Mining and Social Capital: A Micro-analysis from Odisha, India

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Submitted: 10 April 2020, Accepted: 17 August 2020, Published: 26 October 2020
Volume 29, 2021. p. 100-117. http://doi.org/10.25133/JPSSv292021.007

Abstract

The Sustainable Livelihood Framework has identified social capital as one of the means upon which sustainable livelihoods are built. Hence an attempt was made in this study to determine whether mining improves the social capital of a local community in the primary mineral producing state of Odisha, India. A comparative approach utilizing various statistical techniques with mining and non-mining areas was used. It was found that mining is having a significantly adverse impact on the social capital of the mineral-rich region of Odisha in the preference for the nuclear family rather than the larger family size; social tensions due to massive unemployment, migration, or non-payment of compensation for land acquisition; a higher level of alcohol consumption; and, low workforce participation of women in mining villages than in non-mining villages. Even less involvement in associations and groups and weak social networks have been found among people in the mining region. Thus, mining activity in the region has deteriorated, instead of improving, the area's social capital. This depreciation raises the issue of mining as being a truly sustainable source of livelihood. This issue makes it necessary for the administrative machinery to design a strategy appropriate for augmentation of the social capital in India's mineral abundant regions.

Keywords

Livelihood; mineral; mining; region; social capital

Introduction

Mining, as an economic activity, has been identified as a means for developing mineral-rich economies (Sahoo et al., 2018; World Bank and International Finance Corporation, 2002). Mining not only helps in the establishment of new communities but also in the development of existing ones (Mining Minerals and Sustainable Development, 2002). India, one of the largest mineral endowed economies, produces as many as 95 minerals comprising four fuels, ten metallic, 23 non-metallic, three atomic, and 55 minor minerals. Madhya Pradesh, Gujarat, Karnataka, Odisha, Andhra Pradesh, Tamil Nadu, Chhattisgarh, Rajasthan, Goa, Maharashtra, Jharkhand account for 91% of the value of mineral production in the country. The mining and quarrying sector's contribution (at current price) accounted for about 2.38% of the country's Gross Value Added for the years 2018-2019 (Ministry of Mines, 2019). As well, the sector has the credit of creating an average daily employment of 4,77,399 persons in 2017-2018 (Indian Bureau of Mines, 2020). Financially, this sector contributes to the revenue of the Central and State governments through the payment of royalties, dead rent (fixed rent for mines without considering the profitability of the mine), cess (a tax or levy), sales tax, excise duties, and customs duties. Through exports of minerals, this mining and quarrying sector helps the nation in earning foreign exchange, with minerals accounting for 10% of the total value of all merchandise exported from India (i.e., INR1.991 trillion, Indian Bureau of Mines, 2019a).

Be as it may, many developing countries with abundant resources are also confronted with the issue of 'resource curse.' This burden has raised the issue of sustainability (Mishra, 2009) with reduced ecosystem services (Hota & Behera, 2016), destroyed environments resulting from land acquisition (Kumar, 2014), and large scale displacement of populations (Mishra & Mishra, 2017). The existence of mineral resources has turned out to be a curse rather than a blessing for most countries as mining companies, governments, and other actors affect the social capital of the region by siphoning away the wealth of the area while simultaneously battling with a plethora of economic hurdles which sometimes lead to social unrest and conflict (Bebbington et al., 2008).

Social capital is now widely accepted as one of the principal assets of a nation. Traditionally, there are three types of capital which form the basis of economic growth and development; natural capital, human capital, and physical capital. However, it was found that these three capitals only partially determine the development process as they ignore the interaction of economic agents that generate growth (Grootaert, 1998). So, Butler et al. (2009) realized that social capital was a missing link in the development process. Social capital represents various kinds of network interactions that appear to facilitate good outcomes, and also refers to people's relationships to enhance collective action (Ireland & Thomalla, 2011). Considered as an intangible resource embedded in the features of social organizations and networks, social capital facilitates movement and improves efficiency in a society that would not have been in its absence (Keming, 2007). Consequently, social capital has been embraced as a necessary form of capital, indispensable in making sustainable development possible (Pantoja, 2000). Improvement in social capital is vital for achieving objectives in a sustainable manner (Grootaert, 1998).

