compensatory plantation has been done by the companies in few isolated patches near the mines (mostly with exotic species).

Environmental damage, which does not directly affect private cost of mining companies, is termed as externalities. Surface iron ore mining generates several negative externalities. However there are some positive externalities too like employment generation, development of infrastructure in remote mining areas etc. These project externalities are seldom taken into account in any decision making process both at the project approval stage as well as operational stage of a mining projects. In the selected study areas so far no significant effort has been made to estimate the damage cost the society will have to bear on account of mining activities continuing in these areas. The forest departments enumerate mostly timber products & implicit valuation of non-timber products is also done while granting de-

reservation proposal for diversion of forestland for mining purposes. So far no database on various project externalities could be found with different government & research agencies.

In absence of any valuation of some of these project externalities, the scarce environmental resources degraded by the mining operations are not priced i.e. assumed to be available to the mine operators at zero prices. In this context it will not be out of place to refer to the practical guideline issued by Economic Development Institute of the World Bank wherein this phenomenon has been termed as market failure, as it fails to signal the exploitation of scarce natural resources through proper market pricing. The ultimate result is bad projects are chosen and good project are not given due consideration. As per available World Bank publication only solution to this market failure is to internalize these externalities in cost-benefit analysis of mining projects.

Against the above backdrop, in very limited project tenure an attempt has been to undertake economic analysis of only few of the major environmental impacts of surface iron ore mining on natural resources of the study area. Major environmental impacts that are covered under this study are as follows:

- Slitation of perennial nallah courses and consequent environmental damages.
- Large tracts of land are left bare devoid of vegetation form mined watershed in the subcatchment areas of the neighboring river basins. During severe storm events surface runoffs from the mined watershed cause extensive damage to the agricultural land, grazing land & forest growth in the buffer zone.
- Extensive deforestation leads to loss of timber & non-timber forest products. Both these products are essential items both for daily use & also sources of earnings for the local villagers.
- Mining operations involve emission of airborne dust from point and non-point sources, which include mine workings, dumps, haul roads, crushers, loading and unloading stations etc. This often led to high incidence of lung diseases as well as loss of land property value & agriculture productivity etc.

Environmental impacts, which have not been taken into account for the purpose of estimation of damage cost, are as follows:

- Loss of biodiversity reserve of forestland.
- Loss of forest timber product.
- Degradation of aesthetic quality of the study area.

Economic analysis of these major environmental impacts is left out of the purview of this study. Thus the damage cost estimated here can only be termed as a benchmark estimate. Damage cost will increase substantially if the above environmental economic components are also taken into consideration.

The present work has been arranged in the following pattern. Chapter II deals with the objective of the study. Some of the relevant works done earlier on economic analysis of environmental impacts are discussed in Chapter III. Board outline of the methodology adopted in the present work is presented in Chapter IV. Comprehensive data analysis by means of cross tabulation, regression, charts is furnished in Chapter V. Economic analysis of environmental impacts along with financial analysis of operating mines are discussed at length in Chapter VI. An attempt is made to provide a snap shot view of social cost-benefit analysis of different study areas (Chapter VII). This exercise has helped the investigators to recommend a broad policy framework for the entire mining belt.

CHAPTER II: OBJECTIVE

- Economic analysis of environmental impacts of three selected clusters of mines in combination with manual, semi mechanized & mechanized iron ore mines under the ownership of public and private companies
- Development of a knowledge base for economic evaluation of environmental impacts for mines operating under similar environmental settings.
- Generation of database for estimation of environmental damage cost in the study areas.
- To evolve a methodology that can be used to reduce subjective decision making on environmental aspects of mines both at the operational stage as well as at the project approval stage.
- Integration of environmental damage cost into private cost – benefit analysis of a mining project
- To suggest certain policy by using market and non-market based instruments to reduce damage cost in different mining areas.

CHAPTER III : LITERATURE REVIEW

Mining activities in the region has substantially contributed to economic growth of the country by providing raw material essential for industrial development but has also degraded environment. In case too much of the environment is being consumed through depletion of forest resources and down stream pollution of water bodies etc. it will create an external cost to the society in form of water, air & soil pollution. These external costs (OECD publications; 1995) in absence of proper pricing cannot be captured through market. As a result the market fails to signal the exploitation of scarce natural resources for project activities. Much of the mismanagement and inefficient use of resources can be traced to malfunctioning and distorted or totally absent market. An example is mine waste dumps polluting the forest growth & natural water courses which generate external cost in form of enhanced household medical expenses, loss of earning from forest products etc. (Poulin et.al. 1992). Needless to say that these external costs are seldom included in economic evaluation of any mining project.

Economists are concerned with sustainable development of the exhaustible resources e.g. mineral resources. Solow (1986) provided an estimate for sustainable rate of extraction. El Serafy (1993) has used the idea of permanent income to calculate the true income from the use of exhaustible resources. He suggested that the present value of the resources can be equated to the present value of annual income available forever and any income in excess of that is really depreciation of the capital.

Total economic value of an environmental good can be assessed from market based objective valuation and stated preference based valuation. (Banerjee, 2001)

Total economic value = Actual user value + Option value + Option value + Existence value.

An example of objective based market valuation is assessment of agricultural productivity impact. The productivity impact approach is much direct as unlike health the agricultural products; their reduced output, the lost value of forest resources due to deforestation are all market based transactions. Brandon & Hommann (1995) have presented a rough estimate of total magnitude of environmental costs

associated with environmental degradation in India. In stated preference approach based valuation, total economic value of any particular good or service can be assessed in terms of willingness to pay (WTP). Chopra (1998) tried to find out the marginal WTP for the access to a National Park. Contingent valuation method has been used (Murty M.N. et.al.) to measure user benefit of Ganga Action Plan by formulating an econometric model through construction of a bid function by incorporating age, water quality & education, income etc. In case of industrial pollution an attempt has been made to estimate adverse health impact by assessment of the cost of environmental degradation. Gerking & Stanley (1986) have estimated consumer marginal WTP for better quality of urban air. Misra (1998) provided empirical evidence on costs of water pollution abatement to comply with State Pollution Control Board standards set up for Nandesari Industrial Estate in Gujrat (comprising of 250 small factories) She showed the necessity of water pollution tax on factories for bringing about complete abatement.

Loss of agricultural productivity due to adjoining mines is one of the research areas covered under this study. This loss of earning is related to soil loss due to erosion. In developing countries there is no methodology to value soil loss. Parikh (1989) has shown that yield-input relationship depends on climate and soil characteristics. Experimental data from few locations show a relationship between soil loss or salinity and loss of agricultural production. Repetto ;(1987), Magrath and Arens; (1989), Bishop and Allen (1989) used an erosion-yield relationship obtained from experimental data from Nigeria and Mali, uniformly for all crops of the region. Repetto et.al (1987) has considered same loss of agriculture production to occur every year while evaluating loss of agriculture over a period of time.

Dixon et.al. (1986) have used loss of earning and medicinal expenses technique due to illness caused by industrial activities on the society. Human capital approach has been used by Mishan (1982), Ridker (1967) and Kneese (1966). Shanmugam (1988) have used similar human capital approach using data from India. Willingness to pay approach (Fuchs; 1982) has been increasingly used to measure prices paid for preventing health and death risks. Most of the empirical studies for valuation of life and injury risks are carried out for developed countries and not for developing countries (Viscusi; 1993). The various methods used for estimating the implicit prices of life and health are cost of illness approach and insurance approach, court award,

compensation approach and portfolio approach (Linnerooth; 1979). Alberini et.al. (1997) measured health cost through contingent valuation approach. One of the method is calculation of discounted future earning by sum of direct expenditure for medical care, foregone earning attributable to morbidity plus the cost of premature deaths which is assumed to be equal to the present value of future earnings. This approach is recently more formalized by World Health Organization (WHO) and the World Bank (World Development Report; 1993) through the concept of DALLY (Disability –Adjusted – Life – Years)

Non-timber forest products are essential source of livelihood and sustenance of people residing in villages near the forestland. In the year 1992 IBRAD has prepared a list of NTFP as well as collection time for Midnapur disrict, West Bengal. In Raipur district (Chopra 1994), Madha Pradash considering agricultural laborers, rural artisan and marginal small farmers, NTFP collection constitutes more than 98% of secondary source of their livelihood. There are several marketing channels like tribal agents, whole sellers, and primary retailers in the local market. She computed the value of the NTFP considered relevant in the local market under these alternative market channels.

Non-timber forest products (NTFPs) have been vastly reduced as a result of large-scale deforestation for development of infrastructure and other mining activities. Several authors have emphasized the role of NTFP as an important source of earning for village community (Godoy et.al. 2000; Almeida 1996; Ogle 1996; Falconer 1990). NNTP earning is seen as supporting the economic development process, serving as a safety net for households entering new economic activities and markets (Byron and Arnold 1999). The supplemental role of NTFP is considered particularly important for the poorest households (Cavendish 2000;Godoy and Bawa 1993; Hecht et al 1998;Reddy and Chakrabarty 1999). In a recent paper Pattanayak and Sills (2001) have explored the potential for tropical forests to provide local natural insurance with a model relating agricultural risks to collection of forest products. They found that forest collection is positively correlated with both agricultural shortfalls (consumption smoothing response) and expected agricultural risks (income smoothing response) in an event-count model of survey data from the Brazilian Amazon. This indicates that households rely on the forest to mitigate the risk inherent to subsistence agriculture. Households, who had more opportunities to

learn about the local forest, by living in their communities longer, take more forest collection trips. Forest may be particularly important to households without other options to smooth consumptions but that its importance is not restricted to relatively poor households.

Arnold and Perez (1996) has opined that the selective nature of market demand and the uneven distribution of resources of use values within forests mean that with NTFP harvesting the resource can become altered and degraded. The pressure that market forces can place on local control mechanism and the conflicting interests of those using forest resources for subsistence and income generation can also result in poorer users becoming disadvantaged as NTFP commercialization is intensified. An approach that recognizes such areas of conflict, and attempts to arrive at a realistic balance between development and conservation, is proposed.

R Hedge and T. Enters (2000) in a study undertaken in the Mudumalai Wildlife Sanctuary and the adjoining Sigur Plateau in the state of Tamil Nadu tried to quantify the forest dependence of local people and assess to what extent restrictive bio diversity conservation strategies would affect their livelihoods. Their study showed considerable differences existed between households in different income groups in proximal and distal villages. Per capita income from NWFP (Non Wood Forest Product) collection showed an increasing trend from LIG to HIG households in proximal villages. In total the extent of forest resource use is greater in proximal villages than in distal villages because the proximal villages had better access to market and resources compared to distal ones.

Prem L. Sankhayan and Ole Hofstad (Sept 2000) constructed a village level dynamic, stochastic and non-linear programming model incorporating both economic and ecological aspects to study the complex woodland degradation process in the Sub Saharan Africa. The emphasis is on simultaneous accounting of the effects of three major causes of woodland degradation namely land clearing, grazing and extraction done for wood fuel, poles and charcoal that have not been attempted before.

John Creedy and Anke D. Wurz (November 2000) examined the optimal management strategy for forested catchments in Thomson Catchments, Central Gippsland, Victoria that yields timber water and carbon sequestration benefits. The

Faustman multiple rotation model has been extended in the analysis to allow for the maximization of the net present value of these timber and non-timber benefits. In the benchmark case allowance for both of the benefits were found to lengthen the optimal rotation to infinity.

Garry D. Peterson and Marieke H Cemeskerk (February, 2001) estimated deforestation from gold mining and analyzed the regeneration of abandoned mining areas in the Suriname Amazon. As had been revealed from the study, small-scale gold mining had substantial long-term effects on the forest cover of areas in the Suriname Amazon where mining is concentrated. Massive repeated soil movement that accompanies mining greatly slows regeneration and produces vegetation cover that is qualitatively different from that in nearby old growth forest.

Ben H.J De Jong, Richard Tipper et al (1999) assessed the potential of an incentive based program to stimulate small farms and communities to adopt bio mass accumulating measures such as agro forestry or improved forest management. The authors estimated the carbon sequestration potential of a number of alternative technique based on farmer's preferences. The most cost effective method for sequestering carbon appears to be the improved management of natural forests on communal lands.

Jyoti k Parikh, Subhas K Reddy, et al. in a paper assessed financial as well as economic viability of various plantation programs by valuing both benefit and cost streams at discounted market prices. The authors came to a conclusion that the economic and social benefits of the plantation are significant. Such benefits can form a rationale for starting plantation programs even in a market driven economy.

Extensive literature has been developed in resource economics to study the mining activity and their impact on a country's resource stock, environmental condition etc. Since an exhaustible resource is limited in quantity and is not reproducible extraction and sale of a unit today involves opportunity cost, which is the value that might have been obtained at some future date. Opportunity cost is usually given the name 'user cost' (Bhattacharya; 2001). Substantial research work has been pursued in this sphere to find the optimal depletion rate of an exhaustible resource with the help of 'user cost'. Salant (1995) has introduced a more inclusive definition of marginal cost

as augmented marginal cost to be defined as the marginal cost of extraction (mc) + user cost (uc).

J.N Blignaut and R.M Hassan (2001) applied an approach of natural resource accounting in his study to evaluate the performance and sustainability of mining practices and strategies in South Africa. The study showed that except for a brief period during 1980s rent capture was very low and almost all the resource rent from minerals dissipated to private companies. Recently however user costs have been reasonably covered by taxes and institutional royalty and the capital component of the rent (user cost) has fully been reinvested by mining companies.

Cairns (2001) has used r percent rule when extraction from mineral deposit is constrained by fixed capacity. It is not identical to Hotelling's rule and specific to a given mine. A component of instantaneous profit at the margin is the shadow value of capital. To obtain the user cost of the resource, to which the r percent rule applies, the analyst must subtract the shadow value of capacity from the usual difference between price and (short run) marginal extraction cost. But this shadow value is not, in general, given by the depreciation calculated by common formulas. There need be no link at all between firms' reported, or an analyst's imputed, depreciation and the shadow value of capacity. Rather, as a proposal for future empirical work, they had derived alternative methods of estimating the shadow value of capacity and the resource using currently observable variables.

Chermak and Patrick (2001) have developed a test of the theory of exhaustible resources at the level of individual natural resource deposits. The authors generalized the economic theory of exhaustible resource production to:

a. Allow falling marginal cost.
b. Consider physical bounds on periodic production.
c. Account for interdependency (feedback) between the stock of resource, the periodic production bounds and the chosen production path.

With the empirical data from 29 natural gas producing firms, they found that the in-situ price of the resource falls with gross production at any point in time.

Environmental resources possess certain characteristics of public goods such as indivisibility and non-excludability. Natural resources like forest, water resources

provide recreational facilities, helps to maintain carbon cycles; provide life-support system to plant and animal or biodiversity and aquatic life. Such benefits are not contingent upon paying price since property right cannot be defined and one individual consumption of these facilities does not reduce others (Murthy, 2001). Because of these characteristics environmental resources are subject to overexploitation in free market and hence proper institutional framework like command and control through government or people's participation and market mechanism are recommended. Extensive literature has been developed in this aspect to identify the proper framework for pollution control.

Environmental tax reform (ETR) represents important development in environmental policy and public finance reform. Instead of taxing economic goods like factors of production labor and capital. ETR shifts tax burden to environmental "bads" like pollution and use of natural resources (European Commission; 1997).

Bonit Bosquet (2000) reviewed the practical experience and available modeling studies to investigate whether ETR produce double dividend; help the environment without hurting the economy. A good deal of debate in recent years has aroused in response to the so-called double dividend hypothesis. Number of recent analytical and numerical analysis have cast doubt on the validity of the hypothesis (Bovenberg & Goulder; 1998) on the ground that an important source of interaction between environmental taxes and preexisting taxes has been ignored. Since environmental taxes cause the costs and prices of products to rise they tend to discourage labor supply and investment and thereby exacerbate the efficiency costs associated with tax distortions in labor and capital markets. The cost from this interaction effect dominate any efficiency benefit from recycling environmental tax revenue in other tax reductions.

Feldstein estimated that efficiency costs of raising extra revenue through income taxes are much larger when the substitution between tax-favored consumption and ordinary non-tax favored consumption is taken into account. Parry and Bento (1999) extended the previous literature by exploring the implications of the tax-favored consumption for the general equilibrium costs and overall welfare effects (benefits less costs) of environmental policies. The authors found that the presence of tax-favored consumption can substantially reduce the cost of environmental taxes. In their benchmark simulations ignoring any environmental benefits, net impact of an

environmental tax swap is to significantly reduce the overall economic costs of the tax system for pollution reduction up to at least 50%. The overall costs of pollution taxes are negative for pollution reductions up to 19-33% in their benchmark simulations.

Some environmentalists express concern that in the presence of international trade and globalization, government may relax their environmental policies to give domestic producers a competitive advantage in international markets (Brander and Spencer; 1985, Barrett; 1994,Conrad; 1993-96). However several papers showed the reason why the incentive for government to relax environmental policy is low. This is the case for price instead of quantity competition (Barrett; 1994,Rauscher; 1994,Ulph; 1996). The conventional approach in strategic trade and tax models was to look at a two-stage game where government set taxes first and then firms react. In such a policy regime the government is concerned about the international competitiveness of its firms and sets taxes below marginal damages. Klaus Conrad (2001) in a paper considered a policy regime with reversed timing. Firms commit themselves in the face of emission taxes to abatement efforts and to lower levels of environmentally sensitive output. Then the government introduces the tax. Under this timing of strategies the tax is equal to marginal damage. Firms waive profit and reduce output in order to use less of the polluting input. This will call for less strict use of policy instruments and hence lower abatement costs in the near future.

Several recent papers show that different combinations of tax and subsidies can achieve the social optimum for green design and household waste management when there is various market failure (Fullerton and Kinnaman; 1995, Fullerton and Wu; 1998, and Choe and Fraser (1999). However Choe and Fraser (2000) have showed that this policy flexibility depends on the ability of the government to introduce necessary policy instruments to target the relevant behavior of economic agents**.** If households can make a waste reduction effort, that is not observable to the government, then the optimal policy is a unique combination of the given policy instruments. This optimal policy outcome is strongly Pigouvian (Cremer et al 1998) and closely based on the user-pays principle.

Cees Van Beers and Joren C.J.M van Bergh (2000) in an article discussed about policy failures at the international level due to environmentally damaging subsidies (EDS). While inspection and pollution charges jointly determine the expected penalty

faced by a firm that fails to comply with the regulatory standards, their results demonstrate that at the plant level, the variation in inspections is a better determinant of the firm's environmental performance than is the variation in the pollution levies.

In India no significant research work for evaluation environmental damage cost imposed on the society by the mining companies is available. Also no literature is found on use of economic instruments to regulate mineral production to socially optimum level of output.

CHAPTER IV : METHODOLOGY AND DATA

Study areas mostly comprise of clusters of big mines & adjacent small mines. The mines being contagious it is not always possible to segregate environmental impacts due to a single mine. Thus instead of a single mine a cluster of mines (in each study area) is considered for the purpose of this project work.

SOCIO ECONOMIC AND ENVIRONMENTAL FEATURES OF DIFFERENT STUDY AREAS

Brief account of diverse characteristics of the study areas are described below:

OWNERSHIP, PRODUCTION & TECHNOLOGY LEVEL:

- In study area 1 a public sector company is carrying out major mining activity. Apart from a big mechanized mine several manual mines of varying production capacities are also located in this area. The small mines are occasionally closed down due to lack demand for poor ore quality.
- Several operating mines with similar production capacity as well as level of mechanization are located in study area II. In the past mining method was predominantly manual now some of the mines are slowly adopting low-level mechanization. A big mechanized mine owned by a private company is being developed which is likely to reach its full production capacity of 3 million tonnes per annum within one or two years. Ownership of the mines are mostly private barring one big manual mine, which is owned by a quasi government company.
- A big private sector mine along with very few scattered small mines is being operated in study area III. Production level is highest compared to other areas.

SMALL MINES

- Several scattered manual small mines are found adjacent to big mechanized mines. Production level of these mines is quite insignificant compared to the major mechanized mines (Refer to Appendix Nos. 1A, 1B, 1C). Average daily employment at most of these mines is below 150. Mostly petty contractors are

engaged at theses mines. Study area I is having highest number of small units followed by study area II & study area III.

SOCIO-ECONOMIC CONDITION AND ENVIRONMENTAL SETTING

- Method of mining being predominantly manual extensive forestland has been degraded in study area II. Land degradation is least in study area III.
- Extent of area covered by agricultural land is high in study area I.
- Extent of land damage is highest in study area II and least in study area III.
- Barring study area III irrigation facility is not available in other study areas. Level of pollution and siltation of the natural watercourses are severe in study areas II & I.
- Study area II being near to two major township area is thickly populated compared to other study areas. More jobs in service sector are also available.
- Infrastructure facilities are better in the study area II.
- Effort is being made in study area III through rural development society to restore back lost traditional livelihood of the area.
- There is acute shortage of potable water in the study area II.
- Total annual household medical cost is higher in the buffer zones of study areas II & I compared to their periphery zones. High incidence of lung disease is recorded in study area II.

BUFFER AND PERIPHERY ZONES

Area falling within 5 km. Of the study area has been defined as buffer zone. Any area falling beyond 5 km. Is considered as periphery zone.

SAMPLE DESIGN

- Several villages in the buffer and periphery zones are far away from the jeepable road and can be only approached on foot. Due to very limited project tenure a list of all villages approachable by road is prepared and sample villages were selected randomly. Inaccessible villages are having limited scope of employment . As these villages are not sampled , this is one of the limitations of this study.

- At the initial stage of survey, lists of households of the selected villages have been prepared. Based on data collected at the initial stage of the survey stratification is done. Amongst the demographic variables income level of each household is not considered for stratification, as the villagers are unable to report their annual household income correctly. Literacy level is also not considered for stratification as the literacy level is generally low & shows no significant variations. Other socio economic variables viz. agriculture land holding & live stock population are not considered for the same reason. However household level variations in occupation is significant therefore primary occupation of households is considered for stratification.
- Based on the initial experience in the study area1while preparing household lists in other areas information was only collected on primary occupation. The same was also pointed during interim review workshop.
- Four major strata with respect primary occupation as follows:
- Mining labour.
- Cultivator.
- Agriculture wage earner.
- Others.
- For the purpose of stratification when a member of a household gets employment at mines for more than six months in a year the household will fall under mining stratum. Others category of primary occupation include various jobs like artisan, shop owner, service holder government staffs, non mining contractual workers, NTFP collectors. Etc. excluding mining and agriculture. In case of households where major earning is from agriculture the household is considered under cultivator stratum. Landless labours who earn money or get paddy by ploughing other's fields and are not employed at mines for more than six months will fall in the agriculture wage earner stratum.
- Sample survey has been conducted by filling up detailed questionnaire at about 20% of the households under each stratum. Households have been selected at random taking samples from all human settlements falling under the same village. Purpose of this detailed random stratified sample survey is

to collect data for the purpose of economic evaluation of environmental impacts in the buffer zone.

- Study areas comprise of villages consisting of several clusters of human settlements locally called 'toli's or 'sai's. These 'toli's are often located far apart without proper connecting roads for vehicle movement. Some of the 'tolis' are inside the forests (scanty population), which are mostly inaccessible. Also some approach roads are prone to frequent attacks by wild animals. A number of villages are also affected by terrorist activities as the terrorists take hideouts in the nearby forests. As a result the villagers are suffering from deep fear-psychosis, which initially restricted entry of the investigators into these villages. Majority of the villagers are tribal. In some villages the villagers do not even converse in their state languages, this posed a communication barrier for the investigators. In few villages the entire village could not be covered where a large sized cluster of households ('toli's) was selected for random stratified sampling (household listing).

Details of sampling pattern done in different study areas are furnished below:

STUDY AREAS ⇨ / SAMPLING DETAILS ⇩		STUDY AREA I	STUDY AREA II	STUDY AREA III
NUMBER OF VILLAGES COVERED	BUFFER	13	6	8
	PERIPHERY	7	5	2+5*
TOTAL SAMPLE DRAWN FROM EACH STRATUM	MINING	170	80	99
	CULTIVATOR	163	30	61
	AGRI. LABOUR	20	4	17
	OTHERS	71	118	112
TOTAL SAMPLE DRAWN		424	232	289 (197+92**)

***** Five villages in periphery of study area III are common with study area II.

** The 92 samples are common with study area II.

OCCUPATION	STUDY AREA I	STUDY AREA II	STUDY AREA III	TOTAL
MINING	170	80	80	330
CULTIVATION	163	30	42	235
AGRICULTURAL WAGE EARNER	20	4	14	38
OTHERS	71	118	61	250
TOTAL	424	232	197	853

ANALYTICAL METHODS

- Descriptive statistics (e.g. tables, charts, averages, dispersions etc.) as well as econometric regression techniques have been used to extract relevant information from available data.
- Annual average agricultural earnings per acre for both zones in respect of each study areas are evaluated from village sample data. Damage cost is estimated as multiple of inter zonal difference in the annual average agricultural earning & total land holdings in the buffer zone.
- Similarly multiple of zone wise differences in annual average household NTFP earning, annual household medical expenses & number of households will give estimated values of damage costs on account of loss in NTFP earning & increase in medical expenses.
- Product of average employment at different mines and average household earning from mining jobs will give benefit accrued from the mines.

CHAPTER V: DATA ANALYSIS

STUDY AREA I

BRIEF DESCRIPTION OF STUDY AREA I

A mechanized iron ore mine, semi mechanized owned by public sector company along with number of small manual and medium sized mines fall in this study area (Refer Appendix No 1A) The locations of these mines are shown in Map no 1. Barring three mines the annual production level of other mines are very low.

PHYSIOGRAPHY

Topography of the area is hilly covered with degraded forestland along with low-lying flat agricultural land. Number of natural streams traverses the area.

SOCIO ECONOMIC CONDITION

Sample village list is furnished in Appendix No. 2A.

- Villages are located in Banei, Kamaposh Balang & Koida P.S. of Sundergarh district.
- Agriculture depends totally on rainwater, as there is no irrigation facility. Paddy is grown as principal crop. Other crops grown are different types of oil seeds, maize, lentils & vegetables.
- Number of labour hutting is located in close proximity to the villages where laborers migrating from outside the district reside.
- Some of the villagers are being engaged temporarily by petty mine contractors. Only few public sector company laborers reside in these villages.
- Inspite of employment opportunity at the mines cultivation is kept more or less intact. This is done either by absenting from casual mining jobs or through other members of the family and hired laborers from poorer section of the village.
- NTFP collection is preexisting livelihood of the area. There is significant drop in household earning from this source in the buffer zone.

- Tube wells are provided in most of the villages, which seldom meet the drinking water requirement of the villagers. They are at times forced to drink water from natural water streams.
- Malaria, diarrhea & bronchial diseases are prevalent in most of the villages.
- There is no significant earning from livestock as there is no milk production and fodder production.
- Primary school is run in all villages. Two government hospitals are located in the study area.
- Details of the villages are furnished in Appendixes Nos 2A, 3A.

ENVIRONMENTAL IMPACT OF MINING

- Influx of people from outside has led to increase in demand of timber as fuel wood etc.
- Most of the mines are opened in forestlands. Scattered mine workings have led to large scale felling of trees and loss of biodiversity.
- Mine waste dumping along hill slope has adverse impact on surrounding forest growth.
- During heavy rains there is inrush of red mud from these mines to nearby agriculture fields and water bodies.
- Barring some isolated plantation patches (covered with exotic species viz. eucalyptus, acacia) for commercial purpose no significant effort is visible to restore back mined out land through plantation. These species also fail to restore back the lost forest ecosystem. According to District Forest Officer, Forest Ranger Sal species dominated the area. However so far Sal could not be successfully re grown on mined out land
- Extensive deforestation has led to significant loss of NTFP (non timber forest product), which is also a source of earning for the local villagers.

VILLAGES SELECTED FOR SURVEY

- Sample survey is conducted in thirteen villages & seven villages in buffer & periphery zones respectively. Design of sample design are shown in Appendixes Nos 4A & 5A.

PRELIMINARY OBSERVATIONS

- Nature of jobs is similar (Table 1A) but distribution of jobs is different in both zones. In buffer zone more than 50% of the households belong to mining stratum. Cultivation is secondary occupation for all strata.
- Annual household earning in both zones are almost similar (Table No. 2A).
- Similar pattern is also noted in case of annual per capita household income (Table No. 3A).
- Percentages of households owning land within 5 acres are about 75 % (buffer) & 63% (periphery)(Table No. 4A). On the other hand as per Table No. 5 an annual earning of majority of the households in both zones (i.e. with landholding $\leq$ 5 acres) is less than 20,000 rupees.
- In both zones households with land holding less than and equal to 5 acres (Table 6A) mostly fall in the per capita income class of 5000 rupees.
- Inspite of the above similarities (Table No. 7A) 70% (buffer) & 30 %(periphery) of the households are having agricultural earning/ acre up to 1000 rupees. One important reasons contributing to low earning in 30% of the households in the periphery zone is damage caused by wild animals. Other reason could be cash earning being low poorer section of the periphery villages cannot buy & use agricultural implements. Average agricultural earning in the buffer zone is 955 rupees against 2241 rupees in periphery zone.
- Further data analysis is done to find out the reasons for this drop in average agricultural earning per acre in the buffer zone. Land damage in varying proportion is reported by 80% of the sample households within 2 km. & 55% of the households within 2 – 5 km. (Table No. 8 A) from the mines. No significant impact of mining was perceptible in the periphery zone. One clue to this decline in agriculture earning may be found in land damage. However this

drop in agricultural earning is not reflected in Table Nos. 2A & 3A since there is no significant differences in total household income & annual per capita income.

- In buffer zone about 75% of the households are engaged in mining jobs (Table No. 9 A)
- Majority (68%) of the sample households in buffer zone (Table No. 10 A) are earning more than 40% (total household income) from mining jobs. Tabular interpretation of data also fits well with the regression results (Table No. 11 A) as household income is positively related to ratio of income from mining jobs to total income (significant value of t).
- As stated earlier distinguishing feature in both zones is not job pattern but distribution of jobs. Thus in absence of any alternate sources of income loss in agricultural earning is being compensated by additional earning from mining jobs. This explains the observation made in the context of Table 2A & 3A.

AGRICULTURAL PRODUCTIVITY IN THE BUFFER ZONE:

- Further analysis is done to examine whether any other socioeconomic variable is responsible for low productivity in the buffer zone. Table No. 12A is prepared to compare average household agricultural earning /acre (in both zones) amongst households falling in the same land holding class. Average agriculture earning figures show higher value in periphery compared to buffer zone. This eliminates the effect of size of household land holding on low agriculture earning.
- In majority of the croplands there is very limited use of fertilizer other than cow dung. This observation is well corroborated by regression results in Table No. 13A as fertilizer cost per acre is not significantly related to agricultural earning per acre (as indicated insignificant t value).
- Also proportion of miners in a family does not significantly influence annual household agricultural earning as indicated by insignificant t value (Table No. 14A).
- It is found that quantitative variables often fail to explain the factors causing damage in the buffer zone due to lack of commonalities existing within the

buffer zone villages and periphery villages. Qualitative variables e.g. distance from active mining zone (distance dummy) may explain decline in agriculture earning in the buffer zone.

- Regression estimate shows (Table No. 15A) that the relation between distance dummy and agricultural earning per acre is positive and statistically significant. This also highlights the fact that drop in agricultural earning is related to nearness to mines.

LAND DAMAGE VISA – VIS MINING JOBS:

- It is stated earlier that majority of household in villages near to mines are having damaged land. This has resulted in a drop in total household agricultural income. Table No. 16A shows frequency distribution of households under different classes of mining income ratio (mining income to total income) and extent land damage. Average land damage figures are shown against each mining income ratio class (mining to total income), which do not indicate any relationship between the two.

- From low t (Table No. 17 A) it can be stated that there is no significant relationship between extent of land damage and total household earning from mining jobs. In other words the villagers are not forced to shift to mining jobs because of land damage.

- A comparison is now drawn between land productivity of unaffected land in the buffer zone with that in the periphery zone. It is seen (Table No. 18A) that agricultural earning from unaffected land in the buffer zone & periphery zone are almost similar. About 81 % (buffer) & 86 % (periphery) of the households are producing annual crop worth more than 1000 rupees per acre from their respective land holdings. Inspite of higher income from mining jobs in the buffer zone agricultural earning of households possessing unaffected agriculture land have not declined. This could have never been possible if the villagers (buffer zone) had neglected their cultivation work just because of more available mining jobs.

- Moreover as mentioned earlier there is no significant relationship between proportion of miners in a family and total agriculture earning of each household.

FINITE LIFE OF A MINE

- It is also essential to point out here that all mines are having a finite life span both in physical and economic sense. Most of the small as well as medium sized mines in the study area are being intermittently worked depending on market demand. Production level is varying, depending on market demand. This has led to frequent layoff of worker engaged by petty mining contractors. In majority of the households under mining stratum one or more members are engaged in temporary jobs under petty mine contractors. Frequently they remain out of jobs due to uncertain market conditions etc. Therefore enhanced earnings from mining jobs provide only a short-term compensation to loss in agricultural earning. On a long-term basis these temporary mining jobs fail to provide any alternate source of earning to the villagers who are losing their traditional sources of livelihood.

- Nature of earning from agriculture and mining jobs are distinctly different. The villagers cultivate their lands for sustenance of their family. There is seldom any cash earning from their agricultural products. On the contrary all mining jobs provide the local villagers with cash earning.

- Earlier it is stated that households under mining stratum are keeping agricultural activity intact either by other members of the family or by hired hands. Persons holding casual jobs under petty mining contractors often absent from their work to cultivate their land during monsoon. The field observations are well corroborated by data analysis. Data analysis has covered almost all possibilities that might have caused low agricultural productivity in buffer zone Thus the hypothesis can be now established on firm ground that low productivity (in buffer zone) is primarily due to land damage by mining and no other external factors are responsible.

ANNUAL HOUSEHOLD EARNING FROM NTFP

- A list of NTFP available is furnished in Appendix

- NTFP (Non Timber Forest Product) collection & selling is another preexisting source of earning of the local villagers. Most of the respondents have reported that they have come to know from the elders of their family that earlier NTFP (before opening of several mines) were available in plenty. Frequency

distribution of household NTFP earning in two zones is shown in Table No. 19A Eighty percent of sample households in the buffer zone are earning from NTFP in the range of nil to 500 hundred rupees annually whereas ninety seven percent of the households in the in the periphery zone are earning more than 500 rupees annually. Average household earnings from NTFP are 438 & 2291 rupees respectively in the buffer and periphery zones.

- The above tabular data analysis is further explained by regression results furnished in Table 20A. Relationship between qualitative distance dummy variable and NTFP earning is positive & statistically significant (as indicated by significant value of t and adjusted R square). Thus nearness to mines may be one of the possible reasons for low NTFP earning.
- Regression results do not show any significant relationship between annual household NTFP earning & mining income (Table Nos. 21A, 22A). Thus availability of more mining jobs cannot explain decline in NTFP earning.

SOCIO ECONOMIC FEATURES AND NTFP EARNING

- Further analysis is carried out to examine whether any difference in socio economic features is influencing this difference in NTFP earning. The socio economic variables identified are family size of each households, proportion of literate in a family, ratio of annual household income from mining jobs to total annual household income (Table Nos. 23A, 24A & 25A).
- Percentages of household falling under literacy rate class of zero to 30 % are about 72 % & 63% respectively in both the zones (Table No. 23A) On zone wise comparison of the frequency distribution of NTFP earning in the above literacy class (up to 30 % literacy rate) it is found that majority of the households belong to NTFP income class up to 500 rupees in the buffer zone. Under the same literacy class in periphery zone majority belongs to above 500 rupees income class. Similar pattern of enhanced earning are noted for all literacy classes in periphery zone.
- Majority of households in both the zones fall in the family size class of 4 to 9 (Table No. 24A). Average NTFP earning in this class is higher in the buffer compared to periphery zone. Data reveals similar trend for all other family size

classes. In buffer zone earning could have been much higher had there been sufficient NTFP available.

- Thus none of the above household characteristics can explain the reasons for lower NTFP earning in buffer zone.

LOW NTFP EARNING AND MINING JOBS

- NTFP earning does not seem to be related to household mining income ratio. This is evident from the frequency distribution in Table No. 25A. In the buffer zone class wise averages of mining income ratio & annual household NTFP earning do not show any convincing relationship.

REASONS FOR LOW NTFP EARNING IN THE BUFFER ZONE:

- Numbers of mines are opened in the buffer zone & consequently extensive deforestation has taken place. This problem has been further aggravated by influx of mining laborers from outside the district. More number of human settlements is built and demand on timber has increased. Analysis has shown that NTFP earning is increasing with distance from the mines and no socio economic variable is responsible for lower NTFP earning in the buffer zone.
- It can be firmly established now that the reasons for lower NTFP earning is primarily done to extensive deforestation in the buffer zone as a result of extensive mining activities.

MEDICAL EXPENSES IN THE TWO ZONES:

- Eighty percent of households away from mines are incurring medical expenses below 500 rupees where as this figure is only 9 % in the buffer zone. However this result is based on household survey and there are frequent recall lapses regarding annual medical expenses on the part of the respondents. (Table 26A) In such cases the field investigators have tried to assess cost from number of incidence of each disease (as reported by the respondents) and average cost of treatment for a particular disease (collected from secondary sources).
- Moreover number of other external factors like distance of villages from hospitals, availability of medicinal plants in the nearby forests etc also affect medical expenses incurred by a family. Village wise incidence of different

diseases is not being complied at local government hospitals. Non-availability of secondary data is another limitation of this study. Chief Medical Officer of government hospital of the region reported higher incidence of bronchial diseases, diarrhea in the buffer zone compared to periphery zone.

- Medical expenses are negatively (Table No. 27A) Related with distance from active mining zone as indicated by significant t value.

SOCIO ECONOMIC FEATURES AND MEDICAL EXPENSES

- In order to draw comparison between households on the basis of socio economic variables number of household characteristics has been identified namely total household annual income, per capita annual household income, family size & literacy rate.
- Average annual household medical expenses for all classes of annual and per capita annual income of all households are higher in villages near to mines than those located in the periphery zone (Table Nos. 28A & 29A).
- Literacy rate is likely to have direct impact on medical expenses as a family with larger proportion of literates will visit qualified doctors and try to stay away from local quacks. Average annual medical expenses for households under same class of literacy are compared (Table No. 30A) Data reveal that average annual total household medical expenses irrespective of literacy classes are higher in mining areas than distant villages.

REASONS FOR HIGHER MEDICAL EXPENSES IN BUFFER ZONE:

- Ample evidences have been furnished to corroborate the fact that higher medical expenses is not due to any differences in socio economic characteristics between buffer and periphery zone. The fact that medical expenses decrease with distance from mining areas clearly suggest that environmental degradation in mining areas is the convincing reason for higher medical expenses in the buffer zone.

STUDY AREA II

BRIEF Description of the study area II

In study area II there are number of medium sized mines details of which are provided in Appendix No 1B. There are two big old manual mines where low-level mechanization is being introduced. Few mines are also being opened. Mostly private and quasi government companies own the mines.. Location of these mines is shown in the enclosed map No 2.

PHYSIOGRAPHY

Topography of the area is undulating and also covered with extensive low-lying flat land. Patches of denuded forest are found on hills. Agriculture lands are located on either sides of the hill. Number of natural water streams traverses the area.

SOCIO ECONOMIC CONDITION

- A mining town is located near the study area. Villages fall under the municipality area of the town. These villages have adequate infrastructure facilities like approach roads, education & medical facilities.
- The area covers number of labour hutting, colony, and township.
- In absence of irrigation facilities cultivation is dependent on rainwater.

ENVIRONMENTAL IMPACT

- Mining operation is continuing in the study area since several decades. Extensive deforestation is caused by on going mining operations as well as influx of labourers from outside the district.
- Existing derelict mined out lands, scattered mine workings & waste dumps are prone to severe erosion. Agricultural productivity has also dropped sharply due to flow of red mud from the mines. Extent of land permanently damaged is quite high in this area.
- Number of crusher units is located in the area. Degradation of ambient air quality has caused high incidence of different lung diseases (TB & other bronchial disease).

- Natural watercourses are now covered with silt and iron fines, which render water unsuitable for drinking.
- Depletion of timber and NTFP has deprived the villagers of their pre existing livelihood. This problem is further compounded by continuance of unsystematic mining activities in this area.
- Extensive deforestation and noise pollution from use of explosives at mines have resulted in loss of wild life habitat and their migratory routes. Elephants are regularly entering into villages, paddy fields causing damage to life and property.

SELECTED VILLAGES

- Six villages are randomly selected in the buffer zone. Only limited number of villages is located in the surrounding area.
- Five villages have been selected in the periphery zone.

PRELIMINARY OSERVATIONS

- Survey data is analysed by preparing 28 tables, 1 chart & 7 regression estimates.
- It is found that (Table No. 1B) 43.4 % (buffer) & 22 % (periphery) of the households fall under mining stratum. Buffer zone & periphery zone being near to town about 47.4% & 57.8% respectively belong to other category of primary occupation. All households irrespective of stratum also cultivate their respective land for sustenance.
- Zone wise difference in average annual household earning is less than 1.6 % of the total annual household income in buffer zone. (Table No. 2B)
- Similar pattern is also noted in case of annual per capita household income (Table No. 3B).
- Frequency distribution of households by total annual household income and size of respective land holdings is shown in Table No 4B. Also frequency distribution of per capita annual household income and land holdings size is shown in Table 5B. Data reveals that majority of the households fall under the landholding class up to 5 acres, annual household income class within 20,000

rupees and per capita annual income class within 5,000 rupees. This shows that some similarity exists between the zones on certain socio economic aspects.

- In the buffer zone decline in household agricultural earning is noted (Table 6B). Frequency distribution shows that 73% & 30 % of the households in the buffer zone & periphery zone respectively are having agricultural earning per acre below 1000 rupees. Unlike buffer zone poorer section of the villagers in the periphery zone are not having cash earning from mining jobs. Some of them cannot buy & use agricultural implements. Also at times wild animals damage their crops. This explains the reasons behind low agricultural earning in 30 % of the households in villages located far away from mines.
- Respondents of 62 % of the sample households (buffer zone) (Table 7B) have reported that more than 50% of their total land holdings are damaged due to nearby operating mines. About 32% of the households have reported cent percent land damage. However low agriculture earning is not reflected in the income tables (Tables Nos. 2B & 3B).
- About 51% of the households in the buffer zone are having income from mining jobs (Table No. 8B), which is more than 20 % of the total household income.
- Majority of the households (both zones) are having per capita income below 10,000 rupees. In the above income class about 52 % of the households (buffer zone) are holding mining jobs (Table No 9B).
- Earning from mining jobs is low in villages located beyond 5 km from mines (Tables 8B).
- Tabular data analysis fits well with regression results as there exists positive and statistically significant relationship between total income (buffer zone) and earning from mining jobs. (Table No. 10 B)).
- As found in study area 1 sources of income in both zones are almost similar although distribution of job is different. Analysis results are almost similar to earlier study area. In this study area also earning from mining jobs is compensating for loss in agricultural earning.

AGRICULTURAL PRODUCTIVITY IN BUFFER ZONE

- Tabular analysis done in study area I is repeated here also.
- Table Nos. 11B & 12 B show comparison between agricultural earnings of both zones falling under same land holding size classes. Result of data analysis leads to almost similar conclusion (as seen in study area I). It is found that irrespective of land holding size average household agricultural earning is low in the buffer zone.
- Regression results also fit well with tabular analysis as (Table No. 13B) distance dummy is positively related to agricultural earning per acre (indicated by significant t value).
- From the above analysis it is evident that neither earning from mining jobs nor land holding size can explain low agricultural productivity in the buffer zone. Only influencing factor that can be found is distance from active mining zone, which has statistically significant relation with agricultural productivity. Environmental degradation due to mining activities can be the possible reason for decline in household agricultural earning.

LAND DAMAGE VISA – VIS MINING JOBS

- Table No. 14B is prepared to show frequency distribution of households with respect to income ratio (mining income to total income) and extent of land damage. Average land damage figures are furnished against different classes of the above ratio. Tabular data do not show any relationship between the two.
- Tabular interpretation fits well with regression results (Table No.15B), as there is no significant relation with household income from mining jobs and extent of land damage.
- Comparison is drawn between land productivity of unaffected land in the buffer zone with that of the periphery zone (Table No. 16B). From the figures given below land productivity of unaffected land (not affected by runoffs from mines) in buffer zone is almost similar to that of croplands located far away from the mines. About 64 % of the households possessing unaffected land in the buffer zone is producing crop worth more than 1000 rupees per acre from

their respective land holdings. In the periphery zone about 67% of the households are producing crop worth more than 1000 rupees per acre. The above figures corroborate with the fact that although the income ratio (mining income to total income) is much higher in the buffer zone earning from unaffected agriculture land is not dissimilar. This could have never been possible if the villagers would have neglected their cultivation work because of more available mining jobs.

- It can be seen from Table Nos. 17B (Buffer) & 18B (periphery) that in both the zones there is a positive & statistically significant relation between total earning from non mining jobs (including cultivation work) and size of cultivable land. This reveals that there is regular earning from agriculture in buffer zone.

ANNUAL HOUSEHOLD NTFP EARNING

- Frequency distribution (Table No. 19B) shows that seventy four percent of sample households in the buffer zone have no earning from NTFP. Forty percent of the households in the in the periphery zone is earning more than 1000 rupees annually from NTFP against meager 6 % in the buffer zone.
- Tabular data interpretation also fits well with regression estimate as there is statistically significant relation between annual NTFP earning and distance dummy variable (Table No. 20B). Environmental degradation due to mining may be the possible reason for low NTFP earning in villages near to mines.

SOCIO ECONOMIC FEATURES AND NTFP EARNING

- The socio economic variables identified for further analysis are family size, proportion of literate in a family (Tables Nos. 21B, 22B).
- Tabular data of NTFP earning and proportion literates in a family are shown in Table No. 21B. Under the 25% literacy level class (includes illiterates also) zone wise NTFP earnings are different. About 93% of households in villages near to mines are earning annually below 500 rupees where as 66% of households in periphery areas are earning above 500 rupees. Decline in NTFP earning in buffer villages cannot be thus explained by proportion of literates in a family.

- There is zone wise similarity in family size (Table No. 22B). Average annual NTFP earning for different classes of family sizes are distinctly different in both zones. Other members of the household in villages near to mines (who are not employed at mines) could have also made similar NTFP earning provided the same were found in sufficient quantity in the buffer zone.

NTFP EARNING VISA – VIS MINING JOBS

- Regression result shows that (Table No. 23B) that annual NTFP earning is not significantly related to mining income. This provides ample evidences in favour of the fact that villagers are not neglecting NTFP collection in buffer villages because of their engagement at the mines.

REASONS FOR LOW NTFP EARNING IN THE BUFFER ZONE

Analysis results are almost similar in both study areas. Thus in this area also no other socio economic variable is responsible for lower NTFP earning in the buffer zone other than extensive deforestation due to mining.

MEDICAL EXPENSES IN TWO ZONES

Majority of households (86 %) in periphery zone are incurring yearly medical expenses below 500 rupees whereas forty six percent of households in buffer zone are spending annually above 500 rupees. (Table No. 24 B).

SOCIO ECONOMIC FEATURES AND ANNUAL MEDICAL EXPENSES

Number of household characteristics is identified for further analysis viz-total household annual income, per capita annual household income, family size & proportion of literates in a family.

- Annual household medical expenses for all frequency classes of total annual household income and per capita annual household income are higher in buffer zone compared to periphery zone (Table Nos. 25B & 26B).
- Data also reveals the similar pattern for all literacy classes. (Table No. 27B).
- Number of sick days (Table No. 28B) for same family size class is much higher in buffer zone than periphery zone.

REASONS FOR HIGHER MEDICAL EXPENSES

High medical expenses in mining areas are not caused by any zone wise variations in household characteristics but due to degradation of environment at the villages near to mines.

STUDY AREA III

RURAL DEVELOPMENT SOCIETY

In the year 1982 a private mining company (study area III) has established a rural development society and now its developmental activities have spread in forty-two villages. The society is working towards the goal of socio economic independence of the people at the grass root level through people's participation and empowerment. Three development phases are welfare approach, people's participation & people's empowerment. Need priorities of the villagers are infrastructure development health & hygiene, forest & environment, income generation & household food security. Major fund is being received from the mining company. Other funding agencies are MLA fund, different government and international agencies. About ninety lakhs rupees were spent last year on different welfare schemes. Effort is being also made to globalize resources from other international funding agencies.

RURAL DEVELOPMENT SCHEMES

LIVELIHOOD ENHANCEMENT PROGRAMME

This program aims at enhancement of household income. Out of total allocated budget for the study area III about 40-45% is being spent in this program. Under this scheme mainly multi crop farming has been introduced. Additional household earning generated were 45 lakh rupees in 1998, 80 lakh rupees during 1999 and 150 lakh rupees in the year 2000. So far 1153 families have been benefited under this program.

FOOD SECURITY

In other study areas agriculture is rain fed. Single crop is grown which generally meet the food requirement of the households for only few months. The society is making effort to increase land productivity through proper management of land and water bodies. This will ensure better food security by helping the farmers to grow

multiple crops, which will provide sustenance to the villagers throughout the year. They can also make some cash earning by growing vegetables and selling it to local market.

Land management program include shift from mono cropping to multi cropping & use of high yielding variety seeds. Each household below poverty line is being provided with seed, fertilizer and other agricultural implements at subsidized rates. Rate of subsidy is being reduced every year and after three years they are finally released from assistance track. So far 1153 families below poverty line have been brought under “Grow More Food Project”. Multi cropping pattern that has been introduced in the area include paddy, wheat and growing vegetables. So far about 1000 acres of cropland have been brought under wheat and vegetable cultivation.

Number of watershed management program is being implemented. About 20% of the crop lands are presently covered under irrigation from only 2.4% in the year 1998. Annual average rainfall in the area is about 1500mm and storage of the surface water for dry seasons is being done under this program. Seventeen lift irrigation and four deep bore well have been constructed to bring more croplands under irrigation network.

Fingerings are also supplied to the local people to provide additional source of income from pisciculture.

Training is being imparted to the local villagers to provide yet another source of income from poultry, goat rearing, and pigsty.

SAVE FOREST GROUPS

At the initiative of the society SAVE FOREST GROUPS have been formed at the village level to protect forest growth by the local villagers. Regular meetings are also being organized with the active involvement of local people. Community plantation is being undertaken to provide alternative source of fuel wood supply to the local villagers. Also household earning from non-timber forest produces will increase. The SAVE FOREST GROUPS are presently protecting over 2000 hectares of forestland. During the period 1982 – 1990, 26 villages such groups have been formed and 2.12 million trees have been planted. Since 1991 SAVE FOREST GROUPS is working in 54 villages.

PEOPLE'S EMPOWERMENT:

Under people empowerment program self-help groups are formed. These groups will promote information sharing about various government schemes on self-employment, health care & literacy campaign. About 20 % of the total available fund is being spent under this scheme. From 1998 onwards about 48 self-help groups are involved in income generation schemes in different villages.

HEALTH AND HYGINE:

Free medicine is distributed to villagers. Medical treatment is being done at a nominal fee of rupees two only. Mobile dispensary van goes to villages every week. Also primary health care system is being developed at village level by imparting training to some of the villagers who will be health guide for the entire village. In twenty-nine villages primary health centers have been opened. Health care camps are being organized to provide eye care, family welfare etc. Under mother & child health care scheme it has been possible to reduce mortality rate below national average rate. Killer diseases in this region are malaria and diarrhea. As soon as cases of these diseases are reported village health guides attend the patients. So far 77876 patients were treated & 5825 children have been immunized.

As a part of the health and hygiene scheme 239 cost effective toilets have been constructed. Since 1998 onwards 48 tube wells have been installed.

BRIEF DESCRIPTION OF THE STUDY AREA III

In study area III there is one big private sector mechanized mine producing about 4.9 million tones per annum. Unlike other study areas there are very few small manual mines (Appendix No 1C). Production level of the small mines is meager. Unsystematic nature of their workings also degrade surrounding environment. These mines remain frequently inoperative Location of these mines is shown in the enclosed map (Map No3).

PHYSIOGRAPHY

The study area is adjacent to mining township. The area is traversed by express highway in the central part. The area is mostly covered with hill ranges and large tracts of agricultural lands.

SOCIO ECONIMIC CONDITION

- Number of villages are located in close proximity to mines
- More than 20 % of the croplands are presently covered under irrigation.
- Natural watercourses are much less polluted than other study areas. Dams have been constructed to store rainwater for use during dry seasons.
- Rural development society has introduced multi cropping in this area. Multiple crops are grown each year which include paddy, wheat & vegetables.
- Medical facilities are provided in many villages by the society.
- Wells and tube wells have been constructed by both block development office as well as the society.

ENVIRONMENTAL IMPACT OF MINING & MITIGATION MEASURES ADOPTED

- Mining operation is continuing here since last several decades. Extensive deforestation due to mining, township development etc has reduced availability of NTFP. Mined out areas have been brought under a forestation program by planting exotic species like eucalyptus, acacia etc
- Construction of diversion drains, check dams, sedimentation ponds have been done to mitigate pollution
- Noise & vibration from explosives used for mining operations & expansion of mines have caused loss of wild life habitat and it's migratory route. Elephants are found to intrude into human settlement areas and damage life and crops.
- Mitigation measures have been adopted by the company to control dust emission. As a result incidence of lung disease and diarrhea is low.

SELECTED VILLAGES:

- Eight villages have been selected within 5 km. from the active mining area. The study area being near to the township area and express highway there are limited number of villages.
- Seven villages have been selected in the periphery zone. Few of the villages are also common to the periphery zone of study area II.

- Barring a small part of periphery zone falling in Orissa both buffer & periphery zones fall in Jharkand state.
- Labour hutting and township areas are left out for the purview of this study.

DATA ANALYSIS:

- Tables furnished in Appendixes are similar to other areas.

INCOME SOURCES

- Forty percent (Table No. 1C) of the households (buffer zone) and 26 % of the households (periphery zone) belong to the mining stratum. About 35% & 45% respectively in both zones belong to others category of primary occupation. Percentage of households in cultivator stratum is almost similar in both the zones. The zones being located near to township lot of jobs are available in service sector. This explains the reasons behind such high number of households falling in the others category. All households irrespective of stratum regularly cultivate their land.
- Average annual household earnings are about 28000 & 23000 rupees in buffer & periphery zone respectively. (Table No 2C). Unlike other study areas there is significant rise in household earning in mining areas.
- However due to larger average family size in periphery zone average per capita income shows a different pattern. (Table No. 3C & Table No.4C). Per capita earning is lower in buffer zone.
- About 43 % & 57 % of the sample households in the buffer and periphery zones respectively own agriculture land below 5 acres (Table No. 5C).
- It can be seen from Table No. 6C that average annual agricultural earning per acre in croplands falling within 2 km. from the mines is marginally lower than those located beyond 5 km. from mines. Another noteworthy feature is earning from agriculture is highest in areas falling within 2 km. to 5 km. from mines. Land & water management programs undertaken by the society has helped to increase land productivity of this area.

- A meager 12 % of the sample households (Table No. 7C) have reported varying extent of the land damage due to nearby mines. This figure is lowest in comparison to the other study areas.
- Income from mining jobs is high in the buffer zone (Table No 8C). Mining income constitute more than 40% of total annual household earning in about 47% (buffer) & 27 % (periphery) households.
- Majority of the households in both zones fall under per capita annual income class within 10000 rupees (Table No 9C). Out of the households falling in the above class about 45% (buffer) & 28 %(periphery) households are holding mining jobs
- Regression estimate (Table No.10C) show yet another dissimilarity (between study areas) as relationship between agricultural earning and distance dummy is not statistically significant.

HOUSEHOLD NTFP EARNING

- Like other study areas here also NTFP is another preexisting source of earning. Household data shows zone wise variation in NTFP earning (Table No. 11C). Fifty one percent & twelve percent of sample households in the buffer zone & periphery zones respectively are having no earning from NTFP. Fifty eight percent of the households in the periphery zone is earning more than 1000 rupees annually from NTFP against meager 10 % in the buffer zone.
- Regression results fit well with tabular analysis (Table No.12 C), as the relation between distance dummy & NTFP earning is both positive and statistically significant.
- Further data analysis has been carried out to examine whether any zone wise variation in socio economic features can explain drop in earning from NTFP. The socio economic variables identified for the purpose are household family size, literacy rate, and ratio of mining income to total annual household income. (Tables Nos. 13C, 14C & 15C)

- In both the zones majority of the households fall under family size class of 3 to 9 (Table No. 13C). Average earning under this class is distinctly different in both the zones.
- There is zone wise similarity in household literacy rate (Table Nos. 14C & 16 C). Average annual NTFP earnings irrespective of literacy rate are low in buffer zone.
- No relationship could be established between both mining income of a household, number of miner in family and annual NTFP earning (Table Nos. 15 C & 17C).

ANNUAL HOUSEHOLD MEDICAL EXPENSES IN BOTH ZONES:

Unlike other areas annual average household medical expense in buffer zone is not higher than periphery zone (Table No. 18C) which is primarily due to welfare measures adopted by rural development society as discussed earlier.

CHAPTER VI :ECONOMIC ANALYSIS : OF ENVIRONMENTAL IMPACTS IN DIFFERENT STUDY AREAS

ECONOMIC ANALYSIS OF ENVIRONMENTAL IMPACT

Damage cost is calculated on the basis of household sample survey data covering forty-one villages in three study areas. Environmental economic components that are selected for the purpose of damage cost calculation are as follows:

- Loss of annual household agricultural earning
- Loss of annual household NTFP earning
- Increase in medical expenses of households in the buffer zone.

Several major environmental economic components which have been left out of the purview of the research work (as per project proposal) are as follows:

- Loss of bio diversity
- Loss of wild life habitat & its consequent damage on human settlements and crop lands
- Loss of timber products
- Deterioration of aesthetic beauty of the area
- Deterioration of quality of water available for regular use and drinking purposes.
- Non-inclusion of all above environmental components is a limitation of this study. Thus damage cost figures furnished here is only benchmark estimation. This calls for further research on estimation of damage cost in the area.
- Methodology for estimation of damage cost is discussed earlier in the relevant chapter.
- In order to capture its diverse characteristics study area I is further subdivided in various clusters.
- Each cluster comprises of mines, which are located within 3 km. from each other. The villages falling in each cluster are demarcated on the basis of field

survey, topographic features and distances from nearby mines. Each cluster is described below:

Cluster S1 A: The cluster comprises of one fully mechanized mine; a medium sized semi mechanized & few surrounding small manual mines.

Cluster S1 B: Several small manual mines of varying production capacities fall in this area.

Cluster S1C: Only one big old manual mine (where recently low level mechanization is being introduced) fall in this cluster.

- Unlike study area 1, further subdivision of study areas II & III is not possible (which mostly comprise of contagious mines).
- Damage cost figures is estimated for only five mining areas. This number is quite insufficient for any econometric analysis. No further econometric analysis is attempted here. Instead on the basis of available data specific characteristics of the study areas are examined. Ultimate aim is to arrive at a broad policy framework for the entire mining belt.
- In an attempt to make some recommendations regarding future shift in policies and priorities towards mitigation of some of the negative project externalities the study areas are further divided into five categories. The clusters / study areas are categorized on the basis of level of mechanization, ownership of mines and social welfare activities undertaken by the companies. (Table No 33)
- Categorization on level of mechanization is based on the information collected during visits of major mines falling in each study area.
- Different welfare activities like rural development, medical facilities provided to local villagers are also considered for the purpose of categorization.
- Due to lack of information broad categorization could only be done on the basis of perception of the respondents regarding welfare measures undertaken by the company.

Category I: Entire iron ore production is achieved from small manual mines under private ownership. Respondents are not aware of any welfare measures undertaken by any company in the area. Cluster S1B falls under this category.

Category II: Extensive manual mining was done in the past. The area is witnessing a transformation from manual mining to low level of mechanization. About fifty percent of iron ore production is still achieved from manual mines. Some of the respondents have reported that they get medical treatment at company hospital. Ownership is mostly private and quasi government, Study area II falls under this category.

Category III: Entire production is achieved from a big manual mine. Ownership is under a public sector company. Respondents reported that they receive treatment at company hospital. Cluster SIC falls under this category

Category IV: Fully mechanized mining is adopted. Medical facilities are being provided to the villagers (to a limited extent). Category S1 A falls under this category

Category V: Mechanized mining with the help of mine planning soft ware for excavation planning and production scheduling is being practiced here. Environmental pollution control measures taken up by the company are highly effective in reducing some of the negative project externalities. Also commendable performance on overall rural development could be achieved. Study area III falls under this category

- Damage cost is also estimated on unit output basis. Additional cost each household near the mines will have to bear on account of environmental damage is also estimated.
- Due to lack of data on correlation between damage cost and pollution level, damage cost is graphically plotted against production. This gives a rough idea of how damage cost varies with output.
- Damage cost per year is low in Category IV & V and high in case of manual mines. (Graph 1)
- Amongst Category IV & V damage cost (expressed as per unit output) is lower in Category V. Graph also reflects high damage cost per unit output in Category I. There is no significant difference in damage cost figures in

respect to Category II & III as similar technology is being adopted in both the areas. (Graph 3)

- Data reveal that even with very high output level households in Category V area are least affected. Low household wise damage cost is also noted in Category IV area. (Graph 2)
- Thus analysis results provide ample evidences in support of incorporation of mechanization in policy framework.
- It will not be out of place to point out here that negative externalities are always associated with mining. By adoption of improved technology damage cost can be only reduced to a certain extent. Results point out that rural development essentially plays complementary role in making significant reduction in damage cost
- As stated before mine management in Category V by reinvesting some part of the profit towards development of renewable resources in the surrounding area could make significant reduction in damage cost. Any further policy changes in favour of reinvestment especially in renewable resources for the benefit of future generation is thus felt essential.

FINACIAL ANALYSIS

Average cost figures of operating mines at different study areas are furnished in Table No 34. Cost figures do not include tax and royalty. Salient features of the mine wise cost pattern is discussed below:

- In case of small manual mines (S1B) average variable cost and total cost are marginally different. Fixed cost is low primarily due to minimum investment, negligible overhead & low establishment cost. Due to non-availability revenue figures only major sales products (calibrated ore is excluded) of the mines is considered for analysis (lack of data).
- A quasi government company runs the major operating mine at S2 area. Private companies are also operating few mines here. Contractors are usually engaged in iron ore extraction. Mining operations are mostly manual barring few mines where low-level mechanization is being introduced. Overhead expenses are high compared to S1B as a mining colony with infrastructure

facilities has been developed in this area. Investments were made long back and relevant data are not presently available. Revenue figures are pertaining to the prime sales product excluding calibrated ore. Weighted average sale values of different iron ore grade could not be furnished (non availability of data).

- A public sector steel company is operating a big captive manual mine at S1C through contractors. Average daily employment is about 1000. The company has developed a big mining colony with adequate infrastructure facilities. Overhead expenses are high. Being a captive mine of a government steel plant there is no direct sale of iron ore in open market. Entire production is utilized for internal consumption. Sales price furnished here is based only on transfer value.
- At S1A the public sector company is operating a mechanized mine where average variable cost is lower than any of the manual mines. Mining township overhead has increased the fixed cost component. It appears that due to low capacity utilization the total mining cost is high and private benefit is deflated to a great extent.
- A private sector steel (S3) company through almost full capacity utilization, efficient managerial skill, adoption of improved technology is successful in bringing down both fixed & variable cost components. Good financial performance is evident from both high private and social benefits.

INVESTMENT ANALYSIS

Salient features of investments made in different operating mines (Table No 35) are discussed below:

- Small-scale mines are being operated through contractors without making any significant initial investment in mineral exploration, machinery purchase, infrastructure development etc. Any proceeds earned from sale of mineral is seldom reinvested back either at the mine or for socio economic development of the surrounding areas. Initial investment made at these mines is only few lakhs.