The Sustainable Livelihood Framework identifies social capital as one of the capitals upon which sustainable livelihoods are built (Department for International Development, 1999), and its assistance in improving the other types of capital. Substantial social capital is, therefore, not only seen as a resource in community development, but also a vital prerequisite

for such development. Although social capital can address whatsoever may be designated as social, it has tended to neglect the state, class, power, and conflict (Fine, 2010). Social capital requires a proper analysis of politics and administration to address the concepts of connection, exclusion, and inclusion, likewise showing to be less effective in situations of inequality, control, and exclusion (Harriss, 2006).

Mining is identified as a core sector in Odisha because of its vast mineral resources. This sector has flourished after the initiation of the liberalization process in India in the 1990s. As a result, mining has made Odisha potentially the most attractive destination for large capital-intensive projects by mineral-based private-sector firms (Mishra, 2010). Presently, the state has 130 reported mines, or roughly 9% of the country's total operating mines (Indian Bureau of Mines, 2019b). Equally, the sector had a share of 9% of the Gross State Domestic Product of Odisha in 2018-2019, along with a leading position in the value of mineral production, with a share of 24% in the national output (Ministry of Mines, 2019). The state of Odisha is one of the principal producers of some major minerals in India like iron ore, bauxite, manganese ore, graphite, chromite, sillimanite, pyroxenite, and quartzite, and dolomite. Among all mineral resources, iron-ore plays a significant role in the economy, with iron ore being the most exported mineral from Odisha. The state has the largest share of the country's iron ore reserves (34%) and production (51%) (Indian Bureau of Mines, 2019c). Out of the total national mineral export, Odisha enjoyed the highest share of 94% in 2016-2017, while iron ore mining provided employment opportunities to 35% of total mining workers during 2017-2018.

According to a research report by Fitch Solution Macro Research (2019), the global iron-ore production will increase from 2850 million tons in 2019 to 3119 million tons by 2028, with India and Brazil primarily driving the supply growth. As a result, India's iron-ore output growth has been forecasted to increase from 230 million in 2019 to 241 million tons in 2028. This growth necessitates even more iron-ore mining activities. As previously stated, social capital is one of the crucial resources of a nation. A pertinent research query that arises here is whether the exploration of iron-ore improves the social capital of the local community. Hence, the purpose of the present study is to investigate the impact of iron–ore mining on the social capital of the local community so that the administrative machinery may conduct necessary intervention for the augmentation of the social capital in the mineral-abundant regions.

The present paper is organized in the following manner. The first section will offer the study area description. The Data Collection & Methodology will be presented in section two, followed by the Results and Discussions in section three, and finally, section four concludes with Policy Implications.

Study area description, data collection & methodology

The Keonjhar district is considered to be the hub of iron ore mining in the state of Odisha. The district contributes 35% of the country's iron-ore production and 71% of the state's production during 2017-2018 (Indian Bureau of Mines, 2019c). Hence, due to the valued nature of the Keonjhar district, this area has been selected for the study.

There are thirteen administrative blocks in the Keonjhar district, out of which six blocks are mining, and seven are non-mining. A mining block is an area where mining operations take place. Out of six mining blocks in April 2014, the Joda block was randomly selected for this

study, whereas the M/s Serajuddin & Co. iron ore mine being randomly chosen out of six operational iron ore mines in the Joda block. Further, four surrounding villages of the M/s Serajuddin & Co. iron ore mine, namely Balda, Kundaposi, Bada Kalimati, and Unchabali, were selected. As a side note, these villages will be referred to as 'mining villages' in the present study.

M/s Serajuddin & Co. has been in operation in the area since the 1960s, so a pre-post analysis was not possible to assess the impact of mining on the social capital of local communities. Hence a "with and without analysis" objective was adopted for the present study. Here some control villages, i.e., Dhangardiha, Suneriposi, Sanajiuli, and Banachakulia, were selected by a simple random sampling method from a non-mining block (Ghatagaon block) of Keonjhar district, and will be referred to as 'non-mining villages.' A stratified simple random sampling technique was used to select 180 households from mining villages and 180 households from non-mining villages, making the study's total sample size 360 households. The socio-economic profile of these sample households is shown in Table 1.