- Most of the big operating manual mines are run through contractors. At these mines departmental labours are mostly engaged for waste removal. Investment was made long back mostly on machines & township development. Historical cost figures are not presently available.
- To develop a mine like the ones operational at S1A & S3 investment required will be above 300 crores. This also includes ore beneficiation facilities
- As an alternative to the above huge investment most of the mine operators are deploying rental machines by engaging a monopoly contractor. Cost structure of a mine (outside the study areas) deploying rental machines is also presented in the Table No 35. Required investment is only few crores. The investment figures do not include iron ore beneficiation plant.

BENEFIT

- Benefit estimation is not included in the terms of reference of this study. However an attempt is made to make only a rough estimate of project benefit taking into account number of mining jobs created in each study area (Table 36).
- Present study provides only a snap shot view of social cost and benefit at a specific point of time. However these short-term benefits accrued from mining jobs will not be realized after mine closure. On longer term it appears that the society will continue to bear damage cost several years even after mine closure (till the mine is naturally reclaimed).
- In study area S1C there is a big manual public sector mine, which is being operated through contractors. Employment potential of this mine is reflected by high benefit figures.
- In case of mechanised mines major mining operations being mechanized there is limited scope of direct employment at mines. Several contractual transportation & loading jobs are available.
- Other benefit like infrastructure development in remote mining areas is not taken into account. This may be noted as limitation of the present study.

CHAPTER VII: POLICY IMPLEMENTATION AND CONCLUSION

POLICY RECOMMENDATION

IMPROVED MINING TECHNOLOGY

Iron ore mining is essential to meet raw material requirement of the society but it runs the risk of environmental degradation. By adoption of improved mining technology suggested below it is possible to mitigate environmental damages to a certain extent.

- Basic objective of any improved technology is to adopt environmentally sustainable mining practices. It is essential to both restrict the size of mine excavation and also to attain the desired output level, quality requirement of the end users. This calls for systematic mine planning. Prerequisite mine planning is development of database on subsurface iron ore occurrence. To develop such database costly iron ore exploration will have to be undertaken. In order to maximize their profit margin owners of small and medium sized mines usually avoid exploratory work. In absence of subsurface database small and medium sized mines haphazardly extract iron ore without any fore planning. Scattered excavations are made and in case no iron ore is found these excavations are abandoned and fresh ones are made. These scattered mine workings cause extensive degradation of natural resources of the surrounding areas. Since these small leaseholds are contiguous the cumulative impact of these small mines is quite significant. Thus it is essential to restrict mining operations in leaseholds where there is insufficient subsurface database. Barring a few big mechanized mines this database is not available with most of the mine operators.
- To restrict sizes of mine workings as well as achieve desired output mine operations will have to be mechanized by deploying excavators, matching capacity of dumpers and large diameter drills.
- Mine planning software may be used for precise demarcation of the excavation areas.
- Unless strict supervision can be ensured engagement of contactors may be restricted to the extent possible.

- At most of the mines several old mine excavations exist. These are prone to severe erosion for several years. Thus immediate decision may be taken on future working / abandonment of these discontinued mine workings.
- Waste dumps degrade the surrounding environment. Improved waste dump management can be done by digging diversion drains all around the dumps, flattening of dump slope, constructing retaining walls and garland drains, terracing of waste dumps, planting quick growing grass on dump surface to check soil erosion etc.
- As far as possible creation of external dumps may be avoided. Instead effort may be made to backfill the old abandoned excavations after confirming presence or absence of iron ore at depth.
- Arrangements may be made to divert surface runoffs from the mined watershed to settling tanks before discharging muddy water to surrounding areas.
- Green belt may be developed around the active mining zone to control air & noise pollution.
- Water discharged from tailing dams may be periodically checked. In case of overflow during monsoon dams will have to be progressively heightened keeping safety norms in view.
- Check dams may be erected on all natural watercourses flowing in the area.
- Diversion drains may be also dug all around the active mining area to prevent water from surrounding areas from entering into the mines. This will reduce the rate of flow of muddy water from active mine workings.
- Crusher units will have to be installed in covered areas with proper water spraying arrangements at dust generating points.
- As far as practicable several smaller crusher units may be replaced by high capacity crushers (located centrally) to cater to the needs of several small mining units.
- Virgin forest patches may be left intact on areas where no iron ore exists below ground.

- Township and other mine facilities may be located as far as practicable in non forest land

SOCIAL COST-BENEFIT ANALYSIS AND POLICY IMPLICATION

An attempt is made to integrate damage costs, benefits with private costs and benefits. Study limitation highlighted earlier due to non-inclusion of all environmental economic components is also applicable to SCBA figures furnished here. On analysis of the social cost and benefit figures furnished in the Table nos 36 & 37 the following findings are arrived at. For the purpose of analysis two ratios are used as indicators viz. development environment tradeoff & social vial ability of the project defined as. benefit / damage cost & social benefit / social cost respectively which will be henceforth referred as R_b & R_{sc}

- Variation of different damage cost wit distance is shown in Graph Numbers 4.5.6.
- In the study areas S1B & S2 (manual mines) both R_b & R_{sc} show low values. In S1C (big public sector manual mine) R_b is high because of significant employment generation.
- Mechanized mine at S1A is being operated generating low damage cost to the society. High private cost is primarily due to low capacity utilization as reflected by low value of Rsc.
- In study area S3 major mining activity is concentrated in a private sector mechanized mine. Hallmark of its performance is almost full capacity utilization, adoption of environmentally sustainable mining practices, high managerial efficiency as a result of which the company could record substantial financial gains as well as low damage cost.
- SCBA provides only a snap shot view thus non-availability of time series data is another limitation of the present study.
- Both (Table Nos 36 & 37) different damage cost figures as well as R_b is showing low values for small manual mines (S1B). Also it is not possible to make technology changes at these mines due to high initial investment & insufficient ore reserve. This calls for certain policy reforms to restrict small manual mines. Mine operators are mostly attracted to operate small manual

mines to earn quick profit by making very low investment. This necessitates that permission for any small manual mines may only be granted in such cases where SCBA indicate high social benefit on long term basis. However as mining is having several site-specific variables such policy implementation may be judged as per local geo mining conditions. Implementation of such policies should also take note of the fact that all mineral deposits are not amenable to mechanization

- In future permission for small manual mines should be strictly restricted to minerals with low national inventory. In such cases exploitation of small scarce mineral resources (not amenable to mechanization) might be necessary to meet raw material requirement of the country. This policy exemption is not applicable to iron ore as nature has endowed this country with abundant iron ore reserve. It appears that imposition of restriction on small iron ore mines will not significantly affect the consuming industries except non-availability of iron ore at cheap price. Since production level from these mines is meager the policy outcome will not adversely hit the consuming industries. Inclusion of social cost–benefit analysis in decision-making framework is thus felt essential.
- At the next stage of analysis financial data of two mechanized mines are compared to identify the factors, which require needful consideration in policy design.
- The private sector mining company at S3 has recorded impressive financial gains through full capacity utilization, managerial skills. This calls for incorporation of different company's financial performances indicators in future policy framework.
- In spite of huge investment at public sector mechanized mine in study area S1A the marked differences in financial performance, capacity utilization are clearly revealed in Table Nos 36 & 37. It is reported that the reasons may be administrative. Difficult geo mining conditions cannot be the major contributing factor for the above performance as the property was explored well in advance before making such huge investment decisions. (Further discussion on this aspect is beyond the scope of this study.) On the other hand the

private sector mine at S3 could transfer some of its efficiency gains to the society through reinvestment in renewable resources of the area like agriculture, forestry etc. Necessary infrastructure has been built for the purpose. Social benefits in this case are being generated for longer period of time. Future generation being deprived of iron resources (in that particular study area) will make higher earning from agriculture, forestry etc. In order to adopt the above principle of sustainable development, future policy should aim at inducing the mine operators to invest in renewable resources of the area.

- Based on past experiences it can be opined that command and control measures will not be very effective in filling up any of the existing policy vacuum. It appears that use of market-based instruments can be an effective tool for future policy implementation.
- One of the policy options could be to tax the mine operators on the basis of damage cost the society will have to bear for environmental degradation. In that case the manual mines would have to bear high tax burden. High taxation in such cases may act as an incentive for mine operators to adopt improved technology, which will ultimately reduce damage cost, tax imposed on them as well as total mining cost.
- Mechanization is precisely absent in case of small and medium sized mines, which contribute most to the environmental damage. Results also provide ample evidence to show that mechanized mining can set a balance between economic gains from mines and degradation of natural resources.
- Manual mines at S1B have recorded lowest production cost per unit, which is marginally lower than mechanized mine at S3. One of the major constraints in use of economic instruments for inducing these mines to adopt mechanization is huge investment requirement. Such steps will only eliminate small mine operators which can be one policy option. Loss of meager production from these manual mines can be met by intensification of mining activities at big mechanized units.
- Total mining costs of big manual mines are higher than mechanized mines running at their full capacity (S3). Imposition of taxes will deflate their profit

margin only during mine restructuring period. On longer term by restructuring their units average variable cost will decline as is evident from S3 & S1A. Also the mine operator at S3 has shown that through full capacity utilization, increasing managerial efficiency it is possible to bring down per unit fixed cost. Thus by restructuring big manual mines ultimately private benefits will be enhanced from it's present level. The mine operators of the mines can then build up enough surplus for reinvestment in welfare of the local people who are adversely affected by mining.

- Restructuring of unit operations will require certain level of investment. Tax imposition will enforce elimination of small unit operation and promote amalgamation of units under collective ownership.
- As an additional force to induce the small mines to adopt mechanization the prevailing restriction on area of operation by MOEF needs to be continued.
- Use of economic instruments is likely to fail if the companies cannot record efficiency gains (refer to example of S1A & S3) .The companies should attain certain level of efficiency in operation so that the company can build necessary infrastructure for rural development. Incentive for the company to make technology changes to attain the above level of efficiency may be provided in form of tax relief.
- In the present study SCBA could be conducted for only three study areas, which is quite insufficient for drawing any marginal cost curves to assess the rate of taxation. This major limitation, has restricted any scope of further econometric analysis. With the limited data available a broad policy framework could be only recommended. Further intensification of research for design of tax structure is essential.
- Hartwick (1977), Solow (1986), Hassan et.al (2002) and others opined that some part of the proceeds from the exploitation of non renewable resources may be reinvested in other forms of capital assets that are capable of providing at least the same stream of benefits in the future. As discussed earlier this is attempted on a very limited scale in S3 area by running a rural development society. Needless to say that there is still scope for further

improvement by intensification of welfare activities as well as mobilization of funds from other agencies.

- As discussed above a modified form of model of rural development society could replicate in other mining areas too. The modification that needs to be introduced is to be a collective action of small and medium sized mine owners. Since there is a problem of collective action here the solution may come as an administrative command and control policy. Alternatively these small mine owners could be asked to contribute according to their area of operation to a common fund which could be operated either by some institutions e.g. elected body of their own or autonomous NGO etc. Government may also transfer a part of the royalty collected from these mines to such restoration activity.
- International and government agencies may be encouraged to canalize their available funds for welfare of the people residing in the mining areas.
- It is essential that the rural development society will give priority to the management of water and land in the area as well as form save forest management groups to enhance earning of the local villagers from traditional means of livelihood of the area.
- Further improvements in the model are suggested here, which include participation of local community or their representative in the decision making, planning and implementing different welfare scheme. Local people should be involved to know about the perception of problems existing in the area.

CONCLUSION

Mining to extract non-renewable resources played a crucial role in economic development of any country. India has a large resource base of iron ore and is also playing a significant role to meet iron ore demand of both domestic & world markets. Mining activities in the region has substantially contributed to economic growth of the country by providing raw material essential for industrial development. But it runs a risk of environmental degradation. In case too much of the environment is being consumed through depletion of forest resources and down stream pollution of water bodies etc. it will create an external cost to the society in form of water, air & soil pollution. Economic development and sound environmental management are

complementary aspects of the same agenda. Future productivity can be jeopardized if development results in soil degradation and destroys natural eco system.

Prerequisite to environmentally sustainable development of iron ore resources is integration of environmental issues in decision-making process both at the project approval stage and operational stage. It is essential to use economic instruments to reduce subjectivity in decision-making. This can be only achieved by integration of damage costs and benefits, if any, to private cost – benefit analysis of a project. Lack of comprehensive database on various project externalities presently restricts use of social cost – benefit analysis for the said purpose. It is also discussed earlier that there is an urgent need to make shifts in polices and priorities to ensure sustainable development of iron ore resources. Future policies should aim at reduction of damage cost. Extensive research work on economic analysis of varied project externalities is essential before making any such policies changes. Unfortunately no information on any significant research work in that direction is presently available.

In view of very limited scope of the present study, remoteness of the study area, adverse field survey conditions etc. comprehensive environmental economic components could not be accommodated in this study. Future research can be directed towards 1) a more comprehensive SCBA of mining projects based on time series & or larger cross section information; 2) economic analysis to identify policy measures to provide incentives for mining companies to invest and adopt cost effective pollution control technologies; 3) Incentive to mining companies in taking compensatory & corrective social welfare schemes.

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AREA I Maps and Tables

STUDY AREA(I) MAP

(NOT TO SCALE)

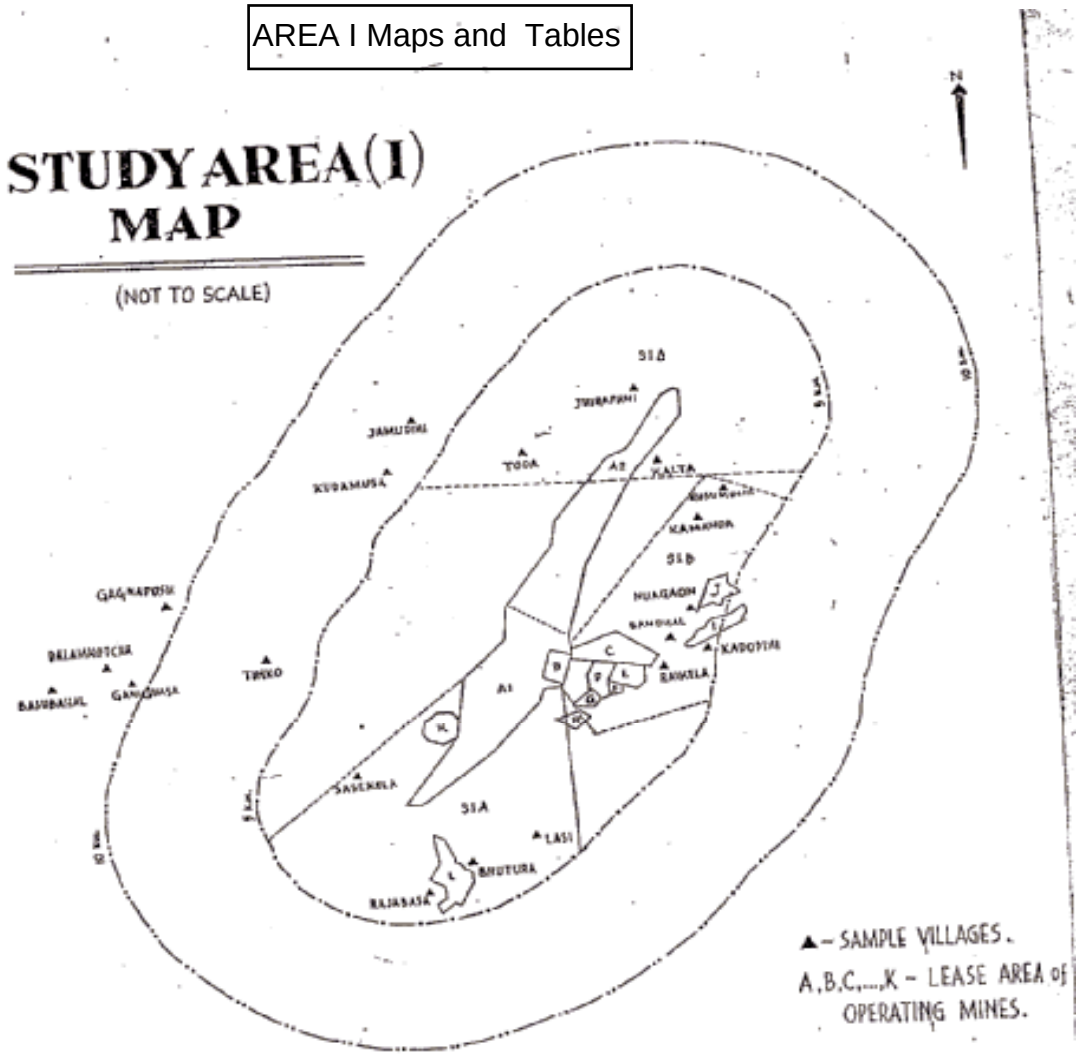


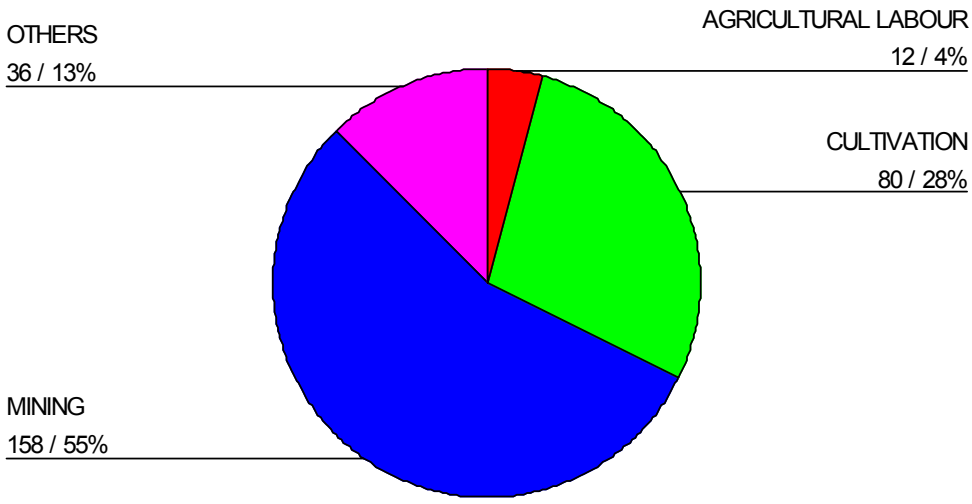
TABLE NO: 1A
DISTRIBUTION OF HOUSEHOLD BY PRIMARY OCCUPATION IN STUDY AREA I.

PRIMARY OCCUPATION OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA	
	NUMBER OF HOUSEHOLDS WITHIN 0 KM. TO 2 KMS.	NUMBER OF HOUSEHOLDS ABOVE 2 KMS. TO 5 KMS.	NUMBER OF HOUSEHOLDS ABOVE 5 KMS. TO 10 KMS.	NUMBER OF HOUSEHOLDS ABOVE 10 KMS. TO 15 KMS.
MINING LABOUR	371 (59.93)	469 (54.98)	82 (25.0)	9 (2.51)
CULTIVATOR	173 (27.95)	250 (29.31)	145 (44.21)	222 (62.01)
AGRICULTURAL WAGE EARNER	29 (4.69)	45 (5.27)	5 (1.22)	65 (18.16)
OTHERS	46 (7.43)	89 (10.44)	97 (29.57)	62 (17.32)
TOTAL	**619** (100.0)	**853** (100.0)	**329** (100.0)	**358** (100.0)

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

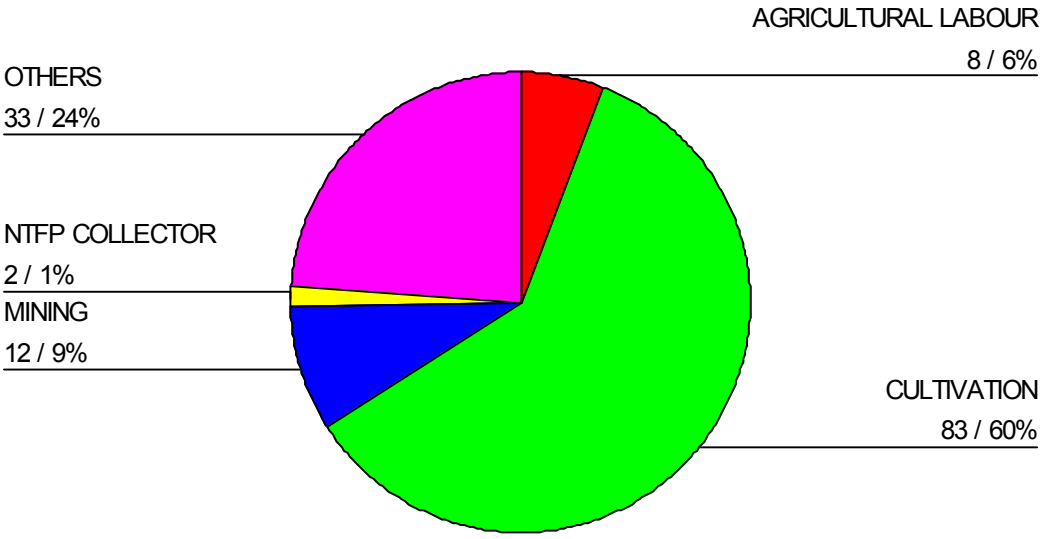
CHART: 1A

DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATIONS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA IN STUDY AREA I.



BASED ON HOUSEHOLD SAMPLE SURVEY.

DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATIONS FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA IN STUDY AREA I.



BASED ON HOUSEHOLD SAMPLE SURVEY.

TABLE NO: 2A
DISTRIBUTION OF HOUSEHOLDS BY TOTAL ANNUAL HOUSEHOLD INCOME IN STUDY AREA I.

TOTAL ANNUAL HOUSEHOLD INCOME IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KM.FROM THE ACTIVE MINING AREA.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM.FROM THE ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D	FREQ.	MEAN	S.D
0-10000	102 (35.7)	7548.53	1884.85	35 (25.36)	7928.86	1869.86
>10000-15000	79 (27.6)	12381.96	1461.92	50 (36.23)	12910	1528.04
>15000-20000	33 (11.5)	17709.70	1499.12	23 (16.7)	17264.78	1503.79
>20000-30000	26 (9.1)	24915.19	2963.22	14 (10.14)	25375	2334.42
>30000-50000	15 (5.24)	43776.67	5866.30	10 (7.24)	41198.50	5048.39
ABOVE 50000	31 (11)	69061.13	12342.77	6 (4.34)	68520	16922.22
TOTAL	286 (100)			138 (100)		
MEAN	20202.40			18104.75		

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 3 A
DISTRIBUTION OF HOUSEHOLDS BASED ON ANNUAL PERCAPITA INCOME OF EACH HOUSEHOLD IN STUDY AREA I.

ANNUAL PER CAPITA HOUSEHOLD INCOME IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING ZONE			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING ZONE		
	FREQ.	MEAN	S.D.	FREQ.	MEAN	S.D.
> 0 - 2000	117 (40.9)	1423.05	365.08	37 (26.8)	1606.69	310.38
>2000 - 5000	112 (39.1)	3135.13	813.95	78 (56.5)	3159.09	817.20
>5000 - 10000	38 (13.3)	7457.30	1504.76	20 (14.5)	6566.19	1166.43
>10000	19 (6.6)	12205.00	1729.77	3 (2.2)	10463.54	317.28
TOTAL	286 (100)	3611.55	3121.82	138 (100)	3395.44	2012.07

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 4A
DISTRIBUTION OF HOUSEHOLDS BY TOTAL AGRICULTURAL LAND HOLDINGS .

TOTAL AGRICULTURAL LAND HOLDING PER HOUSEHOLD (IN ACRES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS FROM ACTIVE MINING AREA.	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS FROM ACTIVE MINING AREA.
>0 – 3	174 (60.8)	62 (44.9)
>3 - 5	40 (14.0)	30 (21.7)
>5 - 10	21 (7.5)	29 (21.0)
>10 - 20	7 (2.7)	7 (5.1)
> 20	2 (0.1)	3 (2.2)
TOTAL (WITH LAND)	**244 (85.1)**	**131 (94.9)**
LANDLESS	42 (14.9)	7 (5.1)
TOTAL	**286 (100.0)**	**138 (100.0)**

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 5A
DISTRIBUTION OF HOUSEHOLDS BY TOTAL LAND HOLDING OF EACH HOUSEHOLD AND ANNUAL AVERAGE HOUSEHOLD EARNING IN STUDY AREA I.

TOTAL LAND HOLDING	TOTAL ANNUAL AVERAGE HOUSEHOLD INCOME CONSIDERING HOUSEHOLDS FALLING WITHIN 5 KM FROM ACTIVE MINING ZONE					
	>0 - 10000	>10000-15000	>15000-20000	>20000-50000	>50000	TOTAL
>0 - 3	75	42	17	27	13	174 (60.8)
>3 - 5	7	17	8	5	3	40 (14.0)
>5 - 10	2	4	5	4	6	21 (7.5)
>10 & 20	2	2	0	0	3	7 (2.7)
> 20	0	0	0	0	2	2 (0.1)
TOTAL (WITH LAND)	86	65	30	36	27	244 (85.1)
LANDLESS	16	14	2	5	5	42 (14.9)
TOTAL	102 (35.66)	79 (27.62)	32 (11.89)	41 (14.34)	32 (11.89)	286 (100)

PERCENTAGE OF HIGHLIGHTED CELLS IS 68% OF HOUSEHOLDS WITH LAND HOLDINGS (244).

TOTAL LAND HOLDING	TOTAL ANNUAL AVERAGE HOUSEHOLD INCOME CONSIDERING HOUSEHOLDS FALLING BEYOND 5 KM FROM ACTIVE MINING ZONE					
	>0 - 10000	>10000-15000	>15000-20000	>20000-50000	>50000	TOTAL
>0 - 3	23	24	12	3	0	62 (44.9)
>3 - 5	7	14	3	3	3	30 (21.7)
>5 - 10	2	7	7	11	2	29 (21.0)
>10 & 20	0	2	0	4	1	7 (5.1)
> 20	0	0	1	2	0	3 (2.2)
TOTAL (WITH LAND)	32	47	23	23	6	131 (94.9)
LANDLESS	3	3	0	1	0	7 (5.1)
TOTAL	35 (25.36)	50 (36.23)	23 (16.67)	24 (17.39)	6 (4.35)	138 (100)

PERCENTAGE OF HIGHLIGHTED CELLS IS 63% OF HOUSEHOLDS WITH LAND HOLDINGS (131).

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 6A
DISTRIBUTION OF HOUSEHOLDS BY PER CAPITA ANNUAL INCOME AND TOTAL AGRICULTURAL LANDHOLDING.

TOTAL LAND POSSESSED BY EACH HOUSEHOLD	ANNUAL PERCAPITA INCOME OF HOUSEHOLDS FALLING WITHIN 5 KM FROM ACTIVE MINING AREA.				
	>0 - 2000	>2000-5000	>5000-10000	>10000	TOTAL
>0 - 3	78	65	21	10	174 (60.8)
>3 - 5	13	20	6	1	40 (14.0)
>5 - 10	4	11	3	3	21 (7.5)
>10 & 20	1	3	1	2	7 (2.7)
> 20	0	1	1	0	2 (0.1)
TOTAL (WITH LAND)	96	100	32	16	244 (85.1)
LANDLESS	20	13	6	3	42 (14.9)
TOTAL	116 (40.6)	113 (39.5)	38 (13.3)	19 (6.6)	286 (100)

PERCENTAGE OF SUM OF FREQUENCIES OF THE HIGHLIGHTED CELLS IS 72% OF HOUSEHOLD WITH LAND HOLDING (244).

TOTAL LAND POSSESSED BY EACH HOUSEHOLDS	TOTAL ANNUAL PERCAPITA INCOME OF HOUSEHOLDS FALLING BEYOND 5 KM FROM ACTIVE MINING AREA.				
	>0 - 2000	>2000-5000	>5000-10000	>10000	TOTAL
>0 - 3	21	36	4	1	62 (44.9)
>3 - 5	9	15	5	1	30 (21.7)
>5 - 10	4	17	7	1	29 (21.0)
>10 & 20	0	5	2	0	7 (5.1)
> 20	0	1	2	0	3 (2.2)
TOTAL (WITH LAND)	34	74	20	3	131 (94.9)
LANDLESS	3	4	0	0	7 (5.1)
TOTAL	37 (26.8)	78 (56.5)	20 (14.5)	3 (2.2)	138 (100.0)

PERCENTAGE OF SUM OF FREQUENCIES OF THE HIGHLIGHTED CELLS IS 61% OF HOUSEHOLD WITH LAND HOLDING (131).

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 7A
DISTRIBUTION OF HOUSEHOLDS BY TOTAL ANNUAL AGRICULTURAL EARNING PER ACRE OF LAND HOLDING IN STUDY AREA I.

AGRI - CULTURAL EARNING PER ACRE (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA	
	FREQUENCY	MEAN	FREQUENCY	MEAN
LANDLESS	42 (14.7)	---	7 (5.1)	---
LAND BELOW 1 ACRE	37 (12.9)	---	4 (2.9)	---
NIL	9 (3.1)	---	2 (1.4)	---
>0 – 500	56 (19.6)	348.52	5 (3.6)	500.0
>500 – 1000	69 (24.1)	849.63	32 (23.2)	913.44
>1000 – 1500	38 (13.3)	1333.72	17 (12.3)	1390.18
>1500 – 2000	20 (7.0)	1834.70	19 (13.8)	1918.28
>2000 – 3000	12 (4.2)	2445.18	23 (16.7)	2607.17
>3000 – 4000	3 (1.1)	3600.0	13 (9.4)	3650.00
>4000	0	---	16 (11.6)	5154.63
TOTAL (WITH LAND)	244	---	131	---
LANDLESS	42 (14.7)	---	7 (5.1)	---
TOTAL	286 (100.0)	993.52	138 (100.0)	2218.10
MEAN		955.19*		1548.75*

SUM OF THE FREQUENCY OF BLUE COLOURED CELLS IS 80% AND 54% OF THE TOTAL HOUSEHOLDS WITH LAND HOLDING.

* THE MEAN CALCULATION CONSIDERED; AREA OF LAND ≥1 ACRE & PER ACRE AGRICULTURAL INCOME ≤ RS.3000.00.

FIGURES IN PARENTHESIS SHOW PERCENTAGE OF HOUSEHOLD.
SOURCE: SAMPLE SURVEY.

Majority of the people living in buffer villages has an annual agricultural earning below Rs 1000 per acre. Agricultural earning is higher in periphery villages. The households with land holding zero has been entered in the table.

TABLE NO: 8A
DISTRIBUTION OF HOUSEHOLDS BY PERCENTAGE OF LAND DAMAGED DUE TO MINING ACTIVITIES IN STUDY AREA I.

PROPORTION OF LAND DAMAGED DUE TO MINING ACTIVITIES	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA.				NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA.
	0 KM. TO 2 KMS.		ABOVE 2 KMS TO 5 KMS.		
	FREQUENCY	MEAN	FREQUENCY	MEAN	
LANDLESS HOUSEHOLD	4 (3.2)	---	38 (23.4)	---	NO SIGNIFICANT LAND DAMAGE WAS REPORTED IN THIS ZONE
NIL	25 (20.2)	---	57 (35.2)	---	
>0 - 0.25	28 (22.6)	0.19	15 (9.3)	0.15	
>0.25 – 0.5	48 (38.7)	0.42	32 (19.7)	0.44	
>0.5 - 0.75	7 (5.6)	0.64	6 (3.7)	0.63	
>0.75	12 (9.7)	0.97	14 (8.6)	1.0	
TOTAL	124 (100.0)	0.35*	162 (100)	0.28*	

* THE MEAN CALCULATION EXCLUDES THE 'LANDLESS' CLASS.

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

Dist. of LAND DAMAGE_T16

This table shows that for the majority of the households in the buffer zone villages the proportion of land damaged due to mining activities is in the higher side in the range 20% to 50% of the total agriculture land. There is no effect of mining in agriculture land in case of agriculture land located in the periphery zone.

TABLE NO: 9 A
DISTRIBUTION OF HOUSEHOLDS BY THE PROPORTION OF MINING

RATIO OF MINING INCOME TO TOTAL FAMILY INCOME	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D.	FREQ.	MEAN	S.D.
0	72 (25.2)	---	---	122 (88.4)	---	---
>0 TO 0.25	8 (2.8)	0.18	0.07	1 (0.7)	0.05	
>0.25 TO 0.5	18 (6.3)	0.36	0.07	3 (2.2)	0.41	0.07
>0.5 TO 0.75	33 (11.5)	0.64	0.07	10 (7.3)	0.66	0.07
>0.75 TO 1.0	155 (54.2)	0.92	0.07	2 (1.4)	0.86	0.04
TOTAL	286 (100.0)	0.60	0.40	138 (100.0)	0.07	0.20

INCOME TO TOTAL FAMILY INCOME IN STUDY AREA I.

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 10A
DISTRIBUTION OF HOUSEHOLDS BY RATIO OF MINING INCOME TO TOTAL ANNUAL HOUSEHOLD INCOME AND ANNUAL PER CAPITA HOUSEHOLD INCOME.

RATIO OF MINING INCOME TO TOTAL INCOME.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF PER CAPITA INCOME.									
	>0 to <1500	1500-<3000	3000-<5000	5000-<7500	7500-<10000	10000& above	TOTAL	P.C.	MEAN	S.D.
0	23	35	11	2	0	1	72	25.17	2185.30	1520.12
>0-0.25	3	3	1	0	1	0	8	2.8	2842.65	2950.81
>.25-.5	2	11	5	0	0	0	18	6.29	2543.11	1161.38
>.5-.75	11	5	11	4	1	1	33	11.53	3108.93	2347.31
>.75-1	21	54	31	16	13	20	155	54.19	4544.84	3638
TOTAL (P.C.)	60 (20.97)	108 (37.76)	59 (20.63)	22 (7.69)	15 (5.24)	22 (7.69)	286 (100)	100	3611.55	3121.82
MEAN	.46	.52	.63	.81	.86	.90	.6			
S.D.	.41	.42	.36	.29	.23	.21	.4			

RATIO OF MINING INCOME TO TOTAL INCOME.	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF PER CAPITA INCOME.									
	>0 to <1500	1500-<3000	3000-<5000	5000-<7500	7500-<10000	10000& above	TOTAL	P.C.	MEAN	S.D.
0	13	58	33	14	3	1	122	89.05	3202.83	1822.95
>0-0.25	0	0	0	1	0	0	1	.72	6394.17	--
>.25-.5	0	0	2	1	0	0	3	2.19	3727.78	1189.11
>.5-.75	0	2	6	0	1	1	10	7.29	4511.92	2735.11
>. 75-1	0	0	1	0	0	1	1	.72	7564.06	4616.08
TOTAL (P.C.)	13 (9.48)	60 (43.79)	42 (30.65)	16 (11.67)	4 (2.91)	3 (2.19)	137 (100)	100	3395.44	2012.07
MEAN	.0	.02	.14	.03	.17	.47	.7			
S.D.	.0	.12	.28	.09	.35	.43	.2			

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 11 A

MULTIPLE REGRESSION ANALYSIS

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. **INCOME** (Total Annual Household Income)

Block Number 1. Method: Enter **MIN_INC** (Total Annual Household Income from Mining Jobs)

Variable(s) Entered on Step Number
1.. MIN_INC mining income

Multiple R .95845
R Square .91862
Adjusted R Square .91833
Standard Error 5618.31919

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	101189474198.94530	101189474198.945
Residual	284	8964604985.40783	31565510.51200

F = 3205.69738 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
MIN_INC	.951085	.016798	.958445	56.619	.0000
(Constant)	5872.249839	417.645421		14.060	.0000

TABLE NO: 12A
DISTRIBUTION OF HOUSEHOLDS BY TOTAL AGRICULTURAL LAND HOLDINGS AND ANNUAL AGRICULTURAL EARNING PER ACRE IN STUDY AREA I.

ANNUAL AGRI-CULTURAL EARNING PER ACRE IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA				NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA			
	1 TO 3 ACRES	ABOVE 3 TO 5 ACRES	ABOVE 5 TO 10 ACRES	ABOVE 10 ACRES	1 TO 3 ACRES	ABOVE 3 TO 5 ACRES	ABOVE 5 TO 10 ACRES	ABOVE 10 ACRES
LAND BELOW 1 ACRE	37 (21.3)				4 (6.4)			
NIL	5 (2.9)	2 (5.0)	0	2 (22.2)	1 (1.6)	0	1 (3.4)	0
>0 – 500	34 (19.5)	10 (25.0)	9 (42.8)	3 (33.3)	3 (4.8)	1 (3.3)	1 (3.4)	0
>500-1000	50 (28.7)	10 (25.0)	6 (28.6)	3 (33.3)	17 (27.4)	7 (23.3)	8 (27.6)	0
>1000-1500	24 (13.8)	10 (25.0)	4 (19.0)	0	10 (16.1)	5 (16.7)	1 (3.4)	1 (10.0)
>1500-2000	14 (8.0)	4 (10.0)	1 (4.8)	1 (11.1)	11 (17.7)	4 (13.3)	3 (10.3)	1 (10.0)
>2000- 3000	8 (4.6)	3 (7.5)	1 (4.8)	0	7 (11.3)	5 (16.7)	8 (27.6)	3 (30.0)
>3000 –4000	2 (1.2)	1 (2.5)	0	0	3 (4.8)	2 (6.7)	6 (20.7)	2 (20.0)
>4000	0	0	0	0	6 (9.7)	6 (20.0)	1 (3.4)	3 (30.0)
TOTAL	174 (100.0)	40 (100.0)	21 (100.0)	9 (100.0)	62 (100.0)	30 (100.0)	29 (100.0)	10 (100.0)
AVERAGE AGRI-CULTURAL EARNING	1035.26	1046.62	814.01	541.07	1935.29	2415.83	2211.38	3284.73
HOUSE-HOLD WITH LAND HOLDING	**244** *(85.3)*				**131** *(94.9)*			
LANDLESS HOUSE-HOLD	**42** *(14.7)*				**7** *(5.1)*			
TOTAL SAMPLE	**286** *(100.0)*				**138** *(100.0)*			

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 13A

MULTIPLE REGRESSION ANALYSIS

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable..
A_EARN: Annual Average Agricultural Earning per Acre.

Variable(s) Entered on Step Number
1.. FERDUMMY: Fertilizer Dummy.

Multiple R .03846
R Square .00148
Adjusted R Square -.00120
Standard Error 1523.19550

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	1282180.10813	1282180.10813
Residual	373	865406449.71882	2320124.53008

F = .55263 Signif F = .4577

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
FERDUMMY	203.644884	273.939484	.038463	.743	.4577
(Constant)	1327.797001	261.225873		5.083	.0000

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TABLE NO: 14A

MULTIPLE REGRESSION ANALYSIS

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable:
A_EARN: Annual Average Agricultural Earning per Acre.

Variable(s) Entered on Step Number
1.. P_MINER: Proportionate of Miners in a Household.

Multiple R .03626
R Square .00131
Adjusted R Square -.00281
Standard Error 1438.35319

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	659180.63446	659180.63446
Residual	242	500664095.68066	2068859.89951

F = .31862 Signif F = .5730

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
P_MINER	349.829870	619.755242	.036261	.564	.5730
(Constant)	1089.139974	138.870845		7.843	.0000

TABLE: 14A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
T_A_EARN: Total Annual Agricultural Earning of a Household.

Variable(s) Entered on Step Number
1. **CULLAND**: Total Cultivable Land Possessed by a Household.

Multiple R .61400
R Square .37700
Adjusted R Square .37481
Standard Error 2589.85240

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	1152712499.96726	1152712499.96726
Residual	284	1904883272.94726	6707335.46812

F = 171.85848 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
CULLAND	838.669135	63.974246	.614003	13.109	.0000
(Constant)	984.975577	188.712848		5.219	.0000

TABLE NO: 15A

MULTIPLE REGRESSION ANALYSIS

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. A_EARN

Block Number 1. Method: Enter
DUMMY_D : Distance Dummy.
Considering households with land holding greater than 1 acre.

Variable(s) Entered on Step Number
1.. DUMMY_D

Multiple R .51257
R Square .26272
Adjusted R Square .25827
Standard Error 1042.85232

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	128275954.03356	64137977.01678
Residual	331	359976058.52691	1087540.96232

F = 58.97523 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
DUMMY_D	872.271677	164.305241	.350222	5.309	.0000
(Constant)	853.072557	85.721933		9.952	.0000

TABLE NO: 16A
DISTRIBUTION OF HOUSEHOLDS BY LAND DAMAGE DUE TO MINING ACTIVITIES AND RATIO OF MINING INCOME TO TOTAL INCOME IN STUDY AREA I.

RATIO OF MINING INCOME TO TOTAL INCOME	EXTENT OF LAND DAMAGE DUE TO MINING ACTIVITIES												AVERAGE PER-CENTAGE OF LAND DAMAGE
	LAND LESS		0 % DAMAGE		>0 – 25 % DAMAGE		>25 – 50 % DAMAGE		>50 – 75% DAMAGE		>75% DAMAGE		
	0 – 2 KMS	2 – 5 KMS	0 – 2 KMS	2 – 5 KMS	0 – 2 KMS	2 – 5 KMS	0 – 2 KMS	2 – 5 KMS	0 – 2 KMS	2 – 5 KMS	0 – 2 KMS	2 – 5 KMS	
NIL MINING INCOME	0	3 (7.9)	6 (24.0)	20 (35.1)	10 (35.7)	3 (20.0)	11 (22.9)	11 (34.4)	1 (14.3)	2 (33.3)	3 (25.0)	6 (42.8)	0.30
MEAN	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
>0 TO 0.25	0	0	0	1 (1.8)	2 (7.1)	1 (6.7)	0	1 (3.1)	1 (14.3)	1 (11.1)	0	0	0.37
MEAN	-----	-----	-----	0.15	0.24	0.18	-----	0.25	0.20	0.04	-----	-----	
>0.25 TO 0.50	0	1 (2.6)	1 (4.0)	7 (12.3)	1 (3.6)	1 (6.7)	4 (8.3)	1 (3.1)	0	0	0	1 (7.1)	0.20
MEAN	-----	0.26	0.39	0.32	0.44	0.36	0.39	0.32	-----	-----	-----	0.40	
>0.50 TO 0.75	0	2 (5.3)	2 (8.0)	5 (8.8)	4 (14.3)	3 (20.0)	8 (16.7)	3 (9.4)	1 (14.3)	1 (11.1)	2 (16.7)	2 (14.3)	0.36
MEAN	-----	0.61	0.69	0.65	0.65	0.65	0.61	0.63	0.67	0.63	0.69	0.64	
>0.75 TO 1.00	4 (100)	32 (84.2)	16 (64.0)	24 (42.1)	11 (39.3)	7 (46.6)	25 (52.1)	16 (50.0)	4 (57.1)	2 (33.3)	7 (58.3)	5 (35.7)	0.25
MEAN	0.98	0.97	0.90	0.92	0.91	0.90	0.88	0.91	0.89	0.95	0.94	0.92	
TOTAL	4 (100)	38 (100)	25 (100)	57 (100)	28 (100)	15 (100)	48 (100)	32 (100)	7 (100)	6 (100)	12 (100)	14 (100)	0.31
MEAN	0.98	0.85	0.65	0.48	0.48	0.58	0.59	0.53	0.63	0.43	0.67	0.44	

N.B. NO SIGNIFICANT LAND DAMAGE WAS REPORTED IN THE PERIPHERY ZONE (BEYOND 5 KMS).

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.

TABLE NO: 17A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable:
MIN_INC : Annual Household Mining Income.

Variable(s) Entered on Step Number
1. **P_LAND**: Proportionate of Land Damaged due to Mining Activities.

Multiple R .01209
R Square .00015
Adjusted R Square -.00337
Standard Error 19845.29141

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	16364342.14842	16364342.14842
Residual	284	111849307888.92360	393835591.15818

F = .04155 Signif F = .8386

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
P_LAND	755.047072	3704.095989	.012095	.204	.8386
(Constant)	14858.527378	1557.110087		9.542	.0000

TABLE NO: 18A
DISTRIBUTION OF HOUSEHOLDS BY RATIO OF MINING TO TOTAL INCOME AND AVERAGE ANNUAL AGRICULTURAL EARNING PER ACRE IN STUDY AREA I.

RATIO OF MINING INCOME TO TOTAL INCOME	AVERAGE AGRICULTURAL EARNING PER ACRE (IN RUPEES) WITHIN 5 KMS. FROM ACTIVE MINING AREA														TOTAL
	0		>0 & < 500		500 & < 1000		1000 & <1500		1500 & <2000		2000 & < 3000		3000 & ABOVE		
LAND DAMAGED	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	
0	2	1	12	1	9	2	13	8	3	3	4	2	2	2	64
>0 TO < 0.25	0	0	1	0	0	0	2	1	1	0	0	0	0	0	5
0.25 TO <0.5	0	0	2	1	2	2	1	0	2	0	0	2	0	0	12
0.5 TO <0.75	1	0	4	0	7	0	7	2	2	3	1	1	0	0	28
0.75 TO 1.0	4	1	17	0	30	3	9	11	6	6	3	7	1	0	98
TOTAL	7 (5)	2 (3)	36 (24)	2 (3)	48 (32)	7 (12)	32 (23)	22 (38)	14 (9)	12 (20)	8 (5)	12 (20)	3 (2)	2 (3)	207
LAND DAMAGED (HH)	**148** (100)														
TOTAL LAND NOT DAMAGED	**59** (100)														
LANDLESS	**42**														
LAND > 0 & <1	**37**														
TOTAL SAMPLE	**286**														

RATIO OF MINING INCOME TO TOTAL INCOME	AVERAGE AGRICULTURAL EARNING PER ACRE (IN RUPEES) BEYOND 5 KMS. FROM ACTIVE MINING AREA.							
	0	. >.0 & < 500	500 & < 1000	1000 & <1500	1500 & <2000	2000 & < 3000	3000 & ABOVE	TOTAL
0	2	0	12	22	12	29	34	111
>0 TO < 0.25	0	0	0	0	1	0	0	1
0.25 TO <0.5	0	0	0	2	1	0	0	3
0.5 TO <0.75	0	0	4	3	1	1	1	10
0.75 TO 1.0	0	0	0	1	0	1	0	2
TOTAL	2 (1)	0	16 (13)	28 (22)	15 (12)	31 (24)	36 (28)	127
LAND DAMAGED (HH)	**0**							
TOTAL LAND NOT DAMAGED	**127**							
LANDLESS	**7**							
LAND > 0 & <1	**4**							
TOTAL SAMPLE	**138**							

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 21A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
E_NTFP : Annual Earning of a Household from NTFP Collection.

Variable(s) Entered on Step Number
1. **MIN_INC** : Total Annual Income of a Household from Mining Jobs.

Multiple R .06073
R Square .00369
Adjusted R Square .00018
Standard Error 309.55852

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	100753.14288	100753.14288
Residual	284	27214719.82565	95826.47826

F = 1.05141 Signif F = .3061

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
MIN_INC	9.49032E-04	9.2554E-04	.060733	1.025	.3061
(Constant)	234.326658	23.011455		10.183	.0000

TABLE NO: 20A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
E_NTFP : Total Earning of a Household from NTFP Collection.

Variable(s) Entered on Step Number
1.. **DUMMY_D** : Distance Dummy.
2.. **P_POL** : Number of Household Member.

Multiple R .79233
R Square .62779
Adjusted R Square .62602
Standard Error 724.75180

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	372975037.23942	186487518.61971
Residual	421	221136637.53181	525265.17228

F = 355.03500 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
P_POL	37.042884	15.044465	.073474	2.462	.0142
DUMMY_D	2008.797337	75.387574	.795137	26.646	.0000
(Constant)	32.456038	97.695733		.332	.7399

TABLE NO: 21A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
E_NTFP : Annual Earning of a Household from NTFP Collection.

Variable(s) Entered on Step Number
1. **MIN_INC** : Total Annual Income of a Household from Mining Jobs.

Multiple R .06073
R Square .00369
Adjusted R Square .00018
Standard Error 309.55852

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	100753.14288	100753.14288
Residual	284	27214719.82565	95826.47826

F = 1.05141 Signif F = .3061

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
MIN_INC	9.49032E-04	9.2554E-04	.060733	1.025	.3061
(Constant)	234.326658	23.011455		10.183	.0000

TABLE NO: 22A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
E_NTFP : Annual Earning of a Household from NTFP Collection.

Variable(s) Entered on Step Number
1. **RATIOMIN**: Ratio of Mining Income of a Household to its Total Annual Income.

Multiple R .05418
R Square .00294
Adjusted R Square -.00057
Standard Error 309.67540

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	80198.11028	80198.11028
Residual	284	27235274.85825	95898.85513

F = .83628 Signif F = .3612

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
RATIOMIN	-42.070657	46.004884	-.054185	-.914	.3612
(Constant)	273.857295	33.114501		8.270	.0000

TABLE NO: 23A
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE NTFP EARNING AND PERCENTAGE OF LITERATES IN HOUSEHOLDS OF STUDY AREA I.

ANNUAL HOUSEHOLD NTFP EARNING IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF HOUSEHOLD LITERACY.											
	ILLITERATE		>0 – 25%		>25 – 50%		>50 – 75%		>75%		TOTAL	
	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN
NIL	64 (45)	---	18 (33)	---	29 (44)	---	9 (53)	---	4 (80)	---	124 (44)	---
>0 - 500	48 (33)	310	25 (46)	270	30 (45)	306	8 (47)	213	1 (20)	40	112 (39)	292
>500 - 1000	26 (18)	718	10 (19)	614	7 (11)	560	0	---	0	---	43 (15)	668
>1000 - 1500	3 (2)	1121	0	---	0	---	0	---	0	---	3 (1)	1121
>1500 - 2000	3 (2)	1585	1 (2)	1560	0	---	0	---	0	---	4 (1)	1579
>2000	0	---	0	---	0	---	0	---	0	---	0	---
TOTAL	144 (100)	**521**	54 (100)	**268**	66 (100)	**198**	17 (100)	**100**	5 (100)	**40**	**286** (100)	**439**
% TO TOTAL	**(50)**		**(19)**		**(23)**		**(6)**		**(2)**			

ANNUAL HOUSEHOLD NTFP EARNING IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF HOUSEHOLD LITERACY.											
	ILLITERATE		>0 – 25%		>25 – 50%		>50 – 75%		>75%		TOTAL	
	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN
NIL	1 (1)	---	0	---	0	---	1 (5)	---	1 (14)	---	3 (2)	---
>0 - 500	1 (1)	500	0	---	0	---	0	---	0	---	1 (1)	500
>500 - 1000	21 (30)	958	2 (15)	1000	3 (11)	900	3 (16)	1000	4 (57)	1000	33 (24)	964
>1000 - 1500	9 (13)	1192	0	---	2 (7)	1350	4 (21)	1313	0	---	15 (11)	1245
>1500 - 2000	6 (8)	1992	2 (15)	1875	4 (14)	1950	1 (5)	1750	0	---	13 (9)	1942
>2000	33 (47)	2936	9 (70)	3486	19 (68)	3413	10 (53)	3420	2 (29)	2900	73 (53)	3193
TOTAL	71 (100)	**2003**	13 (100)	**2855**	28 (100)	**2787**	19 (100)	**2326**	7 (100)	**1400**	**138** (100)	**2292**
% TO TOTAL	**52**		**9**		**20**		**14**		**5**			

* MEAN CALCULATIONS EXCLUDE 'NIL' CASES.
FIGURES IN PARENTHESIS INDICATE PERCENTGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 25A
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE NTFP EARNING AND RATIO OF MINING INCOME TO TOTAL INCOME IN STUDY AREA I.

RATIO OF MINING INCOME TO TOTAL INCOME	DISTRIBUTION OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA BY ANNUAL AVERAGE NTFP EARNING.						
	NIL	>0 - 500	>500 - 1000	>1000 – 1500	>1500 – 2000	>2000	TOTAL
NIL	29	31	11	0	1	0	72
>0 TO 0 .25	2	4	2	0	0	0	8
>0.25 TO 0.5	8	6	3	1	0	0	18
>0.5 TO 0.75	14	14	4	0	1	0	33
>0.75	71	57	23	2	2	0	155
TOTAL	124 (43.4)	112 (39.2)	43 (15.0)	3 (1.0)	4 (1.4)	0	286 (100)
MEAN*	0.63	0.57	0.57	0.70	0.62		0.60

RATIO OF MINING INCOME TO TOTAL INCOME	DISTRIBUTION OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA BY ANNUAL AVERAGE NTFP EARNING.						
	NIL	>0 - 500	>500 - 1000	>1000 – 1500	>1500 – 2000	>2000	TOTAL
NIL	3	1	31	13	12	62	122
>0 TO 0 .25	0	0	0	0	0	1	1
>0.25 TO 0.5	0	0	0	0	0	3	3
>0.5 TO 0.75	0	0	2	2	1	5	10
>0.75	0	0	0	0	0	2	2
TOTAL	3 (2.2)	1 (0.7)	33 (23.9)	15 (10.9)	13 (8.7)	73 (53.6)	138 (100)
MEAN*			0.04	0.10	0.05	0.09	0.07

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 26A
DISTRIBUTION OF HOUSEHOLD BY ANNUAL MEDICAL EXPENSES IN STUDY AREA I.

ANNUAL MEDICINAL EXPENSES OF EACH HOUSEHOLD IN RUPEES	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS OF ACTIVE MINING ZONE.				NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS OF ACTIVE MINING ZONE.			
	0 – 2 KMS.		>2 – 5 KMS.		>5 – 10 KMS.		>10 – 15 KMS.	
	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN	FREQ.	MEAN
< 500	11 (8.87)	322.73	43 (26.54)	293.02	53 (81.54)	243.77	55 (70.51)	228.64
500 - <1000	26 (20.96)	699.04	68 (41.98)	588.24	9 (13.84)	561.11	14 (19.18)	603.85
1000 - <1500	41 (33.06)	1104.89	36 (22.22)	1122.22	3 (4.61)	1100	3 (4.11)	1100
1500 - < 2000	23 (18.54)	1632.17	12 (7.4)	1583.33	0	---	1 (1.37)	---
2000 - < 2500	16 (12.9)	2021.89	3 (1.85)	2138.75	0	---	0	---
2500 - < 3000	2 (1.61)	2600.11	0	---	0	---	0	---
3000 - < 3500	3 (2.42)	3100	0	---	0	---	0	---
3500 & ABOVE	2 (1.61)	4150	0	---	0	---	0	---
TOTAL	124 (100.0)	1288.03	162 (100.0)	730.28	65 (100.0)	322.62	73 (100.0)	326.64

FIGURES IN PARENTHESIS INDICATE THE PERCENTAGES.

SOURCE: SAMPLE SURVEY.

Major diseases affecting villagers in the buffer zone are diarrhea and other bronchial diseases. It has been somewhat difficult to asses the loss of earning due to sickness as the villagers were unable to recollect the number of days they were usually absent from workplace only due to these diseases. However from the data given in the table it can be seen that the medical expenses incurred in periphery villages are comparatively low compared to the villages in the buffer zone. The majority of households living in periphery villages incur medical expenses within Rs 500 annually .

TABLE NO: 27A

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
C_MED : Total Annual Medical Expenses of a Household.

Variable(s) Entered on Step Number
1.. **INCOME** : Household's Total Income.
2.. **DUMMY_D** : Distance Dummy.
3.. **P_LIT** : Proportion of Literate in a Household.

Multiple R .62651
R Square .39251
Adjusted R Square .38817
Standard Error 487.68855

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	64542466.22666	21514155.40889
Residual	420	99892851.99975	237840.12381

F = 90.45637 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
DUMMY_D	-629.150204	50.889920	-.473365	-12.363	.0000
P_LIT	184.387719	97.970303	.074230	1.882	.0605
INCOME	.012712	.001354	.369442	9.388	.0000
(Constant)	681.273818	40.717209		16.732	.0000

TABLE NO: 28A
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE MEDICAL EXPENSES AND ANNUAL AVERAGE HOUSEHOLD INCOME IN STUDY AREA I.

ANNUAL AVERAGE MEDICAL EXPENSES IN RUPEES.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT ANNUAL INCOME LEVELS IN RUPEES.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT ANNUAL INCOME LEVEL IN RUPEES.					
	0 – 5 KM.			5 – 10 KM.			10 – 15 KM.		
	≤10000	>10000 TO ≤20000	>20,000	≤10000	10000 TO ≤20000	>20,000	≤10000	10000 TO ≤20000	>20,000
NIL	0	0	0	0	0	0	2 (8.6)	3 (8.8)	1 (6.25)
>0 - 500	29 (28.4)	21 (18.75)	4	12 (92.30)	31 (83.78)	10 (66.66)	19 (82.8)	25 (73.56)	6 (37.5)
>500 – 1000	37 (36.27)	46 (41.07)	11	1 (7.7)	4 (10.81)	4 (26.66)	1 (4.3)	4 (11.76)	9 ()
>1000 – 1500	27 (26.47)	27 (24.10)	25	0	2 (5.40)	1 (6.68)	1 (4.3)	1 (2.94)	0
>1500 – 2000	7 (6.8)	10 (8.9)	16	0	0	0	0	1 (2.94)	0
>2000	2 (1.9)	8 (7.14)	16	0	0	0	0	0	0
TOTAL	102 (35.67)	112 (39.16)	72 (25.17)	13	37	15	23	34	16
% TO TOTAL	(35.6)	(39.2)	(25.2)	(20)	(56.9)	(23.1)	(31.5)	((46.6)	(21.9)
MEAN	764.36	870.54	1424.38	259.85	327.57	370			
TOTAL SAMPLE	286 (100.0)			65 (100.0)			73 (100.0)		
AVERAGE MEDICAL EXPENSES	972.10			322.62			326.64		

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 29A
DISTRIBUTION OF HOUSEHOLDS BY PER CAPITA MEDICAL COST AND PER CAPITA ANNUAL HOUSEHOLD INCOME IN STUDY AREA I.

PER CAPITA ANNUAL HOUSEHOLD INCOME IN RUPEES.	NUMBER OF HOUSEHOLDS UNDER DIFFERENT RANGES OF PER CAPITA MEDICAL EXPENSES FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA.				
	NIL	>0 - 300	>300 - 600	>600	TOTAL
>0 - 2000	0	109 (93.2)	8 (6.8)	0	117 (100.0)
MEAN	----	113.57	368.23	----	130.98
>2000 - 5000	0	89 (79.5)	23 (20.5)	0	112 (100.0)
MEAN	----	151.38	404.91	----	203.45
>5000 - 10000	0	26 (68.4)	12 (31.6)	0	38 (100.0)
MEAN	----	166.05	364.01	----	228.57
>10000	0	10 (52.6)	7 (36.9)	2 (10.5)	19 (100.0)
MEAN	----	202.88	374.93	650.83	313.42
TOTAL	0	234 (81.8)	50 (17.5)	2 (0.7)	286 (100.0)
MEAN	----	137.60	385.03	650.83	184.45
PER CAPITA ANNUAL HOUSEHOLD INCOME IN RUPEES.	NUMBER OF HOUSEHOLDS UNDER DIFFERENT RANGES OF PER CAPITA MEDICAL EXPENSES FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA.				
	NIL	>0 - 300	>300 - 600	>600	TOTAL
>0 - 2000	3 (8.1)	33 (89.2)	1 (2.7)	0	37 (100.0)
MEAN	----	52.08	334.0	----	55.46
>2000 - 5000	2 (2.6)	76 (97.4)	0	0	78 (100.0)
MEAN	----	67.51	----	----	65.78
>5000 - 10000	1 (5.0)	19 (95.0)	0	0	20 (100.0)
MEAN	----	83.08	----	----	78.92
>10000	0	3 (100.0)	0	0	3 (100.0)
MEAN	----	90.28	----	----	90.28
TOTAL	6 (4.3)	131 (94.9)	1 (0.8)	0	138 (100.0)
MEAN	----	66.40	334.0	----	65.45

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 30A
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE MEDICAL EXPENSES AND LITERACY RATE IN STUDY AREA I.

ANNUAL HOUSE-HOLD MEDICAL EXPENSES IN RUPEES.	NUMBER OF HOUSEHOLDS UNDER DIFFERENT RANGES OF FAMILY LITERACY RATES.											
	ILLITERATE		0 - 25%		>25 - 50%		>50 - 75%		>75 – 100%		TOTAL	
	A* ZONE	B* ZONE	A* ZONE	B* ZONE	A* ZONE	B* ZONE	A* ZONE	B* ZONE	A* ZONE	B* ZONE	A* ZONE	B* ZONE
NIL	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**1**	**0**	**6**
%	---	33.3	---	---	---	50.0	---	---	---	16.7	---	100
< 500	**38**	**59**	**7**	**9**	**7**	**16**	**2**	**15**	**0**	**3**	**54**	**102**
%	70.4	57.8	13.0	8.8	13.0	15.7	3.7	14.7	0	2.9	100	100
MEAN	287	228	286	261	343	238	425	250	---	183	299	234
500 - <1000	**50**	**9**	**16**	**3**	**24**	**7**	**3**	**2**	**1**	**2**	**94**	**23**
%	53.2	34.8	17.0	13.0	25.5	30.4	3.2	8.7	1.1	8.7	100	100
MEAN	628	563	609	567	605	579	566	675	800	650	619	586
1000 - <1500	**37**	**1**	**12**	**1**	**18**	**2**	**8**	**1**	**2**	**1**	**77**	**6**
%	48.0	16.7	15.6	16.7	23.4	33.2	10.4	16.7	2.6	16.7	100	100
MEAN	1131	1300	1150	1000	1089	1000	1113	1000	1100	1000	1113	1050
1500 - <2000	**16**	**0**	**8**	**0**	**8**	**0**	**1**	**1**	**2**	**0**	**35**	**1**
%	45.7	---	22.9	---	22.9	---	2.8	100	5.7	---	100	100
MEAN	1629	---	1663	---	1555	---	1700	1500	1650	---	1615	1500
2000 - <2500	**2**	**0**	**9**	**0**	**6**	**0**	**2**	**0**	**0**	**0**	**19**	**0**
%	10.5	---	47.4	---	31.6	---	10.5	---	---	---	100	---
MEAN	2000	---	2011	---	2109	---	2000	---	---	---	2040	---
2500 - <3000	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**
%	50.0	---	---	---	---	---	50.0	---	---	---	100	---
MEAN	2700	---	---	---	---	---	2500	---	---	---	2600	---
3000 & MORE	**0**	**0**	**2**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**5**	**0**
%	---	---	40.0	---	60.0	---	---	---	---	---	100	---
MEAN	---	---	3625	---	3450	---	---	---	---	---	3520	---
TOTAL	**144**	**71**	**54**	**13**	**66**	**28**	**17**	**19**	**5**	**7**	**286**	**138**
%	50.3	51.4	18.9	9.4	23.1	20.3	5.9	13.8	1.7	5.1	100	100
MEAN	**805**	**274**	**1189**	**388**	**1090**	**352**	**1156**	**400**	**1260**	**407**	**972**	**325**

* A ZONE IS THE AREA WITHIN 5 KMS. FROM THE ACTIVE MINING AREA.
B ZONE IS THE AREA BEYOND 5 KMS. FROM THE ACTIVE MINING AREA.

SOURCE: SAMPLE SURVEY.

TABLE NO: 31A
DISTRIBUTION OF HOUSEHOLDS BY PROPORTION OF LITERATE IN A FAMILY IN STUDY AREA I.

PROPORTION OF LITERATE IN A FAMILY	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA	
	FREQUENCY	MEAN	FREQUENCY	MEAN
NIL	144 (50.3)	----	71 (51.4)	----
>0 – 0.25	54 (18.9)	0.20	13 (9.4)	0.18
>0.25 - 0.5	66 (23.1)	0.41	28 (20.3)	0.38
>0.5 - 0.75	17 (5.9)	0.63	19 (13.8)	0.63
>0.75	5 (1.8)	0.92	7 (5.1)	0.99
TOTAL	286 (100.00)		138 (100.00)	
MEAN	0.18		0.23	

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.

SOURCE: SAMPLE SURVEY.

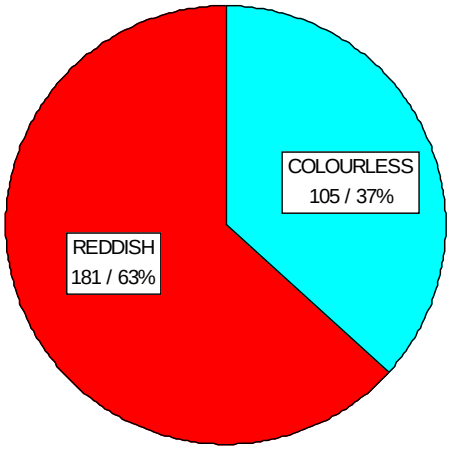
TABLE NO: 32A
DISTRIBUTION OF HOUSEHOLDS BY QUALITY OF DRINKING WATER DURING MONSOON.

DISTRIBUTION OF HOUSEHOLDS AS PER QUALITY OF DRINKING WATER				
QUALITY OF DRINKING WATER USED BY THE RESPONDENTS	DISTANCE FROM ACTIVE MINING ZONE			
	0 – 2 km	2 – 5 km	5 – 10 km	10 – 15 km
	NUMBER OF HOUSEHOLDS FALLING IN BUFFER ZONE		NUMBER OF HOUSEHOLDS FALLING IN PERIPHERY ZONE	
REDDISH	87 (70.16)	94 (58.03)	33 (50.77)	16 (21.91)
COLOURLESS	37 (29.84)	68 (41.97)	32 (49.23)	57 (78.08)
TOTAL	124 (100)	162 (100)	65 (100)	73 (100)

FIGURES IN THE PARENTHESIS SHOW THE PERCENTAGE FIGURES.
SOURCE: SAMPLE SURVEY

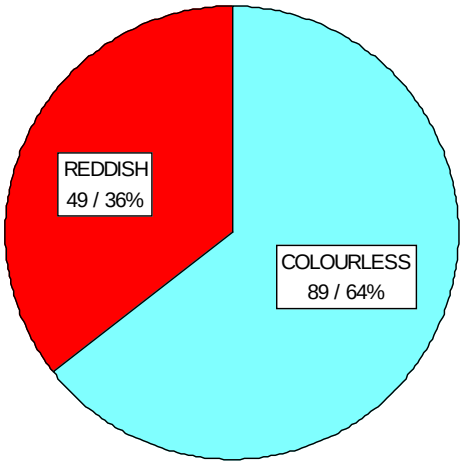
CHART:

DISTRIBUTION OF HOUSEHOLDS BY QUALITY OF DRINKING WATER AVAILABLE DURING MONSOON FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA I.



BASED ON THE REPLY RECEIVED DURING HOUSEHOLD SURVEY.

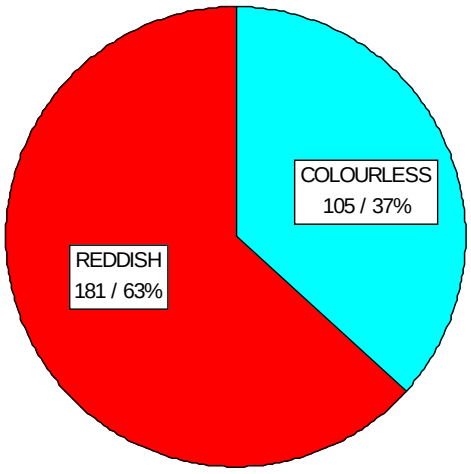
DISTRIBUTION OF HOUSEHOLDS BY QUALITY OF DRINKING WATER AVAILABLE DURING MONSOON FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA I.



BASED ON THE REPLY RECEIVED DURING HOUSEHOLD SURVEY.

CHART :

DISTRIBUTION OF HOUSEHOLDS BY QUALITY OF DRINKING WATER AVAILABLE DURING MONSOON FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA I.



BASED ON THE REPLY RECEIVED DURING HOUSEHOLD SURVEY.

APPENDIX NO: 1A
LIST OF OPERATING MINES IN THE STUDY AREA I (REFER TO MAP NO 1).

SL. NO.	NAME OF MINE	LEASE AREA (IN HECTARS)	ANNUAL PRODUCTION (IN LAKH TONNES)	MINING METHOD
1	**MINES A1, B & K**	**2486**	**22.00**	**MECHANISED**
2	**MINE C**	**297.847**	**6.5**	**DO**
3	**MINE D**	**49.372**	**.08**	**MANUAL**
4	**MINE E**	**45.932**	**.08**	**MANUAL**
5	**MINE F**	**18.315**	**.03**	**MANUAL**
6	**MINE G**	**67.582**	**.68**	**MANUAL**
7	**MINE H**	**69.606**	**.003**	**MANUAL**
8	**MINE I**	**90.143**	**.44**	**MANUAL**
9	**MINE J**	**51.476**	**.10**	**MANUAL**

APPENDIX NO: 2A
LIST OF SAMPLE VILLAGES OF STUDY AREA I.

Sl. No.	Village Name	Block	Police Station	Total House-holds (1991 census)	Popu-lation (1991 census)	Area of the Village (in hectors)
1.	Kalta Basti	Koida	Koida	555	2110	610.65
2.	Jhirpani	Koida	Koida	169	832	3103.35
3.	Toda	Koida	Koida	633	2319	1620.45
4.	Kadodiha	Koida	Koida	118	598	559.23
5.	Nuagaon	Koida	Koida	58	349	1069.30
6.	Kusumdihi	Koida	Koida	145	616	163.35
7.	Komondo	Koida	Koida	169	919	1751.10
8.	Bandhal	Koida	Koida	68	337	1080.80
9.	Raikela	Koida	Koida	184	795	1488.85
10.	Jamdihi	Koida	K.Balang	225	1022	1946.61
11.	Kudamasa	Koida	K.Balang	73	337	292.51
12.	Gagnaposh	Lahunipara	K.Balang	83	410	1144.17
13.	Sasekela	Lahunipara	Lahunipara	391	1603	1491.11
14.	Tinko	Lahunipara	Lahunipara	64	375	1267.47
15.	Dalamkucha	Lahunipara	Lahunipara	34	192	300.11
16.	Ganighasa	Lahunipara	Lahunipara	74	434	455.02
17.	Basubahal	Lahunipara	Lahunipara	94	464	275.34
18.	Rajabasa	Lahunipara	Lahunipara	*	*	*
19.	Bhutura	Lahunipara	Lahunipara	96	305	2612.17
20.	Lasi	Lahunipara	Lahunipara	*	*	*

* Data not available in Census Report: 1991.

APPENDIX NO: 3A

LIST OF ALL VILLAGES OF CORE AREA WITH TOTAL AGRICULTARAL LAND HOLDING

Sl. No.	**Village Name**	**Total Agricultural Land (in acres)**
1	**SASEKELA**	**674.48**
2	**LASI**	**N.A.**
3	**BHUTURA**	**23.97**
4	**RAJABASA**	**N.A.**
5	**RAIKELA**	**315.25**
6	**BANDHAL**	**323.22**
7	**KOMONDO**	**664.25**
8	**KADODIHA**	**228.96**
9	**NUAGAON**	**403.23**
10	**HARISHCHANDRAPUR**	**70.63**
11	**KULA**	**374.41**
12	**BHANJPALI**	**294.72**
13	**KASHIRA**	**351.55**
14	**DENGULA**	**370.73**
15	**BAHAMBA**	**35.48**
16	**DAMALU**	**198.17**
17	**SHILGUDA**	**1.53**
18	**KILINDA**	**99.85**
19	**RANDA**	**10.93**
20	**NUATANTRA**	**.00**
21	**TANTRA**	**62.98**
22	**RANGUA**	**178.50**
23	**KALTA BASTI**	**126.96**
24	**JHIRPANI**	**494.88**
25	**TODA**	**503.54**
26	**KUSUMDIHI**	**235.40**
27	**NADIKASHIRA**	**41.95**
28	**KUNCHAPANI**	**497.59**
	TOTAL	**3984.39**

TABLE NO: 4A
TOTAL VILLAGEWISE LANDHOLDINGS OF THE SAMPLE VILLAGES OF STUDY AREA I.

SL.NO	VILLAGE NAME	TOTAL AGRICULTURAL LAND (ACRES)
1	KADODIHA	228.96
2	KOMONDO	664.25
3	KUSUMDIHI	235.40
4	KALTA	126.96
5	NUAGAON	403.23
6	TODA	503.54
7	GAGNAPOSH	266.62
8	JAMDIHI	718.09
9	JHIRPANI	494.88
10	BHUTUDA	23.97
11	SASEKELA	674.48
12	BANDAL	323.22
13	TINKO	346.58
14	RAIKELA	315.25
15	KUDAMASA	150.00
16	RAJABASA	NOT AVAILABLE
17	LASI	NOT AVAILABLE
18	DALAMKOCHA	158.83
19	BASUBAHAL	150.00
20	GANIGHASA	267.52

SOURCE: SECONDARY DATA COLLECTED FROM REVENUE INSPECTOR'S OFFICE AT KOIRA BLOCK, SUNDERGARH DISTRICT

APPENDIX NO: 4A
DISTRIBUTION OF VILLAGES BY DISTANCE FROM ACTIVE MINING AREA IN STUDY AREA I.

ZONE	DISTANCE FROM ACTIVE MINING AREA	LIST OF VILLAGES
BUFFER	0 – 2 KMS.	
		1. KALTA.
		2. JHIRPANI.
		3. KADODIHA.
		4. NUAGAON.
		5. BANDAL.
		6. RAIKELA.
	2 – 5 KMS.	
		1. TODA.
		2. KUSUMDIHI.
		3. KOMONDO.
		4. SASEKELA.
		5. LASI.
		6. BHUTURA.
		7. RAJABASA.
PERIPHERY	5 – 10 KMS.	
		1. JAMDIHI.
		2. KUDAMUSA.
		3. TINKO.
	10 – 15 KMS.	
		1. BASUBAHAL.
		2. GANIGHASA.
		3. GAGNAPOSH.
		4. DALAMKOTCHA.

AREA II MAPS, CHARTS AND TABLES

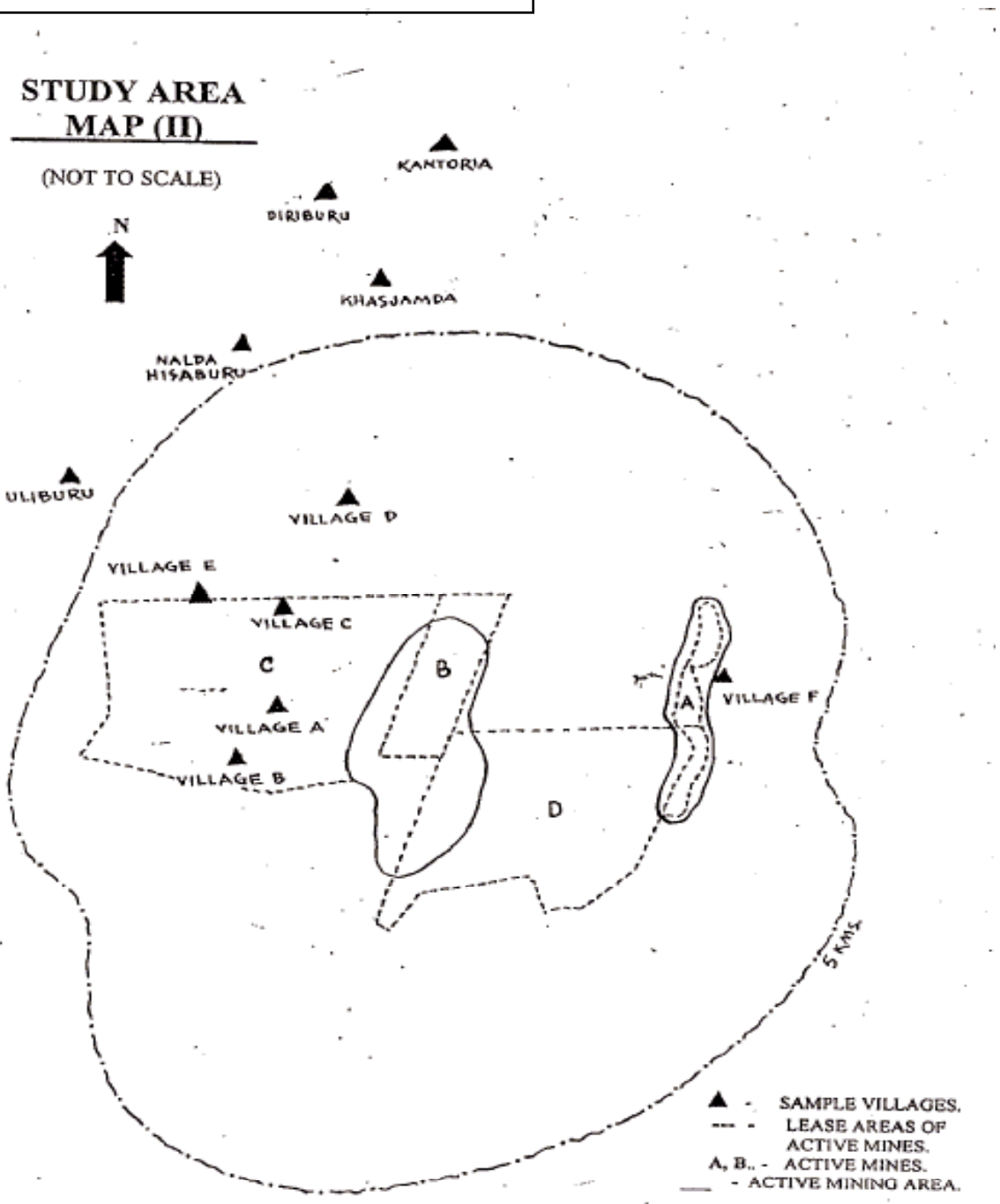
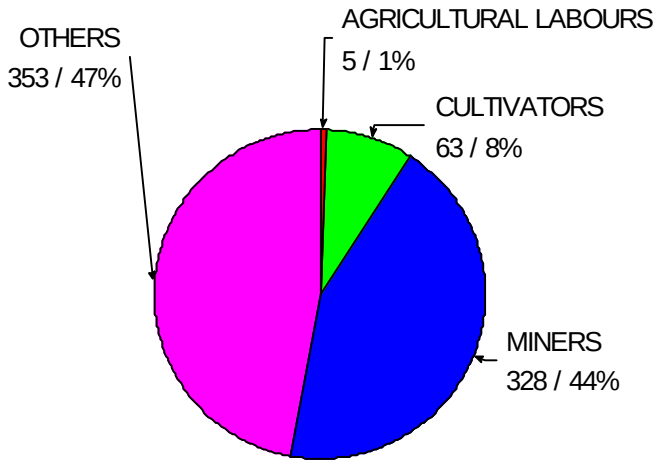


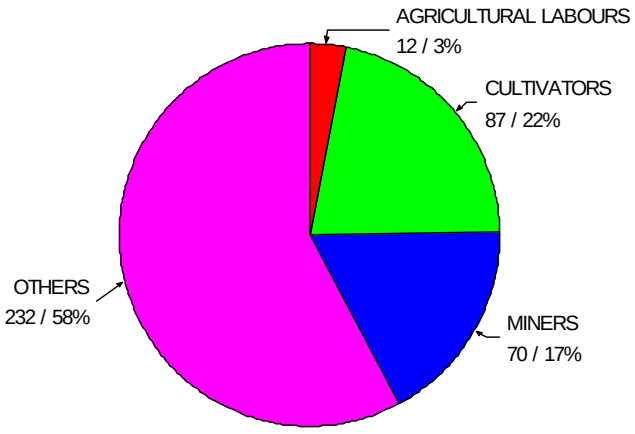
CHART 1B

DISTRIBUTION OF HOUSEHOLDS OF STUDY AREA II BY PRIMARY OCCUPATION



BASED ON LISTING OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA .

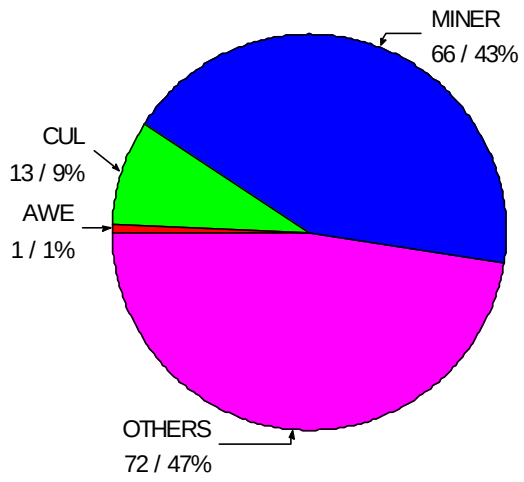
DISTRIBUTION OF HOUSEHOLDS OF STUDY AREA II BY PRIMARY OCCUPATION



BASED ON LISTING OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA .

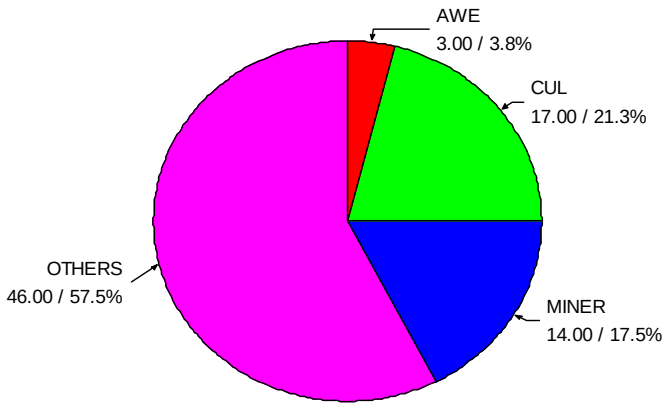
CHART:

DISTRIBUTION OF HOUSEHOLDS OF SAMPLE VILLAGES BY PRIMARY OCCUPATIONS.



BASED ON LISTING OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA .

DISTRIBUTION OF HOUSEHOLDS OF SAMPLE VILLAGES BY PRIMARY OCCUPATIONS.



BASED ON HOUSEHOLD SAMPLE FALLING BEYOND 5 KMS

TABLE NO: 1B
DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATION IN STUDY AREA II.

PRIMARIY OCCUPATION OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA
MINING LABOUR	328 (43.8)	70 (17.5)
CULTIVATOR	63 (8.4)	87 (21.7)
AGRICULTURAL WAGE EARNER	5 (0.7)	12 (3.0)
OTHERS	353 (47.1)	232 (57.8)
TOTAL	749 (100.0)	401 (100.0)

FIGURES IN PARENTHESIS INDICATE PERCENTAGE

TABLE NO: 2B
DISTRIBUTION OF HOUSEHOLDS BY TOTAL ANNUAL HOUSEHOLD INCOME IN STUDY AREA II.

TOTAL ANNUAL HOUSEHOLD INCOME (RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KM FROM THE ACTIVE MINING AREA.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM FROM THE ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D	FREQ.	MEAN	S.D
0-10000	30 (19.74)	7642.83	1791.45	23 (28.75)	7492.39	1619.15
>10000-15000	30 (20)	12746.94	1542.78	11 (13.75)	12232.27	1513.95
>15000-20000	28 (18.42)	17539.82	1639.26	13 (16.25)	17741.54	1204.30
>20000-30000	27. (17.76)	25360	3249.37	13 (16.25)	23217.69	2958.58
>30000-50000	26 (17.51)	38308	6458.78	12 (15)	35829.17	6003.38
ABOVE 50000	10 (6.58)	73185	7250.52	8 (10)	65772.5	14785.28
	152 (100)			80 (100)		
MEAN	23211.40			22840.25		

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 3B
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL PERCAPITA INCOME IN STUDY AREA II.

ANNUAL PER CAPITA HOUSEHOLD INCOME IN RUPEES	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D.	FREQ.	MEAN	S.D.
> 0 - 2000	28 (18.4)	1534.75	364.27	19 (23.8)	1414.54	345.73
>2000 - 5000	78 (51.4)	3554.86	868.61	39 (48.7)	3357.35	926.41
>5000 - 7500	28 (18.4)	6023.61	663.35	8 (10.0)	6344.90	664.86
>7500 - 10000	12 (7.9)	8253	570.78	8 (10.0)	8368.36	509.35
>10000 - 15000	4 (2.6)	10777.68	960.58	4 (5.0)	10875.18	685.67
>15000	2 (1.3)	16000.00	--	2 (2.5)	19625.00	2298.10
TOTAL	**152** (100)	4362.27	2635.84	**80** (100)	4478.37	3637.14

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 4B
DISTRIBUTION OF HOUSEHOLDS BY TOTAL LAND HOLDING OF EACH HOUSEHOLD AND ANNUAL AVERAGE HOUSEHOLD EARNING IN STUDY AREA II.

TOTAL HOUSEHOLD LAND HOLDING (IN ACRES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT INCOME GROUPS.						
	>0 -10000	>10000 - 15000	>15000 - 20000	>20000 - 30000	>30000 - 50000	>50000	TOTAL
>0 - 3	14	19	19	8	10	3	73 (64.6)
>3 - 5	2	1	3	6	2	1	15 (13.3)
>5 - 10	4	4	0	5	4	1	18 (15.9)
>10 & 20	1	0	0	0	1	3	5 (4.4)
> 20	0	0	0	0	1	1	2 (1.8)
TOTAL (WITH LAND)	21 (18.6)	24 (21.2)	22 (19.5)	19 (16.8)	18 (15.9)	9 (8)	**113** (100.0)
LANDLESS	9	7	6	8	8	1	39
TOTAL	30	31	28	27	26	10	**152**

TOTAL HOUSEHOLD LAND HOLDING (IN ACRES)	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT INCOME GROUPS.						
	>0 -10000	>10000 -15000	>15000 - 20000	>20000 - 30000	>30000 - 50000	>50000	TOTAL
>0 - 3	16	7	8	8	8	3	50 (76.9)
>3 - 5	0	3	1	2	3	3	12 (18.5)
>5 - 10	0	0	0	0	0	2	2 (3.1)
>10 & 20	0	0	0	0	0	1	1 (1.5)
> 20	0	0	0	0	0	0	0
TOTAL (WITH LAND)	16 (24.6)	10 (15.4)	9 (13.8)	10 (15.4)	11 (17.0)	9 (13.8)	**65** (100.0)
LANDLESS	6	1	4	3	0	1	15
TOTAL	22 (27.50)	11 (13.75)	13 (16.25)	13 (16.25)	11 (13.75)	10 (12.5)	**80** (100)

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 5B
DISTRIBUTION OF HOUSEHOLDS BY PER CAPITA ANNUAL INCOME AND TOTAL AGRICULTURAL LANDHOLDING OF EACH HOUSEHOLD IN STUDY AREA II.

TOTAL LAND POSSESSED BY EACH HOUSEHOLD (IN ACRES)	ANNUAL AVERAGE PERCAPTIA INCOME OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.					
	>0 - 2000	>2000-5000	>5000-10000	>10000	TOTAL	MEAN
>0 - 3	15	41	16	1	73 (64.6)	1.59
>3 - 5	3	8	3	1	15 (13.3)	4.46
>5 - 10	4	9	5	0	18 (15.9)	7.75
>10 & 20	1	0	2	2	5 (4.4)	16
> 20	0	0	2	0	2 (1.8)	41
TOTAL (WITH LAND)	23 (20.4)	58 (51.3)	28 (24.8)	4 (3.5)	**113** (100.0)	4.28
LANDLESS	5	20	12	2	39	----
TOTAL	28	78	40	6	**152**	----
MEAN	1524.76	3554.86	6692.55	12518.48	4362.27	----

TOTAL LAND POSSESSED BY EACH HOUSEHOLD (IN ACRES)	ANNUAL AVERAGE PERCAPTIA INCOME OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.					
	>0 - 2000	>2000-5000	>5000-10000	>10000	TOTAL	MEAN
>0 - 3	15	22	11	2	50 (62.5)	1.46
>3 - 5	1	6	4	1	12 (15)	4.46
>5 - 10	0	2	0	0	2 (2.5)	8.00
>10 & 20	0	0	0	1	1 (1.25)	15
> 20	0	0	0	0	0	0
TOTAL (WITH LAND)	16 (24.6)	30 (46.2)	15 (23.1)	4 (6.2)	**65** (100.0)	2.42
LANDLESS	3	9	1	2	15	----
TOTAL	19	39	16	6	**80**	----
AVERAGE	1414.54	3357.35	7356.63	13791.79	4478.37	----

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 6B
DISTRIBUTION OF HOUSEHOLDS BY TOTAL ANNUAL AGRICULTURAL
EARNING PER ACRE OF LAND HOLDING IN STUDY AREA II.

ANNUAL HOUSEHOLD AGRICULTURAL EARNING PER ACRE (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5KM FROM ACTIVE MINING AREA.		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM FROM ACTIVE MINING AREA.	
NIL	34 (30.1)	---	3 (4.6)	---
<500	25 (22.12)	222.30	4 (6.15)	344.64
500-<1000	24 (21.24)	666.97	13 (20)	590.38
1000-<1500	19 (17)	1082.66	13 (20)	590.38
1500-<2000	6 (5.31)	1630.56	7 (11)	159.24
2000-<3000	2 (2)	2250	11 (17)	2325.76
3000 & ABOVE	3 (2.65)	6000	16 (25)	4786.46
TOTAL (WITH LAND)	**113** (100)	658.57	**65** (100)	2073
LAND LESS	39	---	15	---
TOTAL	**152**	---	**80**	---

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 7B
DISTRIBUTION OF HOUSEHOLDS BY PERCENTAGE OF LAND DAMAGED DUE TO MINING ACTIVITIES IN STUDY AREA II.

PROPORTION OF LAND DAMAGED DUE TO MINING ACTIVITIES.	NO OF HOUSEHOLDS FALLING WITHIN 5 KM FROM ACTIVE MINING AREA		NO OF HOUSEHOLDS FALLING BEYOND 5 KM FROM ACTIVE MINING ZONE	
0	33 (29.0)	---	65 (100)	---
>0 - <0.25	2 (1.8)	0.18	0	---
0.25 - <0.5	9 (8)	0.33	0	---
0.5 - <0.75	21 (18.6)	0.59	0	---
0.75 - < 1	12 (10.6)	0.83	0	---
1	36 (32)	1	0	---
TOTAL (WITH LAND)	**113** (100)	3.18	**65** (100)	---
LAND LESS	39	---	15	---
TOTAL	**152**	**---**	**80**	**---**

FIGURES IN THE PATENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 8 B
DISTRIBUTION OF HOUSEHOLDS BY THE PROPORTION OF TOTAL MINING INCOME OF A FAMILY TO TOTAL FAMILY INCOME IN STUDY AREA II.

PROPORTION OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.	
	FREQ.	MEAN	FREQ.	MEAN
0	72 (47.4)	--	65 (81.3)	--
>0 - <0.25	5 (3.3)	0.16	0	--
0.25 - <0.5	8 (5.3)	0.36	2 (2.5)	0.35
0.5 - <0.75	11 (7.2)	0.62	4 (5.0)	0.65
0.75 - <1.0	34 (22.3)	0.90	9 (11.2)	0.91
1.0	22 (14.5)	1.0	0	--
TOTAL	**152** (100.0)	0.41	**80** (100.0)	0.14

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 9B
DISTRIBUTION OF HOUSEHOLDS BY RATIO OF MINING INCOME TO TOTAL ANNUAL HOUSEHOLD INCOME AND ANNUAL HOUSEHOLD PER CAPITA INCOME IN STUDY AREA II.

RATIO OF MINING TO TOTAL INCOME	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT RANGES OF PER CAPITA INCOME.							
	>0-5000	>5000-10000	>10000-15000	>15000-30000	TOTAL	%	MEAN	S.D.
0	55	15	1	1	72	(47.4)	--	--
>0-<0.25	3	2	0	0	5	(3.3)	0.16	0.08
0.25-<0.50	4	4	0	0	8	(5.3)	0.36	0.06
0.50-<0.75	6	3	1	1	11	(7.2)	0.62	0.08
0.75-<1.0	26	7	1	0	34	(22.4)	0.90	0.07
1.0	12	9	1	0	22	(14.4)	1.0	--
TOTAL	106 (69.8)	40 (26.31)	4 (2.63)	2 (1.31)	152 (100)	(100)	0.41	0.44
MEAN	3021.3	6692.6	10777.6	16000.0				
S.D.	1178.2	1211.4	960.6	--				

RATIO OF MINING TO TOTAL INCOME	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT RANGES OF PERCAPITA INCOME.							
	0-5000	>5000-10000	>10000-15000	>15000-30000	TOTAL	%	MEAN	S.D.
0	48	11	4	2	65	(81.25)	0	--
>0-<0.25	0	0	0	0	0	--	--	--
0.25-<0.50	1	1	0	0	2	(2.5)	0.35	0
0.50-<0.75	3	1	0	0	4	(5.0)	0.65	0.05
0.75-<1.0	6	3	0	0	9	(11.25)	0.91	0.06
1.0	0	0	0	0	0	--	--	--
TOTAL	58 (72.5)	16 (20.0)	4 (5.0)	2 (2.5)	80 (100.0)	(100.0)	0.14	0.31
MEAN	2720.9	7356.6	10875.2	19625.0				
S.D.	1206.6	1191.3	685.7	2298.1				

FIGURES IN THE PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 10B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable. **INCOME** (Total Annual Household Income).

Block Number 1. Method: Enter **MININC** (Total Annual Household Income from Mining Jobs)

Multiple R .62012
R Square .38455
Adjusted R Square .38044
Standard Error 13530.32519

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	17157694332.43325	17157694332.4332
Residual	150	27460454976.08652	183069699.84058

F = 93.72220 Signif F = .0000

---------- Variables in the Equation ----------

Variable	**B**	**SE B**	**Beta**	**T**	**Sig T**
MININC	.681869	.070434	.620117	9.681	.0000
(Constant)	15736.369826	1341.862296		11.727	.0000

TABLE NO: 11B
DISTRIBUTION OF HOUSEHOLDS BY TOTAL AGRICULTURAL LAND HOLDING IN STUDY AREA II.

TOTAL AGRICULTARAL LAND HOLDING OF EACH HOUSEHOLD (IN ACRES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KM FROM ACTIVE MINING AREA		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM FROM ACTIVE MINING AREA	
	FREQUENCY	MEAN	FREQUENCY	MEAN
>0 - 3	73 (64.6)	1.59	50 (76.9)	1.46
>3 - 5	15 (13.3)	4.46	12 (18.5)	4.46
>5 - 10	18 (15.9)	7.75	2 (3.1)	8.00
>10 - 20	5 (4.4)	16	1 (1.5)	15
>20	2 (1.8)	41	0	--
TOTAL (WITH LAND)	**113** (100.0)	4.28	**65** (100.0)	2.42
LANDLESS	39	--	15	--
TOTAL	**152**	--	**80**	--

FIGURES IN THE PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 12B
DISTRIBUTION OF HOUSEHOLDS BY TOTAL AGRICULTURAL LAND HOLDINGS AND ANNUAL AGRICULTURAL EARNING PER ACRE IN STUDY AREA II.

AGRICULTURAL INCOME / ACRE (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT SIZES OF LAND HOLDING.					
	1 - 3	>3 – 5	>5 – 10	>10 – 20	>20	TOTAL
NIL	21	5	3	1	0	30 (30.0)
>0 - <250	5	3	4	1	1	14 (14.0)
250- < 500	4	2	4	1	0	11 (11.0)
500 - <1000	16	2	4	0	1	23 (23.0)
1000 - <1500	9	1	2	2	0	14 (14.0)
1500 - <2000	3	1	1	0	0	5 (5.0)
2000 - <3000	1	1	0	0	0	2 (2.0)
3000 & ABOVE	1	0	0	0	0	1 (1.0)
	60	15	18	5	2	100 (100.0)
MEAN	526.22	546.67	453.49	597.44	372.62	
TOTAL	**100** (100.0)					
LANDLESS	**39**					
TOTAL LAND > 0 & < 1	**13**					
TOTAL HOUSEHOLD SAMPLE	**152**					

AGRICULTURAL INCOME / ACRE (RUPEES)	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM FROM THE ACTIVE MINING AREA UNDER DIFFERENT SIZES OF LAND HOLDING.					
	1 - 3	>3 – 5	>5 – 10	>10 – 20	>20	TOTAL
NIL	1	1	0	0	0	2 (3.6)
>0 - <250	0	1	0	0	0	1 (1.8)
250- < 500	2	1	0	0	0	3 (5.4)
500 - <1000	8	3	1	0	0	12 (21.8)
1000 - <1500	9	1	0	0	0	10 (18.2)
1500 - <2000	6	1	0	0	0	7 (12.7)
2000 - <3000	6	2	0	1	0	9 (16.4)
3000 & ABOVE	8	2	1	0	0	11 (20.0)
	40	12	2	1	0	55 (100.0)
MEAN	1880.83	1834.42	3583.33	2666.67	---	
TOTAL	**55** (100.0)					
LANDLESS	**15**					
TOTAL LAND > 0 & < 1	**10**					
TOTAL SAMPLE HOUSEHOLDS	**80**					

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.
SOURCE: SAMPLE SURVEY.

TABLE NO: 13B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
AGR_ACR: Agricultural Earning of Household per acre of Land Holding.

Variable(s) Entered on Step Number
1.. **DISDUMMY** : Distance Dummy.

Multiple R .50417
R Square .25418
Adjusted R Square .24566
Standard Error 1390.76072

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	115360455.50821	57680227.75410
Residual	175	338487691.35212	1934215.37915

F = 29.82100 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
DISDUMMY	593.101702	294.356667	.178838	2.015	.0454
(Constant)	1479.901961	238.513496		6.205	.0000

TABLE NO: 14B
DISTRIBUTION OF HOUSEHOLD BY RATIO OF MINING INCOME TO TOTAL INCOME AND EXTENT OF LAND DAMAGE DUE TO MINING ACTIVITIES IN STUDY AREA II.

RATIO OF MINING TO TOTAL INCOME	NUMBER OF HOUSEHOLD FALLING WITHIN 5 KMS.FROM THE ACTIVE MINING ZONE AND UNDER DIFFERENT EXTENT OF LAND DAMAGE								
	LAND LESS	0	>0 – < 0.25	0.25 – < 0.5	0.5 – < 0.75	0.75 – < 1.0	1.0	TOTAL	MEAN OF LAND DAMAGE
0	21	17	2	3	12	4	13	72 (47.4)	0.49
>0 - <0.25	0	0	0	0	0	2	3	5 (3.3)	0.95
0.25 -< 0.5	0	2	0	2	1	1	2	8 (5.3)	0.6
0.5 - < 0.75	4	2	0	0	1	2	2	11 (7.3)	0.59
0.75 - <1.0	4	11	0	4	7	3	5	34 (22.4)	0.42
1.0	10	1	0	0	0	0	11	22 (14.3)	0.92
TOTAL	39 (25.7)	33 (21.7)	2 (1.3)	9 (5.9)	21 (13.8)	12 (7.9)	36 (23.7)	**152** (100)	0.55
MEAN OF INCOME RATIO		0.34		0.48	0.34	0.38	0.49	0.41	---

RATIO OF MINING TO TOTAL INCOME	NUMBER OF HOUSEHOLD FALLING BEYOND 5 KMS.FROM THE ACTIVE MINING ZONE AND UNDER DIFFERENT EXTENT OF LAND DAMAGE								
	LAND LESS	0	>0 – < 0.25	0.25 – < 0.5	0.5 – < 0.75	0.75 – < 1.0	1.0	TOTAL	MEAN OF LAND DAMAGE
0	9	54	0	0	0	0	0	63 (78.8)	0
>0 - <0.25	0	0	0	0	0	0	0	0	0
0.25 -< 0.5	1	2	0	0	0	0	0	3 (3.8)	0
0.5 - < 0.75	3	2	0	0	0	0	0	5 (6.3)	0
0.75 - <1.0	2	7	0	0	0	0	0	9 (11.1)	0
1.0	0	0	0	0	0	0	0	0	0
TOTAL	15 (18.7)	65 (81.3)	0	0	0	0	0	**80** (100)	0
MEAN OF INCOME RATIO	0.29	0.11	---	---	---	---	---	---	---

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 15B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
MININC: Total Annual Household Income from Mining Jobs.

Variable(s) Entered on Step Number
1. **PLAND**: Proportionate of Land Damaged due to Mining Activities.

Multiple R .14079
R Square .01982
Adjusted R Square .01099
Standard Error 15350.49431

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	528964943.46202	528964943.46202
Residual	111	26155781983.97161	235637675.53128

F = 2.24482 Signif F = .1369

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
PLAND	5259.747922	3510.539390	.140793	1.498	.1369
(Constant)	8379.659841	2401.221189		3.490	.0007

TABLE NO: 16B
DISTRIBUTION OF HOUSEHOLDS BY RATIO OF MINING TO TOTAL INCOME AND AVERAGE ANNUAL AGRICULTURAL EARNING PER ACRE IN STUDY AREA II.

RATIO OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING ZONE UNDER DIFFERENT CLASSES OF AGRICULTURAL EARNING PER ACRE														
	0		>0 & < 500		500 & < 1000		1000 & <1500		1500 & <2000		2000 & < 3000		EQUAL & 3000		TOTAL
LAND DAMAGED	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	
0	9	0	10	1	9	3	3	4	0	3	0	1	0	1	44
>0 & < 0.25	2	0	2	0	1	0	0	0	0	0	0	0	0	0	5
0.25 & <0.5	5	0	0	1	0	0	1	1	0	0	0	0	0	0	8
0.5 & <0.75	2	0	2	0	1	0	0	2	0	0	0	0	0	0	7
0.75 & EQUAL TO 1	14	1	5	1	8	2	1	2	0	1	0	1	0	0	36
TOTAL	32 (43)	1 (4)	19 (25)	3 (12)	19 (25)	5 (20)	5 (7)	9 (36)	0	4 (16)	0	2 (8)	0	1 (4)	100
LAND DAMAGED (HH)	**75**														
TOTAL LAND UNAFFECTED	25														
LANDLESS	39														
LAND > 0 & <1	13														
TOTAL SAMPLE	**152**														

Y - REPONDENTS REPLY YES TO THE QUESTION THAT WHETHER CERTAIN PERCENTAGES OF TOTAL LAND HOLDINGS HAVE BEEN DAMAGED OR NOT

N - REPONDENTS REPLY NO TO THE QUESTION THAT WHETHER CERTAIN PERCENTAGES OF TOTAL LAND HOLDINGS HAVE BEEN DAMAGED OR NOT

RATIO OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING ZONE UNDER DIFFERENT CLASSES OF AGRICULTURAL EARNING PER ACRE							
	0	>0 & < 500	500 & < 1000	1000 & <1500	1500 & <2000	2000 & < 3000	EQUAL & 3000	TOTAL
0	1	4	10	6	7	9	9	46
>0 & < 0.25	0	0	0	0	0	0	0	0
0.25 & <0.5	0	0	0	0	0	0	1	1
0.5 & <0.75	0	0	0	0	0	0	1	1
0.75 & EQUAL TO 1	1	0	2	4	0	0	0	7
TOTAL	2 (3.6)	4 (7.3)	12 (22)	10 (18)	7 (13)	9 (16.4)	11 (20)	55 (100)
LAND DAMAGED (HH)	**0**							
TOTAL LAND UNAFFECTED	55							
LANDLESS	15							
LAND > 0 & <1	10							
TOTAL SAMPLE	**80**							

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 17B

MULTIPLE REGRESSION ANALYSIS

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.
TIN_OTHE: Total Household Income from Non-mining Activities.

Variable(s) Entered on Step Number
1. **CULLAND:** Households' Total Cultivable Land.

Multiple R .75380
R Square .56822
Adjusted R Square .56534
Standard Error 2218.71137

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	971720100.11674	971720100.11674
Residual	150	738402018.93589	4922680.12624

F = 197.39656 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
CULLAND	1366.709973	97.276196	.753802	14.050	.0000
(Constant)	140.141428	211.375179		.663	.5083

TABLE NO: 18B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
TIN_OTHE: Total Household Income from Non-mining Activities.

Variable(s) Entered on Step Number
1. **CULLAND:** Households' Total Cultivable Land.

Multiple R .71897
R Square .51692
Adjusted R Square .51073
Standard Error 5416.40989

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	2448621899.41529	2448621899.41529
Residual	78	2288324699.33472	29337496.14532

F = 83.46390 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
CULLAND	2373.480400	259.798302	.718971	9.136	.0000
(Constant)	-234.544096	792.168967		-.296	.7680

TABLE NO: 19B
DISTRIBUTION OF HOUSEHOLD BY ANNUAL EARNING FROM NTFP COLLECTION IN STUDY AREA II.

ANNUAL NTFP EARNING (IN RUPEES)	NUMBER OF HOUSEHOLD FALLING WITHIN 5 KMS FROM ACTIVE MINING AREA.		NUMBER OF HOUSEHOLD FALLING BEYOND 5 KMS FROM ACTIVE MINING AREA.	
	FREQUENCY	MEAN	FREQUENCY	MEAN
NIL	112 (73.7)	----	14 (17.5)	----
>0 TO 1000	30 (19.7)	325.17	34 (42.5)	504.85
>1000 TO 2000	10 (6.6)	1583.33	13 (16.3)	1381.54
>2000 TO 3000	0	----	10 (12.5)	2395.0
>3000	0	----	9 (11.2)	6047.22
TOTAL	**152 (100.0)**	**168.34**	**80 (100.0)**	**1418.75**

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 20B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
ENTFP: Households' Annual Earning from NTFP Collection.

Variable(s) Entered on Step Number
1. **DISDUMMY**: Distance Dummy.

Multiple R .40019
R Square .16015
Adjusted R Square .15650
Standard Error 1294.18746

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	73461893.14882	73461893.14882
Residual	230	385231872.36842	1674921.18421

F = 43.85991 Signif F = .0000

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
DISDUMMY	1183.881579	178.761666	.400193	6.623	.0000
(Constant)	234.868421	104.972465		2.237	.0262

TABLE NO: 21B
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE NTFP EARNING AND PERCENTAGE OF LITERATES IN A HOUSEHOLD OF STUDY AREA II.

ANNUAL HOUSEHOLD NTFP EARNING (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF LITERATES IN HOUSEHOLD.					
	ILLITERATE	UP TO 25%	>25 TO 50%	>50 TO 75%	>75%	TOTAL
NIL	**32 (28.6)**	**19 (16.9)**	**40 (35.7)**	**17 (15.2)**	**4 (3.6)**	**112 (100.0)**
MEAN	----	----	----	----	----	----
> 0 TO 500	**10 (37.0)**	**7 (26.0)**	**10 (37.0)**	**0**	**0**	**27 (100.0)**
MEAN	240.50	310.71	247.50	----	----	261.30
>500 TO 1000	**1 (33.3)**	**1 (33.3)**	**1 (33.3)**	**0**	**0**	**3 (100.0)**
MEAN	700.00	1000.00	1000.00	----	----	900.00
>1000 TO 2000	**0**	**3 (30.0)**	**5 (50.0)**	**0**	**2 (20.0)**	**10 (100.0)**
MEAN	----	1533.33	1560.0	----	1716.67	1583.33
>2000 TO 3000	**0**	**0**	**0**	**0**	**0**	**0**
MEAN	----	----	----	----	----	----
>3000	**0**	**0**	**0**	**0**	**0**	**0**
MEAN	----	----	----	----	----	----
TOTAL	**43 (28.3)**	**30 (19.7)**	**56 (36.8)**	**17 (11.2)**	**6 (4.0)**	**152 (100.0)**
MEAN	72.21	259.17	201.34	----	572.22	168.34

ANNUAL HOUSEHOLD NTFP EARNING	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF LITERATES IN HOUSEHOLD.					
	ILLITERATE	UP TO 25%	>25 TO 50%	>50 TO 75%	>75%	TOTAL
NIL	**4 (28.6)**	**2 (14.3)**	**6 (42.8)**	**2 (14.3)**	**0**	**14 (100.0)**
MEAN	----	----	----	----	----	----
> 0 TO 500	**6 (30.0)**	**2 (10.0)**	**11 (55.0)**	**1 (5.0)**	**0**	**20 (100.0)**
MEAN	259.17	290.00	304.55	400.00		294.25
>500 TO 1000	**7 (50.0)**	**0**	**3 (21.4)**	**2 (14.3)**	**2 (14.3)**	**14 (100.0)**
MEAN	785.71	----	866.67	825.00	765.00	805.71
>1000 TO 2000	**6 (46.2)**	**4 (30.8)**	**2 (15.4)**	**1 (7.7)**	**0**	**13 (100.0)**
MEAN	1315.0	1542.5	1250.0	1400.0	----	1381.54
>2000 TO 3000	**3 (30.0)**	**2 (20.0)**	**3 (30.0)**	**2 (20.0)**	**0**	**10 (100.0)**
MEAN	2383.33	2100.0	2566.67	2450.0	----	2395.0
>3000	**3 (33.3)**	**2 (22.2)**	**3 (33.3)**	**0**	**1 (11.1)**	**9 (100.0)**
MEAN	6608.33	6225.0	5383.33	----	6000.0	6047.22
TOTAL	**29 (36.3)**	**12 (15.0)**	**28 (35.0)**	**8 (10.0)**	**3 (3.7)**	**80 (100.0)**
MEAN	1445.52	1950.0	1153.57	1043.75	2510.0	1418.75

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 22B
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL HOUSEHOLD NTFP EARNING AND FAMILY SIZE IN STUDY AREA II.

ANNUAL HOUSEHOLD NTFP EARNING (IN RUPEES)	DISTRIBUTION OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZES.				
	UP TO 3	3 TO 6	6 TO 9	10 & ABOVE	TOTAL
NIL	**23 (20.5)**	**62 (55.4)**	**22 (19.6)**	**5 (4.5)**	**112 (100.0)**
MEAN	----	----	----	----	----
>0 TO 1000	**6 (20.0)**	**19 (63.3)**	**4 (13.3)**	**1 (3.33)**	**30 (100.0)**
MEAN	363.33	331.58	275.0	175.0	325.17
>1000 TO 2000	**0**	**6 (60.0)**	**3 (30.0)**	**1 (10.0)**	**10 (100.0)**
MEAN	----	1500.0	1611.11	2000.0	1583.33
>2000 TO 3000	**0**	**0**	**0**	**0**	**0**
MEAN	----	----	----	----	----
>3000	**0**	**0**	**0**	**0**	**0**
MEAN	----	----	----	----	----
TOTAL	**29 (19.1)**	**87 (57.2)**	**29 (19.1)**	**7 (4.6)**	**152 (100.0)**
MEAN	75.17	160.47	204.6	310.71	168.34

ANNUAL HOUSEHOLD NTFP EARNING (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZES.				
	UP TO 3	3 TO 6	6 TO 9	10 & ABOBE	TOTAL
NIL	**4 (28.6)**	**8 (57.2)**	**2 (14.3)**	**0**	**14 (100.0)**
MEAN	----	----	----	----	----
>0 TO 1000	**3 (8.8)**	**20 (58.8)**	**10 (29.5)**	**1 (2.9)**	**34 (100.0)**
MEAN	406.67	523.00	528.5	200.0	504.85
>1000 TO 2000	**3 (23.0)**	**5 (38.5)**	**5 (38.5)**	**0**	**13 (100.0)**
MEAN	1196.67	1500.0	1374.0	----	1381.54
>2000 TO 3000	**1 (10.0)**	**3 (30.0)**	**5 (50.0)**	**1 (10.0)**	**10 (100.0)**
MEAN	2500.0	2183.33	2500.0	2400.0	2395.0
>3000	**1 (11.1)**	**6 (66.7)**	**1 (11.1)**	**1 (11.1)**	**9 (100.0)**
MEAN	8000.0	5945.83	3750.0	7000.0	6047.22
TOTAL	**12 (15.0)**	**42 (52.5)**	**23 (28.7)**	**3 (3.8)**	**80 (100.0)**
MEAN	1275.83	1432.98	1235.0	3200.0	1418.75

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 23B

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
ENTFP: Households' Annual Earning from NTFP Collection.

Variable(s) Entered on Step Number
1. **TMININC**: Total Annual Income of Household from Mining Jobs.

Multiple R .08033
R Square .00645
Adjusted R Square -.00017
Standard Error 809.80369

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	638943.85727	638943.85727
Residual	150	98367303.51115	655782.02341

F = 0.97432 Signif F = .3252

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
TMININC	-.004161	.004216	-.080334	-.987	.3252
(Constant)	280.484181	80.311820		3.492	.0006

TABLE NO: 24B
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL MEDICAL EXPENSES IN STUDY AREA II.

ANNUAL MEDICAL EXPENSES OF EACH HOUSEHOLD (IN RUPEES).	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.	
	FREQUENCY	MEAN	FREQUENCY	MEAN
NIL	27 (17.8)	----	38 (47.5)	----
>0 TO 500	55 (36.2)	244.64	31 (38.7)	180.87
>500 TO 1000	27 (17.8)	692.19	13 (16.3)	749.54
>1000 TO 2000	17 (11.1)	1536.37	3 (3.7)	1325.00
>2000 TO 3000	5 (3.3)	2319.80	2 (2.5)	2395.00
>3000 TO 4000	5 (3.3)	3738.00	2 (2.5)	3730.00
>4000 TO 5000	5 (3.3)	4461.20	0	---
>5000 TO 6000	7 (4.6)	5455.71	0	---
>6000	4 (2.6)	10441.67	1 (1.3)	10650.00
TOTAL	**152 (100.0)**	**1255.36**	**80 (100.0)**	**527.82**

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 25B
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE MEDICAL EXPENSES AND ANNUAL AVERAGE HOUSEHOLD INCOME IN STUDY AREA II.

TOTAL ANNUAL HOUSEHOLD INCOME (IN RUPEES).	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF ANNUAL MEDICAL EXPENSES					
	0	>0 TO 500	>500 TO 1000	>1000 TO 5000	>5000	TOTAL
UP TO 15000	14 (23)	24 (39.3)	10 (16.4)	11 (18)	2 (3.3)	61 (100.0)
MEAN	----	209.08	675.0	2426.36	8050.0	894.39
>15000 TO 30000	7 (12.7)	20 (36.4)	10 (16.4)	13 (23.6)	5 (9.1)	55 (100.0)
MEAN	----	280.85	667.9	2444.1	5881.33	1335.93
>30000 TO 50000	2 (7.7)	10 (38.4)	6 (23.0)	7 (26.9)	1 (3.8)	26 (100.0)
MEAN	----	247.00	776.67	2307.14	18600.0	1610.77
>50000	4 (40)	1 (10.0)	1 (10.0)	1 (10.0)	3 (30.0)	10 (100.0)
MEAN	----	350.0	600.0	4100.0	5283.33	2090.0
TOTAL	27 (17.8)	55 (36.2)	27 (17.7)	32 (21.1)	11 (7.2)	152 (100.0)
MEAN	----	244.64	692.19	2459.79	7268.79	1255.36
TOTAL ANNUAL HOUSEHOLD INCOME (IN RUPEES).	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF ANNUAL MEDICAL EXPENSES					
	0	>0 TO 500	>500 TO 1000	>1000 TO 5000	>5000	TOTAL
UP TO 15000	16 (47.1)	12 (35.3)	5 (14.7)	0	1 (2.9)	34 (100.0)
MEAN	----	178.33	662.8	----	10650.0	474.14
>15000 TO 30000	10 (38.5)	12 (46.1)	0	4 (15.4)	0	26 (100.0)
MEAN	----	148.82	----	2183.75	----	414.88
>30000 TO 50000	2 (16.7)	4 (33.3)	5 (41.7)	1 (8.3)	0	12 (100.0)
MEAN	----	245.0	734.0	1140.0	----	475.83
>50000	0	3 (37.5)	3 (37.5)	2 (25.0)	0	8 (100.0)
MEAN	----	243.33	920.0	3175.0	----	1230.0
TOTAL	28 (35.0)	31 (38.8)	13 (16.2)	7 (8.8)	1 (1.2)	80 (100.0)
MEAN	----	180.87	749.54	2317.86	10650.0	527.82

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 26B
DISTRIBUTION OF HOUSEHOLDS BY PER CAPITA ANNUAL HOUSEHOLD INCOME AND PER CAPITA ANNUAL MEDICAL EXPENSES IN STUDY AREA II.

PER CAPITA ANNUAL HOUSEHOLD INCOME (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF PER CAPITA MEDICAL EXPENSES.					
	NIL	>0 TO 300	>300 TO 600	>600 TO 900	>900	TOTAL
>0 TO 2000	8 (28.6)	16 (57.1)	4 (14.3)	0	0	28 (100.0)
MEAN	----	73.41	419.61	----	----	101.90
>2000 TO 5000	12 (15.4)	46 (59.0)	10 (12.8)	4 (5.1)	6 (7.7)	78 (100.0)
MEAN	----	96.82	464.36	774.38	1903.33	302.75
>5000 TO 10000	5 (12.5)	26 (65.0)	6 (15.0)	0	3 (7.5)	40 (100.0)
MEAN	----	101.69	410.36	----	1953.33	274.15
>10000	2 (33.3)	2 (33.3)	0	1 (16.7)	1 (16.7)	6 (100.0)
MEAN	----	78.33		650.0	1025.0	305.28
TOTAL	27 (17.8)	90 (59.2)	20 (13.2)	5 (3.3)	10 (6.6)	**152** (100)
MEAN	----	93.65	439.21	749.50	1830.50	258.33
PER CAPITA ANNUAL HOUSEHOLD INCOME (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA UNDER DIFFERENT CLASSES OF PER CAPITA MEDICAL EXPENSES					
	NIL	>0 TO 300	>300 TO 600	>600 TO 900	>900	TOTAL
>0 TO 2000	9 (47.4)	9 (47.4)	0	0	1 (5.2)	19 (100.0)
MEAN	----	66.11	----	----	1185.18	93.69
>2000 TO 5000	18 (46.1)	19 (48.7)	1 (2.6)	1 (2.6)	0	39 (100.0)
MEAN	----	61.94	400.0	700.00	----	58.38
>5000 TO 10000	0	14 (87.5)	2 (12.5)	0	0	16 (100.0)
MEAN	----	101.51	396.67	----	----	138.41
>10000	1 (16.7)	4 (66.6)	0	1 (16.7)	0	6 (100.0)
MEAN	----	119.33	----	792.00	----	211.55
TOTAL	28 (35.0)	46 (57.5)	3 (3.8)	2 (2.5)	1 (1.2)	**80** (100)
MEAN	----	79.79	397.78	746.00	1185.18	94.26

FIGURES IN PARENTHESIS SHOW PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 28B
DISTRIBUTION OF HOUSEHOLDS BY NUMBER OF SICK DAYS PER HOUSEHOLD AND FAMILY SIZES IN STUDY AREA II.

SIZE OF HOUSEHOLD	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA UNDER DIFFERENT SICK DAYS SUFFERED BY HOUSEHOLD.							
SICK DAYS >	NIL	UPTO 7	>7 - 15	>15 - 30	>30 - 45	>45 - 60	>60	TOTAL
UP TO 4	**15 (27.8)**	**12 (22.2)**	**10 (18.6)**	**9 (16.7)**	**2 (3.7)**	**3 (5.5)**	**3 (5.5)**	**54 (100)**
MEAN	----	4.92	12.40	22.44	39.50	52.33	191.67	22.15
5 TO 8	**20 (23.8)**	**12 (14.3)**	**21 (25)**	**15 (17.9)**	**5 (6.0)**	**6 (7.1)**	**5 (5.9)**	**84 (100)**
MEAN	----	5.67	11.43	23.67	38.60	53.50	134.20	22.00
9 TO 12	**5 (38.6)**	**0**	**3 (23.1)**	**3 (23.1)**	**0**	**1 (7.7)**	**1 (7.7)**	**13 (100)**
MEAN	----	----	14.00	23.67	----	60.00	68.00	18.54
13 & MORE	**0**	**0**	**1 (100)**	**0**	**0**	**0**	**0**	**1 (100)**
MEAN	----	----	15.00	----	----	----	----	15.00
TOTAL	**40 (26.3)**	**24 (15.8)**	**35 (23)**	**27 (17.8)**	**7 (4.6)**	**10 (6.6)**	**9 (5.9)**	**152 (100)**
MEAN	----	5.29	12.03	23.26	38.86	53.80	146.00	21.71
SIZE OF HOUSEHOLD	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA UNDER DIFFERENT SICK DAYS SUFFERED BY HOUSEHOLD.							
SICK DAYS >	NIL	UPTO 7	>7 - 15	>15 - 30	>30 - 45	>45 - 60	>60	TOTAL
UP TO 4	**17 (73.9)**	**3 (13)**	**2 (8.7)**	**0**	**1 (4.4)**	**0**	**0**	**23 (100)**
MEAN	----	4.00	11.50	----	45.00	----	----	3.48
5 TO 8	**32 (62.7)**	**4 (7.8)**	**4 (7.8)**	**6 (11.9)**	**3 (5.9)**	**2 (3.9)**	**0**	**51 (100)**
MEAN	----	4.50	13.75	23.00	39.00	59.00	----	8.75
9 TO 12	**5 (83.3)**	**0**	**1 (16.7)**	**0**	**0**	**0**	**0**	**6 (100)**
MEAN	----	----	10.00	----	----	----	----	1.67
13 & MORE	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
MEAN	----	----	----	----	----	----	----	----
TOTAL	**54 (67.5)**	**7 (8.8)**	**7 (8.8)**	**6 (7.5)**	**4 (5)**	**2 (2.5)**	**0**	**80 (100)**
MEAN	----	4.29	12.57	23.00	40.50	59.00		6.70

TABLE NO: 29B
DISTRIBUTION OF HOUSEHOLDS BY PROPORTION OF LITERATE IN A FAMILY IN STUDY AREA II.

PROPORTION OF LITERATE IN A FAMILY.	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KM FROM THE ACTIVE MINING AREA.			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KM FROM THE ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D.	FREQ.	MEAN	S.D.
NIL	43 (28.3)	.0	.0	29 (36.3)	.0	.0
>0 – 0.25	30 (19.7)	0.20	0.04	12 (15.0)	0.18	0.05
>0.25 - 0.50	56 (36.8)	0.43	0.07	28 (35.0)	0.42	0.08
>0.50 - 0.75	17 (11.2)	0.67	0.06	8 (10.0)	0.64	0.08
>0.75	6 (4.0)	0.96	0.07	3 (3.7)	0.83	0.04
TOTAL	152 (100)	0.31	0.26	80 (100)	0.27	0.26

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

APPENDIX NO: 1B
LIST OF OPERATING MINES IN STUDY AREA II.

SL. NO.	NAME OF MINES	LEASE AREA (IN HECTRES)	ANNUAL PRODUCTION (IN LAKH TONNES)	METHOD OF MINING.
1.	**MINE A**	**15.37**	**0.13**	MANUAL
2.	**MINE B**	**228.04**	**4.6**	RECENTLY SEMI-MECHANIZED
3.	**MINE C**	**1600.87**	**5**	MANUAL
4.	**MINE D**	**947.05**	**8**	RECENTLY OPENED
	TOTAL	**2791.33**	**17.73**	

APPENDIX NO: 2B
LIST OF SAMPLE VILLAGES OF STUDY AREA II.

SL. NO.	VILLAGE NAME	BLOCK	TOTAL HOUSEHOLDS
1	**VILLAGE A**	JODA	**135**
2	**VILLAGE B**	JODA	**153**
3	**VILLAGE C**	JODA	**132**
4	**VILLAGE D**	JODA	**203**
5	**VILLAGE E**	JODA	**64**
6.	**VILLAGE F**	JODA	**62**
7	**NALDA HISABURU**	JODA	**71**
8	**ULIBURU ***	JODA	**134**
9	**KHASJAMDA**	NOAMUNDI	**139**
10	**DIRIBURU ***	NOAMUNDI	**133**
11.	**KANTORIA**	NOAMUNDI	**49**

***** THE BIGGEST CLUSTER OF HOUSEHOLDS (TOLI) WAS CONSIDERED IN THESE VILLAGES.

- THE ANONYMOUS VILLAGES IN BUFFER ZONE ARE IN A MUNICIPAL AREA.

APPENDIX NO: 3B
VILLAGEWISE TOTAL AGRICULTURAL LAND HOLDINGS IN THE BUFFER ZONE OF STUDY AREA II.

SL. NO.	VILLAGE NAME	TOTAL AGRICULTURAL LAND (IN ACRES)
1	**VILLAGE A**	513.01
2	**VILLAGE B**	351.03
3	**VILLAGE C**	439.24
4	**VILLAGE D**	599.41
5	**VILLAGE E**	284.64
6.	**VILLAGE F**	N.A.
7.	**RAIKA**	80.92
8.	**SAYABALI**	166.58
9.	**BALITA**	538.19
10.	**BHAGALPUR**	311.63
11.	**LAHANDA**	345.94
12.	**GOBARDHANPUR**	235.00
TOTAL		**3865.59**

SOURCE: SECONDARY DATA COLLECTED FROM **TAHASHILDAR'S OFFICE** AT **BARBIL** IN JODA BLOCK IN DISTRICT KEONJHAR, ORISSA.

APPENDIX NO: 4B
DISTRIBUTION OF VILLAGES OF STUDY AREA II BY DISTANCE FROM ACTIVE MINING AREA.

ZONE	DISTANCE FROM ACTIVE MINING AREA	LIST OF VILLAGES
BUFFER	0 – 2 KMS.	
		1. VILLAGE A.
		2. VILLAGE B..
	2 – 5 KMS	
		1. VILLAGE C.
		2. VILLAGE D.
		3. VILLAGE E.
		4. VILLAGE F.
PERIPHERY	BEYOND 5 KMS.	
		1. NALDA HISABURU.
		2. ULIBURU.
		3. KHAS JAMDA.
		4. DIRIBURU.
		5. KANTORIA.

NAME OF VILLAGE	NUMBER OF HOUSEHOLD LISTED	PRIMARY OCCUPATION					NUMBER OF SECONDARY TO BE DONE				
		MINING	MC	CULTIVATOR	AG- WEARNER	OTHERS	MIN	OTH	CUL	AGW	TOT
BELKUNDI		17 (4)	0	6 (1)	0	41 (8)	4	8	1	0	13
BARA BALJURI		63 (13)	0	60 (12)	26 (5)	51 (10)	13	10	12	5	40
DALKI		89 (17)	0	0	0	46 (12)	17	12	0	0	29
DIRIBURU		10 (2)		28 (5)	7 (2)	26 (5)	2	5	5	2	14
GUNDIJORA		9 (2)	0	66 (13)	3 (1)	28 (6)	2	6	13	1	22
MURGA BEDA		23 (5)	0	3 (2)	1	41 (5)	5	5	2	0	12
MERELGERA		26 (7)	0	19 (7)	5 (1)	18 (3)	7	3	7	1	18
MOHUDI		55 (11)	0	2 (1)	20 (4)	35 (7)	11	7	1	4	23
NOAMUNDI BASTI		40 (8)	0	15 (3)	0	10 (2)	8	2	3		13
NALDA		25 (5)	0	16 (3)	0	30 (6)	5	6	3		14
PACHAISAI		55 (11)	0	10 (2)	0	40 (8)	11	8	2		21
PARAM BALJURI		35 (7)	00	16 (3)	0	17 (3)	7	3	3		13
SADING		79 (16)	0	6 (1)	4 (1)	64 (13)	16	1	12	1	31
TORETOPA		56 (12)	0	15 (3)	0	70 (14)	12	14	3		29
KOLKARA		46 (10)	0	10 (2)	0	70 (14)	10	14	2		26
KARAKHENDRA		67 (14)	0	34 (7)	0	97 (20)	13	19	5		41
KANTORIA		0	0	7 (2)	0	42* (8)	0	7	2		10
KHASJAMDA		30 (6)	0	15 (3)	4 (1)	90 (18)	6	18	3	1	28
ULIBURU		25 (5)		30 (6)	0	25 (5)	5	5	6	0	16
TOTAL		784		425	85	663					

* NTFP COLLECTOR(3)

Sl. No.	NAME OF VILLAGE	NUMBER OF HOUSE-HOLD LISTED	PRIMARY OCCUPATION				NUMBER OF SECONDARY TO BE DONE				
			MIN	CUL	AWE	OTH	MIN	CUL	AWE	OTH	TOT
THAKURANI REGION:											
1	**DALKI**	**135**	89 (17)	0	0	46 (12)	17	0	0	12	**29**
2	**SADING**	**153**	79 (16)	6 (1)	4 (1)	64 (13)	16	1	1	13	**31**
3	**KOLKARA**	**132**	49 (10)	10 (2)	0	73 (14)	10	2	0	14	**26**
4	**KARA KHENDRA**	**203**	71 (14)	34 (7)	0	98 (20)	14	7	0	20	**41**
5	**BELKUNDI**	**64**	17 (4)	6 (1)	0	41 (8)	4	1	0	8	**13**
6	**NALDA**	**71**	15 (3)	16 (3)	0	40 (8)	3	3	0	8	**14**
7	**ULIBURU**	**70**	14 (3)	27 (5)	0	29 (6)	3	5	0	6	**14**
8	**KHASJAMDA**	**139**	30 (6)	15 (3)	4 (1)	90 (18)	6	3	1	18	**28**
9	**DIRIBURU**	**72**	10 (2)	22 (4)	8 (2)	32 (6)	2	4	2	6	**14**
10	**KANTORIA**	**49**	0	7 (2)	0	42* (8)	0	2	0	8	**10**
11	**PARAM BALJURI**	**68**	35 (7)	16 (3)	0	17 (3)	7	0	3	3	**13**
12	**BARA BALJURI**	**200**	63 (13)	60 (12)	26 (5)	51 (10)	13	12	5	10	**40**
NOAMUNDI REGION:		**1355**									**273**
13	**NOAMUNDI BASTI**	**63**	38 (8)	15 (3)	0	10 (2)	8	3	0	2	**13**
14	**SARBIL**	**114**	33 (7)	19 (4)	4 (1)	58 (11)	7	4	1	11	**23**
15	**MOHUDI**	**112**	55 (11)	2 (1)	20 (4)	35 (7)	11	1	4	7	**24**
16	**MURGA BEDA**	**61**	23 (5)	7 (2)	1	31 (5)	5	2	0	5	**12**
17	**TORETOPA**	**112**	28 (6)	15 (3)	0	70 (14)	6	3	0	14	**23**
18	**PACHAISAI**	**105**	74 (15)	6 (1)	0	25 (5)	15	1	0	5	**21**
19	**MERELGERA**	**89**	31 (7)	36 (7)	5 (1)	17 (3)	7	7	1	3	**18**
20	**GUNDIJORA**	**111**	11 (2)	66 (13)	5 (1)	29 (6)	2	13	1	6	**22**
TOTAL		**2122**									**429**

APPENDIX NO: 5B
SAMPLE DESIGN OF STUDY AREA II.

SL. NO.	NAME OF VILLAGE	NUMBER OF HOUSE-HOLDS LISTED	DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATION				TOTAL SAMPLE
			MIN	CUL	AWE	OTH	
BUFFER ZONE (WITHIN 5 KMS. FROM ACTIVE MINING AREA).							
1.	**VILLAGE A**	**135**	89	0	0	46	
SAMPLES DRAWN			**17**	**0**	**0**	**12**	**29**
2.	**VILLAGE B**	**153**	79	6	4	64	
SAMPLES DRAWN			**16**	**1**	**1**	**13**	**31**
3.	**VILLAGE C**	**132**	49	10	0	73	
SAMPLES DRAWN			**10**	**2**	**0**	**14**	**26**
4.	**VILLAGE D**	**203**	71	34	0	98	
SAMPLES DRAWN			**14**	**7**	**0**	**20**	**41**
5.	**VILLAGE E**	**64**	17	6	0	41	
SAMPLES DRAWN			**4**	**1**	**0**	**8**	**13**
6.	**VILLAGE F**	**62**	23	7	1	31	
SAMPLES DRAWN			**5**	**2**	**0**	**5**	**12**
TOTAL		**749**	328	63	5	353	
SAMPLES DRAWN			**66**	**13**	**1**	**72**	**152**
PERIPHERY ZONE (BEYOND 5 KMS. FROM ACTIVE MINING AREA).							
1.	**NALDA HISABURU**	**71**	15	16	0	40	
SAMPLES DRAWN			**3**	**3**	**0**	**8**	**14**
2.	**ULIBURU ***	**70**	15	27	0	28	
SAMPLES DRAWN			**3**	**5**	**0**	**6**	**14**
3.	**KHAS JAMDA**	**139**	30	15	4	90	
SAMPLES DRAWN			**6**	**3**	**1**	**18**	**28**
4.	**DIRIBURU ***	**72**	10	22	8	32	
SAMPLES DRAWN			**2**	**4**	**2**	**6**	**14**
5.	**KANTORIA**	**49**	0	7	0	42	
SAMPLES DRAWN			**0**	**2**	**0**	**8**	**10**
TOTAL		**401**	70	87	12	232	
SAMPLES DRAWN			**14**	**17**	**3**	**46**	**80**

* THE BIGGEST CLUSTER OF HOUSEHOLDS (TOLI) WAS CONSIDERED.

N.B. (1)'MIN' => MINING ; 'CUL' => CULTIVATION ; 'AWE' => AGRICULTURAL WAGE EARNING ; 'OTH' => OTHER JOBS.

(2) THE ANONYMOUS VILLAGES IN BUFFER ZONE ARE IN A MUNICIPAL AREA.

AREA III MAP, CHARTS AND TABLES

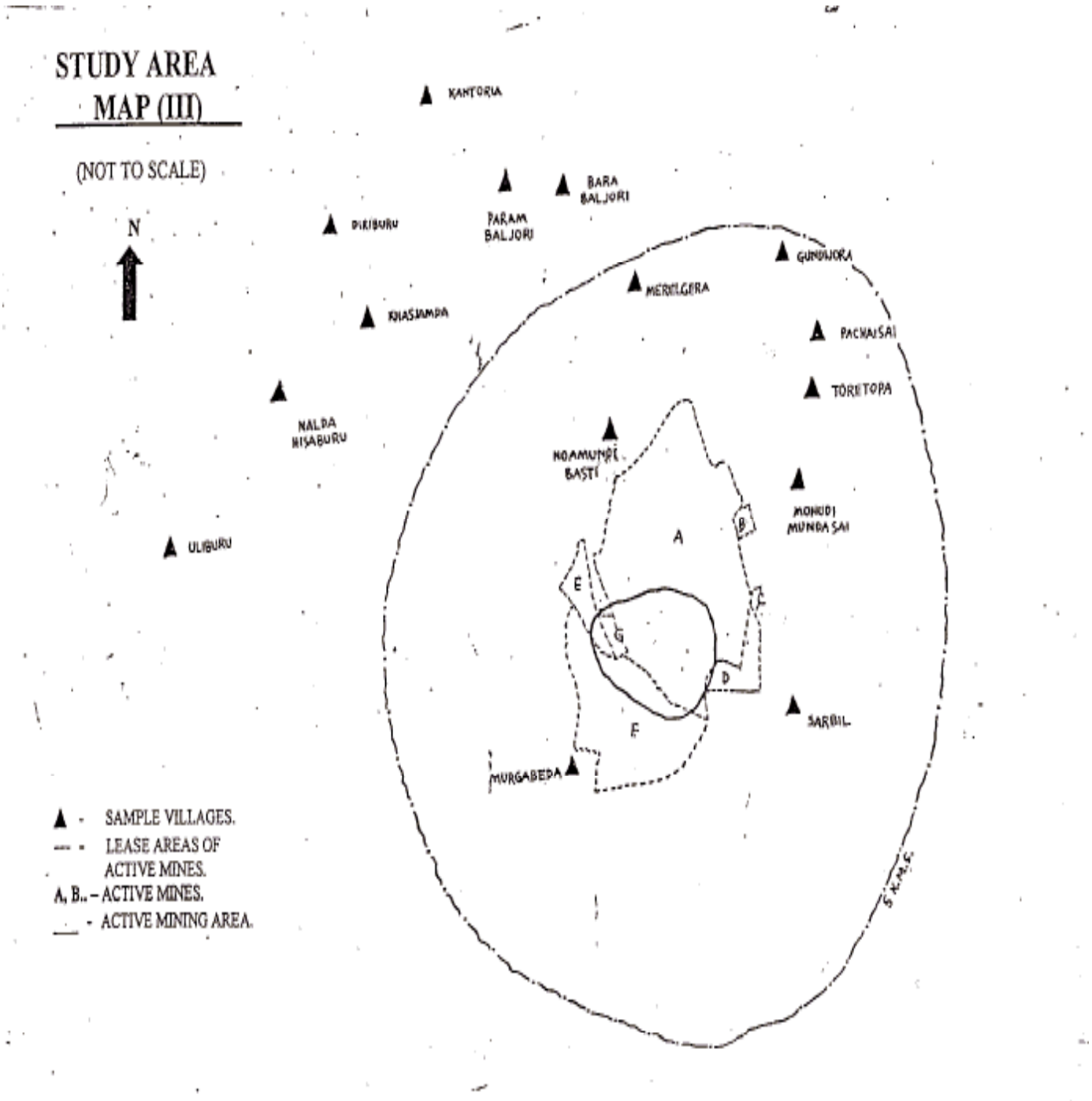
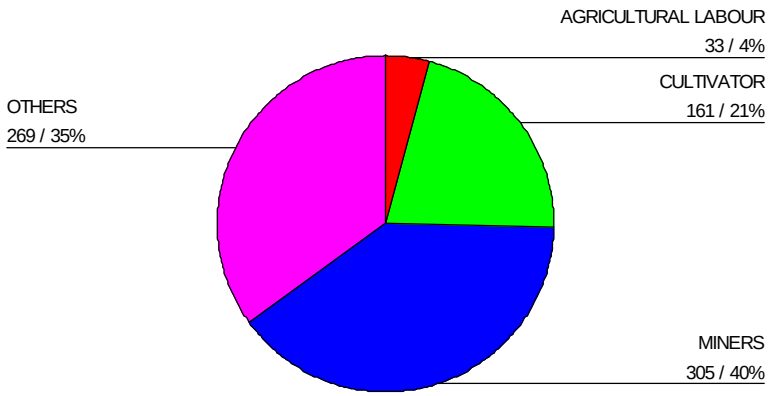


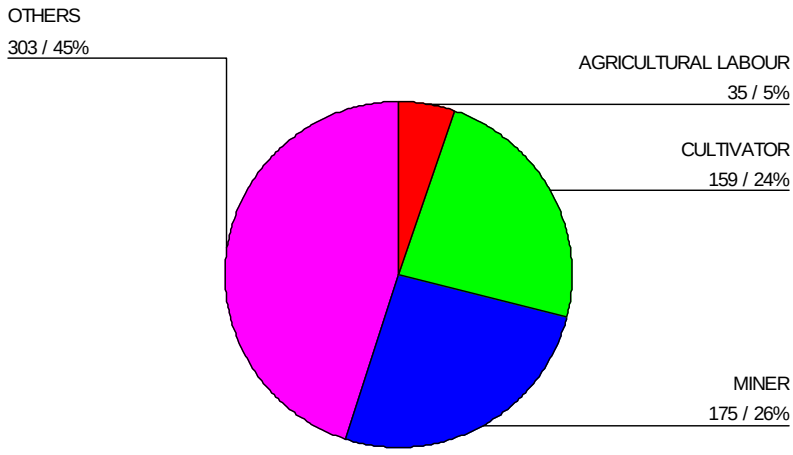
CHART: 1C

DISTRIBUTION OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA BY PRIMARY OCCUPATIONS IN STUDY AREA III.



BASED ON HOUSEHOLD SAMPLE SURVEY.

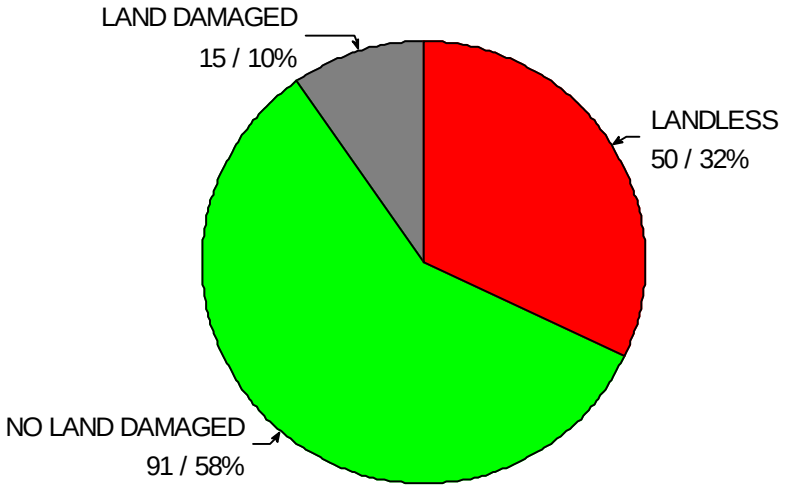
DISTRIBUTION OF HOUSEHOLDS FALLING BEYOND 5 KMS. OF ACTIVE MINING AREA BY PRIMARY OCCUPATIONS IN STUDY AREA III.



BASED ON HOUSEHOLD SAMPLE SURVEY

CHART: 2C

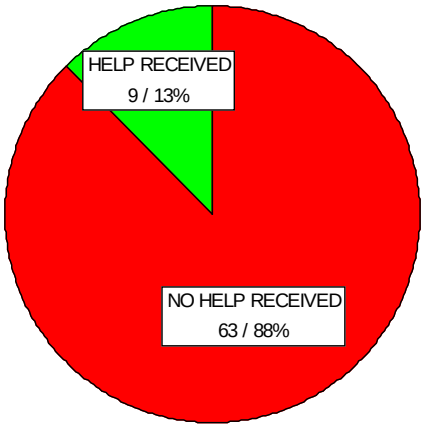
DISTRIBUTION OF HOUSEHOLDS BY LAND DAMAGE OF THEIR RESPECTIVE LANDHOLDINGS DUE TO MINING ACTIVITIES.



BASED ON THE REPLIES OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA IN STUDY AREA III.

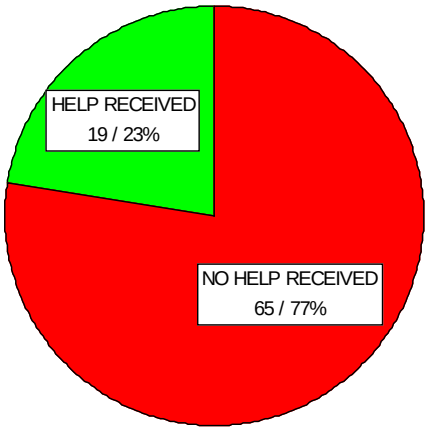
CHART: 3C

HOUSEHOLDS RECEIVING HELP OF IRRIGATION FACILITIES FROM RURAL DEVELOPMENT SOCEITY.



BASED ON REPLIES FROM HOUSEHOLDS FALLING WITHIN 2 KMS. FROM ACTIVE MINING AREA

HOUSEHOLDS RECEIVING HELP OF IRRIGATION FACILITIES FROM RURAL DEVELOPMENT SOCEITY.



BASED ON REPLIES FROM HOUSEHOLDS FALLING WITHIN 2 – 5 KMS. FROM ACTIVE MINING AREA.

CHART: 4C

HOUSEHOLDS RECEIVING HELP FOR BUYING SEEDS FROM RURAL DEVELOPMENT SOCEITY THIS YEAR.

BASED ON REPLIES OF SAMPLE HOUSEHOLDS FALLING WITHIN 2 KMS. OF ACTIVE MINING AREA OF STUDY AREA III.

HOUSEHOLDS RECEIVING HELP FOR BUYING SEEDS FROM RURAL DEVELOPMENT SOCEITY THIS YEAR.

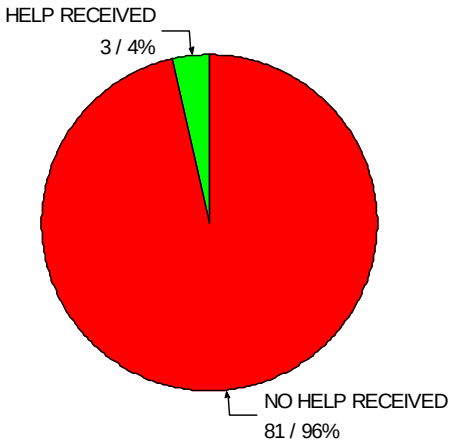
BASED ON REPLIES OF SAMPLE HOUSEHOLDS FALLING WITHIN 2- 5 KMS. OF ACTIVE MINING AREA OF STUDY AREA III.

CHART: 5C

HOUSEHOLDS RECEIVING HELP FOR BUYING FERTILISERS FROM RURAL DEVELOPMENT SOCEITY, THIS YEAR.

BASED ON REPLIES FROM SAMPLE HOUSEHOLDS FALLING WITHIN 2 KMS. FROM ACTIVE MINING AREA OF STUDY AREA III.

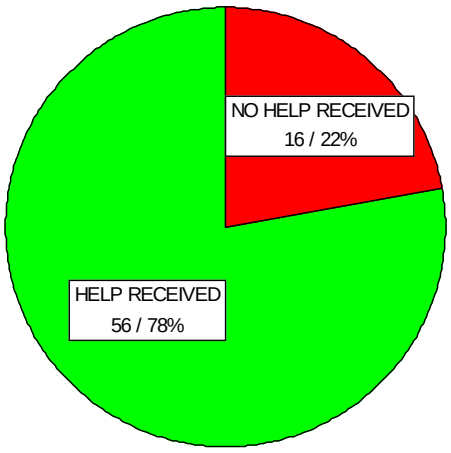
HOUSEHOLDS RECEIVING HELP FOR BUYING FERTILISERS FROM RURAL DEVELOPMENT SOCEITY, THIS YEAR.



BASED ON REPLIES FROM SAMPLE HOUSEHOLDS FALLING WITHIN 2- 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA III.

CHART: 6C

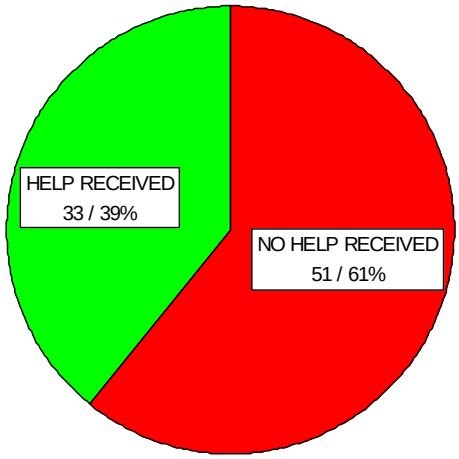
HOUSEHOLDS RECEIVING HELP IN SUPPLY OF DRINKING WATER FROM RURAL DEVELOPMENT SOCEITY.



BASED ON REPLIES FROM SAMPLE HOUSEHOLDS

FALLING **WITHIN 2 KMS**. FROM ACTIVE MINING AREA OF STUDY AREA III.

HOUSEHOLDS RECEIVING HELP IN SUPPLY OF DRINKING WATER FROM RURAL DEVELOPMENT SOCEITY.

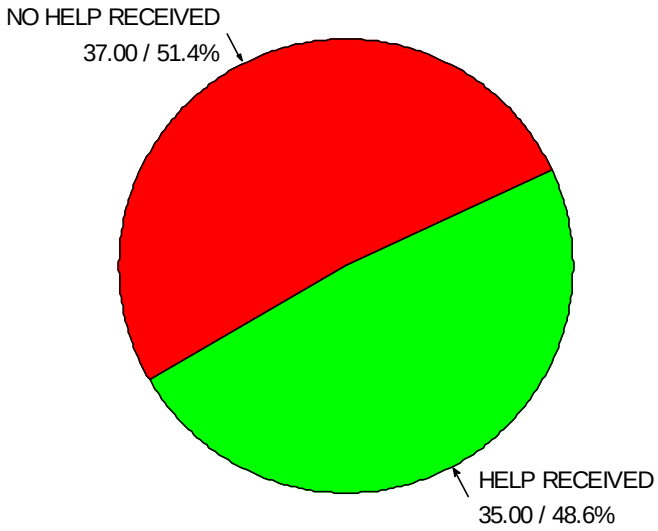


BASED ON REPLIES FROM SAMPLE HOUSEHOLDS

FALLING **WITHIN 2 - 5 KMS**. FROM ACTIVE MINING AREA OF STUDY AREA III.

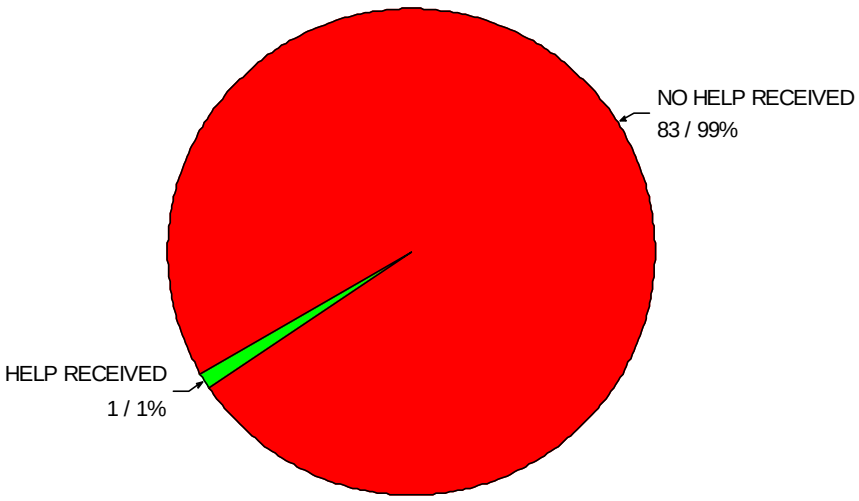
CHART: 7C

HOUSEHOLDS RECEIVING HELP IN SUPPLY OF WATER FOR REGULAR USES FROM RURAL DEVELOPMENT SOCEITY.



BASED ON REPLIES OF SAMPLE HOUSEHOLDS
FALLING **WITHIN 2 KMS**. FROM ACTIVE MINING AREA OF STUDY AREA III.

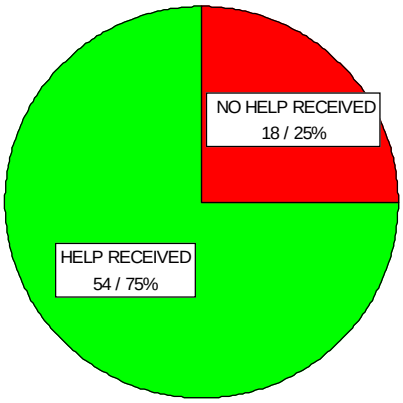
HOUSEHOLDS RECEIVING HELP IN SUPPLY OF WATER FOR REGULAR USES FROM RURAL DEVELOPMENT SOCEITY.



BASED ON REPLIES OF SAMPLE HOUSEHOLDS
FALLING **WITHIN 2 – 5 KMS**. FROM ACTIVE MINING AREA OF STUDY AREA III.

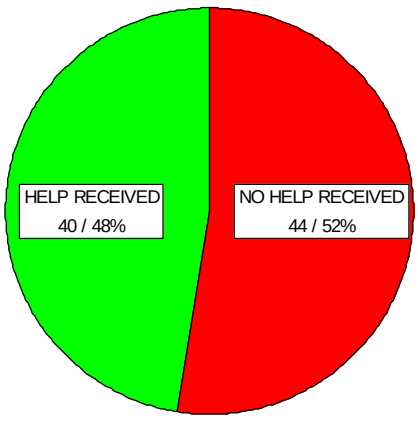
CHART: 8C

HOUSEHOLDS RECEIVING MEDICAL HELP FROM RURAL DEVELOPMENT SOCEITY THIS YEAR.



BASED ON REPLIES FROM SAMPLE HOUSEHOLDS FALLING WITHIN 2 KMS. FROM ACTIVE MINING AREA OF STUDY AREA III.

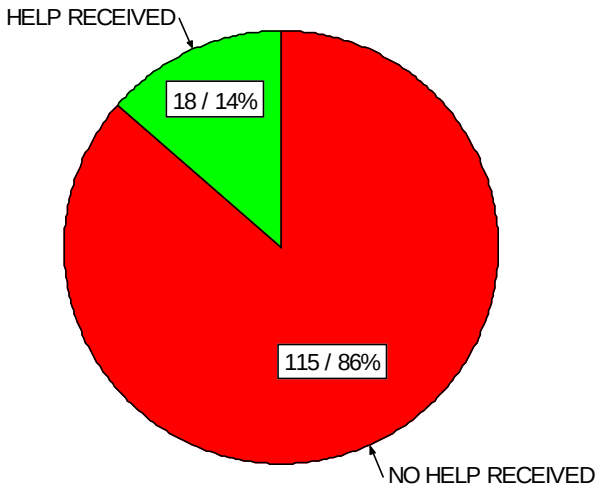
HOUSEHOLDS RECEIVING MEDICAL HELP FROM RURAL DEVELOPMENT SOCEITY THIS YEAR.



BASED ON REPLIES FROM SAMPLE HOUSEHOLDS FALLING WITHIN 2 – 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA III.

CONTD….

HOUSEHOLDS RECEIVING MEDICAL HELP FROM RURAL DEVELOPMENT SOCEITY THIS YEAR.



BASED ON REPLIES FROM SAMPLE HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA OF STUDY AREA III.

Area III Tables

TABLE NO: 1C
DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATIONS IN STUDY AREA III.

PRIMARY OCCUPATION OF HOUSEHOLDS	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA	NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA
MINING LABOUR	305 (39.7)	175 (26.0)
CULTIVATOR	161 (21.0)	159 (23.7)
AGRICULTURAL WAGE EARNER	33 (4.3)	35 (5.2)
OTHERS	269 (35.0)	303 (45.1)
TOTAL	768 (100.0)	672 (100.0)

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

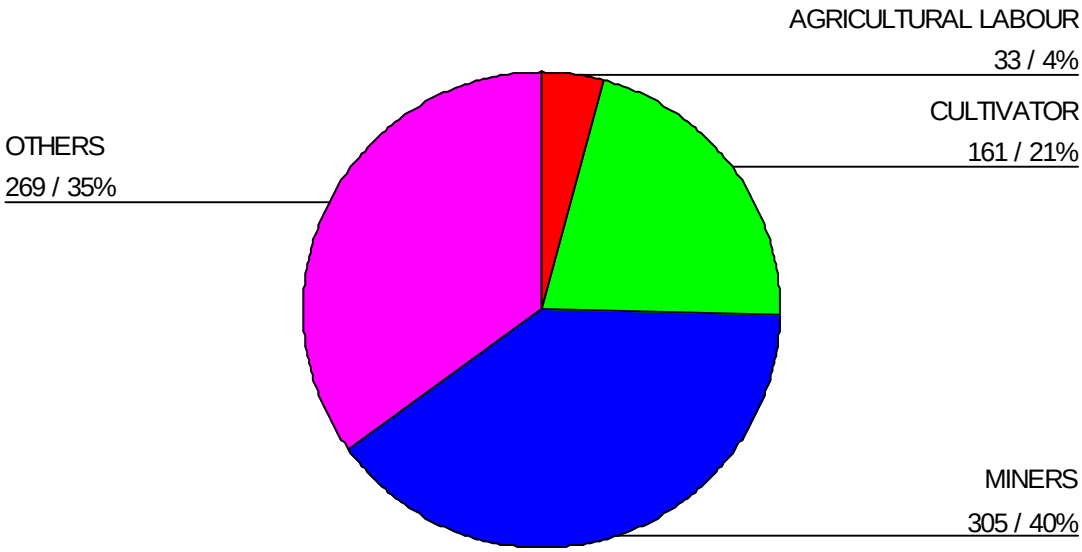

AGRICULTURAL LABOUR
33 / 4%
CULTIVATOR
161 / 21%
OTHERS
269 / 35%
MINERS
305 / 40%

Table 2C

TOTAL ANNUAL HOUSEHOLD INCOME (IN RUPEES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS FROM THE ACTIVE MINING AREA			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS FROM THE ACTIVE MINING AREA		
	FREQ.	MEAN	S.D	FREQ.	MEAN	S.D
0-10000	39 (25)	5908.97	2778.29	34 (25.56)	7232.35	2038.04
>10000-15000	27 (17.3)	12825.19	1549.42	24 (18.04)	12000	1355.63
>15000-20000	29 (18.6)	17502.59	1086.85	25 (19)	17814.02	1213.80
>20000-30000	16 (10.25)	23947.50	2465.41	21 (16)	23788.33	2909.60
>30000-50000	16 (10.25)	39010.31	6725.75	17 (13)	35434.71	5088.83
ABOVE 50000	29 (18.6)	77333.28	13058.32	12 (9.02)	79216.67	24707.86
TOTAL	156 (100)	27783.94	26292.79	133 (100)	23174.59	21378.87

FIGURES IN PARENTHESIS INDICATE PERCENTAGE.

SOURCE: SAMPLE SURVEY.

Table 3C

PER CAPITA INCOME IN A FAMILY	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS FROM THE ACTIVE MINING AREA			NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS FROM THE ACTIVE MINING AREA		
	FREQ.	MEAN	S.D	FREQ.	MEAN	S.D
0-<5000	110 (70.51)	2253.17	1140.36	97 (72.93)	2737.58	1201.83
5000-<7000	12 (7.69)	6084.62	669.57	13 (9.77)	6024.77	691.73
7000-<9000	16 (10.25)	7487.25	529.03	9 (6.8)	8202.43	621.46
9000-<10000	3 (1.92)	9276.67	37.61	3 (2.25)	9084.52	89.67
10000-<20000	13 (8.33)	13072.17	2384.12	6 (4.51)	12833.66	2933.06
20000 & ABOVE	2 (1.28)	21800	282.84	3 (2.25)	21161.11	886.68
TOTAL	156 (100)	4371.98	4069.65	133 (100)	4526.73	3864.52

FIGURES IN THE PARENTHESIS INDICATE PERCENTAGES.

SOURCE: SAMPLE SURVEY.

TABLE NO: 4C DISTRIBUTION OF HOUSEHOLDS BY FAMILY SIZE IN STUDY AREA III.

FAMILY SIZE	*NUMBER OF HOUSEHOLDS FALIING WITHIN 5 K.MS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZES.*		
	FREQUENCY	MEAN	S.D.
UP TO 3	**14** (9.0)	2.79	0.43
3 TO 6	**79** (50.6)	5.15	0.82
6 TO 9	**42** (26.9)	7.67	0.72
10 & ABOVE	**21** (13.5)	12.05	2.33
TOTAL	**156 (100.0)**	**6.54**	2.81

FAMILY SIZE	*NUMBER OF HOUSEHOLDS FALIING BEYOND 5 K.MS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZES.*		
	FREQUENCY	MEAN	S.D.
UP TO 3	**18** (13.5)	2.06	0.64
3 TO 6	**74** (55.7)	5.01	0.77
6 TO 9	**37** (27.8)	7.49	0.69
10 & ABOVE	**4** (3.0)	10.0	---
TOTAL	**133 (100.0)**	**5.45**	1.99

FIGURES IN PARENTHESIS SHOW PERCENTAGES.
SOURCE: SAMPLE SURVEY.

Table 5C

TOTAL LAND HOLDING PER HOUSEHOLD (IN ACRES)	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. OF ACTIVE MINING AREA		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA	
	FREQUENCY	MEAN	FREQUENCY	MEAN
>0 - <0.5	10 (6.4)	0.22	11 (8.3)	0.27
0.5 - <1	5 (3.2)	0.61	9 (6.8)	0.53
1 - <5	68 (43.6)	1.97	77 (58.0)	2.01
5 - <8	14 (8.9)	5.69	11 (8.3)	5.27
8 - <10	5 (3.2)	8.40	3 (2.3)	8
>10	4 (2.6)	13.00	3 (2.3)	11.67
TOTAL (WITH LAND)	**106** (67.9)	2.95	**114** (85.7)	2.45
LANDLESS	**50** (32.1)	---	**19** (14.3)	---
TOTAL	**156** (100.0)	---	**133** (100.0)	---

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

Table 6C

AGRICULTURE INCOME PER ACRE IN RUPEES.	NUMBER OF HOUSEFOLDS FALLING WITHIN 0 – 2 KMS. FROM ACTIVE MINING AREA.	NUMBER OF HOUSEFOLDS FALLING WITHIN 2 - 5 KMS. FROM ACTIVE MINING AREA.	NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.
0 - <500	**6 (8.3)**	**7 (8.3)**	**10 (7.5)**
MEAN	128.47	245.24	137.86
STD.DEVIATION	148.15	174.99	187.42
500 - <1000	**3 (4.2)**	**13 (15.5)**	**17 (12.8)**
MEAN	33.33	661.54	623.53
STD.DEVIATION	125.83	155.70	142.92
1000-<1500	**14 (19.4)**	**6 (7.1)**	**29 (21.8)**
MEAN	1137.76	1108.33	1146.55
STD.DEVIATION	153.65	174.40	134.47
1500-<2000	**3 (4.2)**	**5 (5.9)**	**14 (10.5)**
MEAN	1611.11	1583.33	1592.26
STD.DEVIATION	96.23	117.85	123.31
2000-<3000	**12 (16.7)**	**9 (10.7)**	**26 (19.5)**
MEAN	2250.00	2248.15	2244.10
STD.DEVIATION	255.64	329.19	282.56
3000-<4000	**3 (4.2)**	**10 (11.9)**	**5 (3.8)**
MEAN	3361.11	3222.56	3250
STD.DEVIATION	375.77	296.90	353.55
4000-<5000	**0**	**6 (7.1)**	**7 (5.3)**
MEAN	---	4116.67	4190.48
STD.DEVIATION	---	204.12	243.98
5000 & ABOVE	**2 (2.8)**	**7 (8.3)**	**6 (4.5)**
MEAN	5000	6342.86	6583.33
STD.DEVIATION	0.0	1569.35	1348.87
TOTAL (WITH LAND)	**43 (59.8)**	**63 (75.0)**	**114 (85.8)**
MEAN	1639.91	2324.48	1850.44
STD.DEVIATION	1171.91	1949.29	1545.97
LAND LESS	**29 (40.2)**	**21 (25.0)**	**19 (14.2)**
TOTAL	**72 (100)**	**84 (100)**	**133 (100)**

AGRICULTURE INCOME PER ACRE (IN RUPEES).	NUMBER OF HOUSEFOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.		NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.	
	FREQUENCY	MEAN	FREQUENCY	MEAN
LAND LESS	50 (32.1)	---	19 (14.20)	
0 - <500	13 (8.3)	191.35	10 (7.52)	137.86
500 - <1000	16 (10.3)	656.25	17 (12.78)	623.53
1000-<1500	20 (12.8)	1128.93	29 (21.80)	1146.55
1500-<2000	8 (5.1)	1593.75	14 (10.53)	1592.26
2000-<3000	21 (13.5)	2249.21	26 (19.55)	2244.10
3000-<4000	13 (8.3)	3254.53	5 (3.76)	3250
4000-<5000	6 (3.8)	4116.67	7 (5.26)	4190.48
5000&ABOVE	9 (5.8)	6044.44	6 (4.51)	6583.33
TOTAL	**156** (100.0)	2046.78	**133** (100)	1850.44

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

Table 7C

AGRICULTURE INCOME PER ACRE IN RUPEES.	NUMBER OF HOUSEFOLDS FALLING WITHIN 0 – 2 KMS. FROM ACTIVE MINING AREA.	NUMBER OF HOUSEFOLDS FALLING WITHIN 2 - 5 KMS. FROM ACTIVE MINING AREA.	NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.
0 - <500	**6 (8.3)**	**7 (8.3)**	**10 (7.5)**
MEAN	128.47	245.24	137.86
STD.DEVIATION	148.15	174.99	187.42
500 - <1000	**3 (4.2)**	**13 (15.5)**	**17 (12.8)**
MEAN	33.33	661.54	623.53
STD.DEVIATION	125.83	155.70	142.92
1000-<1500	**14 (19.4)**	**6 (7.1)**	**29 (21.8)**
MEAN	1137.76	1108.33	1146.55
STD.DEVIATION	153.65	174.40	134.47
1500-<2000	**3 (4.2)**	**5 (5.9)**	**14 (10.5)**
MEAN	1611.11	1583.33	1592.26
STD.DEVIATION	96.23	117.85	123.31
2000-<3000	**12 (16.7)**	**9 (10.7)**	**26 (19.5)**
MEAN	2250.00	2248.15	2244.10
STD.DEVIATION	255.64	329.19	282.56
3000-<4000	**3 (4.2)**	**10 (11.9)**	**5 (3.8)**
MEAN	3361.11	3222.56	3250
STD.DEVIATION	375.77	296.90	353.55
4000-<5000	**0**	**6 (7.1)**	**7 (5.3)**
MEAN	---	4116.67	4190.48
STD.DEVIATION	---	204.12	243.98
5000 & ABOVE	**2 (2.8)**	**7 (8.3)**	**6 (4.5)**
MEAN	5000	6342.86	6583.33
STD.DEVIATION	0.0	1569.35	1348.87
TOTAL (WITH LAND)	**43 (59.8)**	**63 (75.0)**	**114 (85.8)**
MEAN	1639.91	2324.48	1850.44
STD.DEVIATION	1171.91	1949.29	1545.97
LAND LESS	**29 (40.2)**	**21 (25.0)**	**19 (14.2)**
TOTAL	**72 (100)**	**84 (100)**	**133 (100)**

AGRICULTURE INCOME PER ACRE (IN RUPEES).	NUMBER OF HOUSEFOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.		NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.	
	FREQUENCY	MEAN	FREQUENCY	MEAN
LAND LESS	50 (32.1)	---	19 (14.20)	
0 - <500	13 (8.3)	191.35	10 (7.52)	137.86
500 - <1000	16 (10.3)	656.25	17 (12.78)	623.53
1000-<1500	20 (12.8)	1128.93	29 (21.80)	1146.55
1500-<2000	8 (5.1)	1593.75	14 (10.53)	1592.26
2000-<3000	21 (13.5)	2249.21	26 (19.55)	2244.10
3000-<4000	13 (8.3)	3254.53	5 (3.76)	3250
4000-<5000	6 (3.8)	4116.67	7 (5.26)	4190.48
5000&ABOVE	9 (5.8)	6044.44	6 (4.51)	6583.33
TOTAL	**156** (100.0)	2046.78	**133** (100)	1850.44

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

Table 8C

PROPORTION OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEFOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.		NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.	
	FREQ.	MEAN	FREQ.	MEAN
0	80 (51.28)	--	93 (69.93)	--
>0 - <0.25	0	--	2 (1.5)	0.16
0.25 - <0.5	5 (3.2)	0.37	6 (4.51)	0.40
0.5 -<0.75	11 (7.05)	0.67	15 (11.28)	0.62
> 0.75	60 (38.47)	0.95	17 (12.78)	0.89
TOTAL	156 (100.0)	0.42	133 (100.0)	0.20

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 9C

DISTRIBUTION OF HOUSEHOLDS BY RATIO OF MINING INCOME TO TOTAL ANNUAL HOUSEHOLD INCOME AND ANNUAL HOUSEHOLD PER CAPITA INCOME IN STUDY AREA III.

RATIO OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEHOLD FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT RANGES OF PER CAPITA INCOME.							
	0 - <5000	5000 - <10000	10000 - <20000	20000 & MORE	TOTAL	%	MEAN	S.D.
0	64	13	3	0	80	51.3	---	---
>0 - <0.25	0	0	0	0	0	---	---	---
0.25 - <0.5	4	1	0	0	5	3.2	0.37	0.09
0.5 - <0.75	9	1	1	0	11	7.0	0.67	0.06
0.75 – 1.0	33	16	9	2	60	38.5	0.95	0.06
TOTAL	110 (70.5)	31 (19.9)	13 (8.3)	2 (1.3)	156 (100.0)	100.0	0.42	0.45
MEAN	2253.17	7117.47	13072.2	21800.0				
S.D.	1140.36	1127.06	2384.12	282.84				

RATIO OF MINING INCOME TO TOTAL INCOME	NUMBER OF HOUSEHOLD FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT RANGES OF PER CAPITA INCOME.							
	0 - <5000	5000 - <10000	10000 - <20000	20000 & MORE	TOTAL	%	MEAN	S.D.
0	72	13	7	1	93	69.9	----	----
>0 - <0.25	1	1	0	0	2	1.5	0.17	0.01
0.25 - <0.5	4	2	0	0	6	4.5	0.40	0.04
0.5 - <0.75	13	2	0	0	15	11.3	0.62	0.08
0.75 – 1.0	8	7	0	2	17	12.8	0.89	0.07
TOTAL	98 (73.7)	25 (18.8)	7 (5.3)	3 (2.2)	133 (100.0)	100.0	0.20	0.34
MEAN	2769.24	7214.30	12434.57	21090.0				
S.D.	1162.72	1361.37	2878.19	999.65				

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 10C

MULTIPLE REGRESSION ANALYSIS

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
AGR_AC : Agricultural Income per acre.

Variable(s) Entered on Step Number
1.. **DUMMY_D**: Distance Dummy.

Multiple R .06055
R Square .00367
Adjusted R Square -.00090
Standard Error 1624.51708

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	2117330.80526	2117330.80526
Residual	218	575314150.97231	2639055.73841

F = .80231 Signif F = .3714

---------- Variables in the Equation ----------

Variable	B	SE B	Beta	T	Sig T
DUMMY_D	-196.336181	219.194808	-.060554	-.896	.3714
(Constant)	2046.776867	157.787047		12.972	.0000

Table 11C

ANNUAL NTFP EARNING (IN RUPEES)	**NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA.**		**NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA.**	
	FREQUENCY	MEAN	FREQUENCY	MEAN
NIL	80 (51.3)	----	17 (12.8)	----
>0 TO 1000	61 (39.1)	374.51	40 (30.1)	520.38
>1000 TO 2000	5 (3.2)	1520.00	24 (18.0)	1455.83
>2000 TO 3000	4 (2.6)	2256.25	22 (16.5)	2476.36
>3000	6 (3.8)	5033.33	30 (22.6)	5084.33
TOTAL	**156 (100.0)**	**446.60**	**133 (100.0)**	**1975.68**

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 12C

M U L T I P L E R E G R E S S I O N A N A L Y S I S

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
ENTFP : Annual Household Earning from NTFP Collection.

Variable(s) Entered on Step Number
1. **PLIT** : Proportion of Literate in a Household.
2. **DUMMY_D** : Distance Dummy.
3. **PMINER** : Proportion of Miner in a Household.

Multiple R .43394
R Square .18831
Adjusted R Square .17976
Standard Error 1600.15143

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	169292387.03988	56430795.67996
Residual	285	729738112.96012	2560484.60688

F = 22.03911 Signif F = .0000

---------- Variables in the Equation ----------

VARIABLE	B	SE B	BETA	T	SIG T
DUMMY_D	1539.352806	190.212181	.435001	8.093	.0000
PMINER	-8.700737	827.403905	-5.680E-04	-.011	.9916
PLIT	269.077474	362.970021	.040010	.741	.4591
(Constant)	373.940551	182.351658		2.051	.0412

Table 13C

ANNUAL AVERAGE EARNING FROM NTFP IN RUPEES.	*NUMBER OF HOUSEHOLDS FALIING WITHIN 5 K.MS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZE CLASSES.*				
	UP TO 3	3 TO 6	6 TO 9	10 & ABOVE	TOTAL
NIL	**11 (13.8)**	**36 (45.0)**	**19 (23.7)**	**14 (17.5)**	**80 (100.0)**
MEAN	---	---	---	---	---
>0TO 1000	**3 (4.9)**	**34 (55.7)**	**19 (31.2)**	**5 (8.2)**	**61 (100.0)**
MEAN	446.67	322.06	423.95	500.00	374.51
>1000 TO 2000	**0**	**4 (80.0)**	**0**	**1 (20.0)**	**5 (100.0)**
MEAN	---	1550.00	---	1400.00	1520.00
>2000 TO 3000	**0**	**3 (75.0)**	**1 (25.0)**	**0**	**4 (100.0)**
MEAN	---	2175.00	2500.00	---	2256.25
>3000	**0**	**2 (33.3)**	**3 (50.0)**	**1 (16.7)**	**6 (100.0)**
MEAN	---	3950.00	5433.33	6000.00	5033.33
TOTAL	**14 (9.0)**	**79 (50.6)**	**42 (26.9)**	**21 (13.5)**	**156 (100.0)**
MEAN	95.71	399.68	639.40	471.43	**446.60**

TABLE NO: 13C
DISTRIBUTION OF HOUSEHOLD BY ANNUAL HOUSEHOLD NTFP EARNING AND FAMILY SIZE IN STUDY AREA III.

ANNUAL AVERAGE EARNING FROM NTFP IN RUPEES.	*NUMBER OF HOUSEHOLDS FALIING BEYOND 5 K.MS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT FAMILY SIZE CLASSES.*				
	UP TO 3	3 TO 6	6 TO 9	10 & ABOBE	Total
NIL	**5 (29.4)**	**9 (52.9)**	**3 (17.7)**	**0**	**17 (100.0)**
MEAN	---	---	---	---	---
>0TO 1000	**5 (12.5)**	**23 (57.5)**	**11 (27.5)**	**1 (2.5)**	**40 (100.0)**
MEAN	534.00	535.22	512.27	200.00	520.38
>1000 TO 2000	**6 (25.0)**	**9 (37.5)**	**8 (33.3)**	**1 (4.2)**	**24 (100.0)**
MEAN	1331.67	1557.78	1485.00	1050.00	1455.83
>2000 TO 3000	**1 (4.5)**	**10 (45.5)**	**10 (45.5)**	**1 (4.5)**	**22 (100.0)**
MEAN	2500.00	2482.50	2475.50	2400.00	2476.36
>3000	**1 (3.3)**	**23 (76.7)**	**5 (16.7)**	**1 (3.3)**	**30 (100.0)**
MEAN	8000.00	4573.04	6470.00	7000.00	5084.33
TOTAL	**18 (13.5)**	**74 (55.7)**	**37 (27.8)**	**4 (3.0)**	**133 (100.0)**
MEAN	1175.56	2112.64	2016.76	2662.50	**1975.68**

FIGURES IN PARENTHESIS SHOW PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE: 14C

ANNUAL HOUSEHOLD NTFP EARNING IN RUPEES.	*NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF HOUSEHOLD LITERACY*					
	ILLITERATE	**>0 – 25%**	**>25 - 50%**	**>50 - 75%**	**>75%**	**TOTAL**
NIL	**24 (44.4)**	**16 (47.1)**	**23 (56.1)**	**13 (68.4)**	**4 (50.0)**	**80 (51.3)**
MEAN	---	---	---	---	---	---
>0 TO 1000	**28 (51.9)**	**12 (35.3)**	**15 (36.6)**	**5 (26.3)**	**1 (12.5)**	**61 (39.1)**
MEAN	312.32	442.08	353.67	538.00	800.00	374.51
>1000 TO 2000	**0**	**1 (2.9)**	**2 (4.9)**	**0**	**2 (25.0)**	**5 (3.2)**
MEAN	---	1500.00	1350.00	---	1700.00	1520.00
>2000 TO 3000	**0**	**2 (5.9)**	**1 (2.4)**	**0**	**1 (12.5)**	**4 (2.6)**
MEAN	---	2225.00	2500.00	---	2075.00	2256.25
>3000	**2 (3.7)**	**3 (8.8)**	**0**	**1 (5.3)**	**0**	**6 (3.8)**
MEAN	3975.00	5116.67	---	6900.00	---	5033.33
TOTAL	**54 (100.0)**	**34 (100.0)**	**41 (100.0)**	**19 (100.0)**	**8 (100.0)**	**156 (100)**
PERCENTAGE	(34.6)	(21.8)	(26.3)	(12.2)	(5.1)	(100.0)
MEAN	309.17	782.50	256.22	504.74	784.38	**446.60**

Distribution of HOUSEHOLDS BY ANNUAL AVERAGE NTFP Earning AND HOUSEHOLD LITERACY RATE OF STUDY AREA III.

ANNUAL HOUSEHOLD NTFP EARNING IN RUPEES.	*NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA UNDER DIFFERENT PERCENTAGE OF HOUSEHOLD LITERACY*					
	ILLITERATE	**>0 – 25%**	**>25 - 50%**	**>50 - 75%**	**>75%**	**TOTAL**
NIL	**4 (7.7)**	**4 (13.3)**	**7 (19.4)**	**2 (18.2)**	**0**	**17 (12.8)**
MEAN	---	---	---	---	---	---
>0 TO 1000	**18 (34.6)**	**2 (6.7)**	**14 (38.9)**	**4 (36.4)**	**2 (50.0)**	**40 (30.1)**
MEAN	539.17	290.00	425.00	762.50	765.00	520.38
>1000 TO 2000	**15 (28.8)**	**6 (20.0)**	**2 (5.6)**	**1 (9.0)**	**0**	**24 (18.0)**
MEAN	1474.67	1486.67	1250.00	1400.00	---	1455.83
>2000 TO 3000	**6 (11.5)**	**10 (33.3)**	**4 (11.1)**	**2 (18.2)**	**0**	**22 (16.5)**
MEAN	2491.67	2473.00	2475.00	2450.00	---	2476.36
>3000	**9 (17.3)**	**8 (26.7)**	**9 (25.0)**	**2 (18.2)**	**2 (50.0)**	**30 (22.6)**
MEAN	5140.00	4925.00	4574.44	7500.00	5350.00	5084.33
TOTAL	**52 (100.0)**	**30 (100.0)**	**36 (100.0)**	**11 (100.0)**	**4 (100.0)**	**133 (100)**
PERCENTAGE	(39.1)	(22.6)	(27.1)	(8.3)	(3.0)	(100.0)
MEAN	1789.13	2454.33	1653.33	2213.64	3057.50	**1975.68**

FIGURES IN PARENTHESIS SHOW PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 15C

DISTRIBUTION OF HOUSEHOLDS BY ANNUAL AVERAGE NTFP EARNING AND RATIO OF MINING INCOME TO TOTAL INCOME IN STUDY AREA III.

RATIO OF MINING INCOME TO TOTAL INCOME	DISTRIBUTION OF HOUSEHOLDS FALLING WITHIN 5 KMS. FROM ACTIVE MINING AREA BY ANNUAL AVERAGE NTFP EARNING					
	NIL	> 0 - 1000	.>1000 - 2000	>2000 – 3000	3000 & ABOVE	TOTAL
0	40	27	4	4	5	**80**
>0 TO <0 .25	0	0	0	0	0	0
0.25 TO < 0.5	1	3	0	0	1	5
0.5 TO < 0.75.	3	8	0	0	0	11
0.75 TO 1.0	36	23	1	0	0	60
TOTAL	80 (51.3)	61 (39.1)	5 (3.3)	4 (2.5)	6 (3.8)	**156** (100.0)
MEAN*	0.94	0.81	0.81	--	0.41	0.87
RATIO OF MINING INCOME TO TOTAL INCOME	DISTRIBUTION OF HOUSEHOLDS FALLING BEYOND 5 KMS. FROM ACTIVE MINING AREA BY ANNUAL AVERAGE NTFP EARNING					
	NIL	>0 - 1000	>1000 - 2000	>2000 – 3000	3000 & ABOVE	TOTAL
0	13	32	15	14	19	**93**
>0 TO <0 .25	0	0	0	1	1	2
0.25 TO < 0.5	2	1	1	0	2	6
0.5 TO < 0.75.	0	1	4	2	8	15
0.75 TO 1.0	2	6	4	5	0	17
TOTAL	17 (12.8)	40 (30.1)	24 (18.0)	22 (16.5)	30 (22.6)	**133** (100.0)
MEAN*	0.66	0.83	0.71	0.69	0.55	0.68

*MEAN CALCULATIONS CONSIDERED ONLY POSITIVE VALUES OF MINING TO TOTAL INCOME.

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

Table 16C

FAMILY LITERACY RATE	NUMBER OF HOUSEFOLDS FALLING WITHIN 5 KMS. FROM THE ACTIVE MINING AREA.			NUMBER OF HOUSEFOLDS FALLING BEYOND 5 KMS. FROM THE ACTIVE MINING AREA.		
	FREQ.	MEAN	S.D	FREQ.	MEAN	S.D
ILLITERATE	54 (34.6)	--	--	52 (39.1)	--	--
>0-0.25	34 (21.8)	0.17	0.05	30 (22.3)	0.18	0.04
>0.25-<0.5	41 (26.3)	0.42	0.08	36 (27.3)	0.42	0.08
>0.5-<0.76	19 (12.2)	0.63	0.06	11 (8.3)	0.62	0.07
>0.75	8 (5.1)	0.94	0.09	4 (3)	0.87	0.09
TOTAL	156 (100)			133 (100)		
AVERAGE	.27			.23		

FIGURES IN PARENTHESIS INDICATE PERCENTAGES.
SOURCE: SAMPLE SURVEY.

TABLE NO: 17C

M U L T I P L E R E G R E S S I O N A N A L Y S I S

List wise Deletion of Missing Data

Equation Number 1 Dependent Variable.
ENTFP : Annual Household Earning from NTFP Collection.

Variable(s) Entered on Step Number
1. **PLIT** : Proportion of Literate in a Household.
2. **DUMMY_D** : Distance Dummy.
3. **PMINER** : Proportion of Miner in a Household.

Multiple R .43394
R Square .18831
Adjusted R Square .17976
Standard Error 1600.15143

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	169292387.03988	56430795.67996
Residual	285	729738112.96012	2560484.60688

F = 22.03911 Signif F = .0000

---------- Variables in the Equation ----------

VARIABLE	B	SE B	BETA	T	SIG T
DUMMY_D	1539.352806	190.212181	.435001	8.093	.0000
PMINER	-8.700737	827.403905	-5.680E-04	-.011	.9916
PLIT	269.077474	362.970021	.040010	.741	.4591
(Constant)	373.940551	182.351658		2.051	.0412

TABLE NO: 18C
DISTRIBUTION OF HOUSEHOLDS BY ANNUAL MEDICAL EXPENSES IN STUDY AREA III.

ANNUAL MEDICAL EXPENSES OF EACH HOUSEHOLD IN RUPEES	NUMBER OF HOUSEHOLDS FALLING WITHIN 5 KMS OF ACTIVE MINING AREA.		NUMBER OF HOUSEHOLDS FALLING BEYOND 5 KMS OF ACTIVE MINING AREA.	
	FREQUENCY	MEAN	FREQUENCY	MEAN
NIL	89 (57.1)	---	45 (33.8)	---
< 500	41 (26.3)	252.01	53 (39.9)	212.23
500 - <1000	7 (4.5)	647.14	17 (12.8)	679.65
1000 - <1500	6 (3.8)	1238.33	6 (4.5)	1192.50
1500 - < 2000	1 (0.6)	1710.00	1 (0.7)	1640.00
2000 - < 2500	4 (2.6)	2215.00	5 (3.8)	2320.00
2500 - < 3000	2 (1.3)	2775.00	1 (0.7)	2860.00
3000 - < 4000	1 (0.6)	3500.00	3 (2.3)	3580.00
4000 - < 5000	3 (1.9)	4200.00	1 (0.7)	4260.00
5000 & ABOVE	2 (1.3)	8050.00	1 (0.7)	10650.00
TOTAL	**156 (100.0)**	**451.36**	**133 (100.0)**	**539.15**

FIGURES IN THE PARENTHESIS SHOW THE PERCENTAGE FIGURES.

SOURCE: SAMPLE SURVEY.

Major diseases affecting villagers in the buffer zone are diarrhea and other bronchial diseases. It has been somewhat difficult to asses the loss of earning due to sickness as the villagers were unable to recollect the number of days they were usually absent from workplace only due to these diseases. However from the data given in the table it can be seen that the medical expenses incurred in periphery villages are comparatively low compared to the villages in the buffer zone. The majority of households living in periphery villages incur medical expenses within Rs 500 annually .

TABLE NO: APPENDIX 1C
LIST OF OPERATING MINES IN STUDY AREA III.

SL. NO.	NAME OF MINES	LEASE AREA (IN HECTRES)	ANNUAL PRODUCTION (IN LAKH TONNES)	MINING METHODS.
1.	**MINE A,B,C,D**	**1146.6**	**49**	**MECHANIZED**
2.	**MINE E**	**84.68**	**0.148**	**MANUAL**
3.	**MINE F**	**N.A.**	**1.8**	**UNDER DEVELOPMENT**
4.	**MINE G**	**N.A.**	**0.12**	**MANUAL**

APPENDIX NO: 2C
LIST OF SAMPLE VILLAGES OF STUDY AREA III.

SL. NO.	VILLAGE NAME	BLOCK	TOTAL HOUSEHOLDS
1.	**NOAMUNDI BASTI**	NOAMUNDI	63
2.	**SARBIL**	NOAMUNDI	197
3.	**MOHUDI MUNDA SAI**	NOAMUNDI	112
4.	**TORETOPA**	NOAMUNDI	112
5.	**PACHAI SAI**	NOAMUNDI	105
6.	**GUNDIJORA**	NOAMUNDI	159
7.	**MERELGERA**	NOAMUNDI	89
8.	**MURGABEDA**	JODA	61
9.	**PARAM BALJORI**	NOAMUNDI	68
10.	**BARA BALJORI**	NOAMUNDI	203
11.	**NALDA HISABURU**	JODA	71
12.	**ULIBURU**	JODA	134
13.	**KHAS JAMDA**	NOAMUNDI	139
14.	**DIRIBURU**	NOAMUNDI	133
15.	**KANTORIA**	NOAMUNDI	49

APPENDIX NO: 3C

VILLAGEWISE TOTAL AGRICULTURAL LAND HOLDINGS OF THE BUFFER AREA VILLAGES OF STUDY AREA III.

SL. NO.	VILLAGE NAME	TOTAL AGRICULTURAL LAND (IN ACRES)
1	**NOAMUNDI BASTI**	86.95
2	**MOHUDI**	371.88
3	**SARBIL**	292.74
4	**MURGABEDA**	N.A.
5	**TORETOPA**	N.A.
6	**PACHAI SAI**	N.A.
7	**GUNDIJORA**	107.30
8	**MERELGERA**	104.38
9	**PADAPAHAR**	242.31
10	**JAMKUNDYA**	711.71
11	**HUNDULA**	159.70
12	**THAKURA**	106.46
13	**SIALIJORHA**	639.46
14	**DEOJHAR**	532.64
15	**KITABERHA**	148.37
16	**KULUM**	266.82
17	**MAHADEBNASA**	327.55
18	**KUDAPI**	40.45
	TOTAL	**4138.72**

APPENDIX NO: 4C
DISTRIBUTION OF VILLAGES OF STUDY AREA III BY DISTANCES FROM ACTIVE MINING AREA.

ZONES	DISTANCES FROM ACTIVE MINING AREA	LIST OF VILLAGES
BUFFER	O – 2 KMS.	**1. NOAMUNDI BASTI.** **2. MOHUDI MUNDA SAI.** **3. MURGABEDA.** **4. SARBIL.**
	2 – 5 KMS.	**1. GUNDIJORA.** **2. MERELGERA.** **3. TORETOPA.** **4. PACHAI SAI.**
PERIPHERY	BEYOND 5 KMS.	**1. PARAM BALJORI.** **2. BARA BALJORI.** **3. DIRIBURU.** **4. KHAS JAMDA.** **5. KANTORIA.** **6. NALDA HISABURU.** **7. ULIBURU.**

APPENDIX NO: 5C

NAME OF VILLAGE	NUMBER OF HOUSEHOLD LISTED	PRIMARY OCCUPATION					NUMBER OF SECONDARY TO BE DONE				
		MINING	MC	CULTIVATOR	AG- WEARNER	OTHERS	MIN	OTH	CUL	AGW	TOT
BELKUNDI		17 (4)	0	6 (1)	0	41 (8)	4	8	1	0	13
BARA BALJURI		63 (13)	0	60 (12)	26 (5)	51 (10)	13	10	12	5	40
DALKI		89 (17)	0	0	0	46 (12)	17	12	0	0	29
DIRIBURU		10 (2)		28 (5)	7 (2)	26 (5)	2	5	5	2	14
GUNDIJORA		9 (2)	0	66 (13)	3 (1)	28 (6)	2	6	13	1	22
MURGA BEDA		23 (5)	0	3 (2)	1	41 (5)	5	5	2	0	12
MERELGERA		26 (7)	0	19 (7)	5 (1)	18 (3)	7	3	7	1	18
MOHUDI		55 (11)	0	2 (1)	20 (4)	35 (7)	11	7	1	4	23
NOAMUNDI BASTI		40 (8)	0	15 (3)	0	10 (2)	8	2	3		13
NALDA		25 (5)	0	16 (3)	0	30 (6)	5	6	3		14
PACHAISAI		55 (11)	0	10 (2)	0	40 (8)	11	8	2		21
PARAM BALJURI		35 (7)	00	16 (3)	0	17 (3)	7	3	3		13
SADING		79 (16)	0	6 (1)	4 (1)	64 (13)	16	1	12	1	31
TORETOPA		56 (12)	0	15 (3)	0	70 (14)	12	14	3		29
KOLKARA		46 (10)	0	10 (2)	0	70 (14)	10	14	2		26
KARAKHENDRA		67 (14)	0	34 (7)	0	97 (20)	13	19	5		41
KANTORIA		0	0	7 (2)	0	42* (8)	0	7	2		10
KHASJAMDA		30 (6)	0	15 (3)	4 (1)	90 (18)	6	18	3	1	28
ULIBURU		25 (5)		30 (6)	0	25 (5)	5	5	6	0	16
TOTAL		784		425	85	663					

* NTFP COLLECTOR(3)

SAMPLES DRAWN	N	**14**	**11**	**4**	**11**	**3**
TOTAL	**672**	175	159	35	303	
SAMPLES DRAWN		**35**	**28**	**10**	**60**	**133**

APPENDIX NO: 5C
SAMPLE DESIGN OF STUDY AREA III.

SL. NO.	NAME OF VILLAGE	HOUSE-HOLDS LISTED	DISTRIBUTION OF HOUSEHOLDS BY PRIMARY OCCUPATION				TOTAL SAMPLE DRAWN
			MIN	CUL	AWE	OTH	
BUFFER ZONE (WITHIN 5 KMS. FROM ACTIVE MINING AREA).							
1.	**NOAMUNDI BASTI**	**63**	42	11	0	10	**13**
2.	**SARBIL ***	**114**	33	19	4	58	**23**
3.	**MUNDA SAI**	**112**	57	2	18	35	**24**
4.	**MURGABEDA**	**62**	23	7	1	31	**12**
5.	**TORETOPA**	**112**	34	14	0	64	**23**
6.	**PACHAI SAI**	**105**	74	6	0	25	**21**
7.	**GUNDIJORA**	**111**	11	66	5	29	**22**
8.	**MERELGERA**	**89**	31	36	5	17	
PERIPHERY ZONE (BEYOND 5 KMS. FROM ACTIVE MINING AREA).							
1.	**NALDA HISABURU**	**71**	15	16	0	40	**14**
2.	**ULIBURU ***	**70**	15	27	0	28	**14**
3.	**KHAS JAMDA**	**139**	30	15	4	90	**28**
4.	**DIRIBURU ***	**72**	10	22	8	32	**14**
5.	**KANTORIA**	**49**	0	7	0	42	**10**
6.	**PARAM BALJORI**	**68**	35	16	0	17	**13**
7.	**BARA BALJORI**	**203**	70	56	23	54	

* THE BIGGEST CLUSTER OF HOUSEHOLDS (TOLI) WAS CONSIDERED.

N.B. **(1)'**MIN' => **MINING ; '**CUL' => **CULTIVATION ; '**AWE' => **AGRICULTURAL WAGE EARNER; '**OTH' => **OTHER JOBS.**