Table 1: Socio-economic profile of sample households

Characteristics		Mining Villages		Non-mining Villages	
		No.	%	No.	%
Caste	Scheduled Tribe (ST)	150	83%	104	58%
	Scheduled Caste (SC)	6	3%	7	4%
	Other Backward Caste (OBC)	23	13%	67	37%
	General	1	1%	2	1%
Sex	Male	451	48%	468	51%
	Female	485	52%	443	49%
Age (in years)	Less than 16	396	42.3%	250	27%
	More than 16 but less than 60	491	52.5%	588	65%
	More than 60	49	5.2%	73	8%
Annual Income	Less than INR100,000	30	16.7%	88	49%
	INR100,000 to INR300,000	112	62.2%	80	44%
	INR300,000 to INR500,000	35	19.4%	10	6%
	More than INR500,000	3	1.7%	2	1%

Note: Field study

It can be seen from Table 1 that more than 80% of households in mining villages belong to Scheduled Tribe (ST), whereas about 13% of households are Other Backward Caste (OBC). Only 3% and 1% belong to Scheduled Caste (SC) and General caste, respectively. In non–mining villages, 58% belongs to ST, followed by OBC (37%), SC (4%), and General (1%). The total population in the mining villages comprise of 48% males and 52% females. There are 49% females and 51% males in non-mining villages. The age-wise analysis shows the working population (age group of more than 16 years but less than 60 years) is highest in both mining villages (52.5%) and non-mining villages (65%). However, the dependent population was found to be more in mining villages than in non-mining villages. The annual income level has been used to show the economic condition of the household. It can be seen from the table that the highest percentage of households (62.2%) in mining villages are earning income within INR100,000 to INR300,000 annually. Although in non-mining villages, the highest percentage of households make less than INR100,000 (around 50%). Few households in non-mining villages earn income between INR300,000 to INR500,000. The percentage of households earning very low (i.e., less than INR100,000) is more in non-mining villages (49%) than in mining villages (17%). This

data shows that mining households are more economically prosperous than their non-mining counterparts.

A structured survey schedule was used to collect the data from the households of mining and non-mining villages during May to December 2014. With appropriate verbal consent of the respondents, a set of structured questions related to the study was asked by the author. Data collected from the field study was then summarized and portrayed in statistical tables and figures. Besides, mathematical and statistical techniques such as averages, percentages, and the t-test, Z-test, and F-test have been used where appropriate to achieve the desired objective. The t-test is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups. In contrast, the Z-test is a test to compare the significance of the difference of two counts under Poisson distribution. Likewise, F-test is a test to investigate the significance of the difference between two counted results based on the Poisson distribution (Kanji, 2011).

Result and discussion

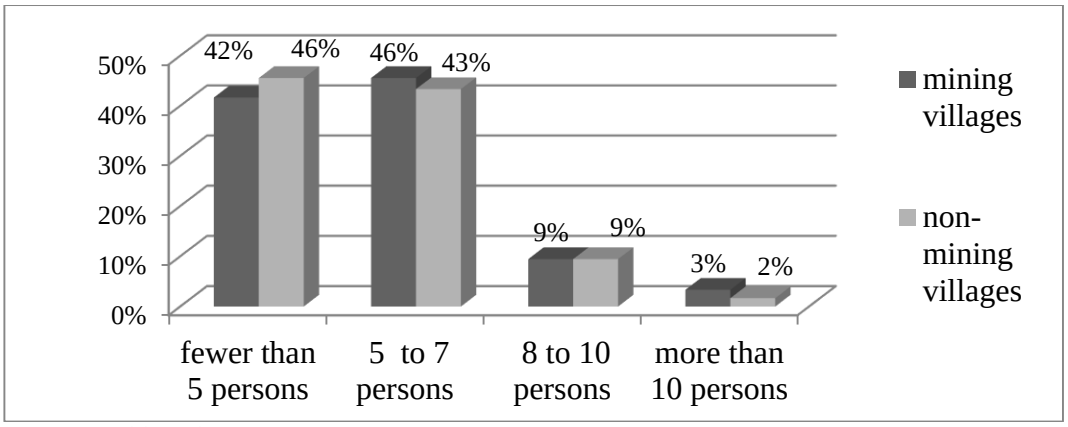
Livelihood is an association of economic activities regularly adopted by the household to make a living (Maliganya et al., 2013). To achieve a positive and sustainable livelihood, five types of capital or assets (e.g., financial, physical, social, natural, and human capital), as identified by Sustainable Livelihood Framework (Department for International Development, 1999), must be necessitated by the members of the household. Though all these five types of capital are essential for a sustainable livelihood, the social capital aspect will be addressed in the present study. The indicators used to examine the impact of mining on the social capital of the local community are the type of family; participation of women in the workplace; social network and involvement in associations and groups; CSR policies of the mining company; social tension due to unemployment, contractual jobs, land acquisition, in-ward migration; and, the prevalence of social illness such as alcoholism. These factors are analyzed below.

Type of family

Family is one of the essential socio-economic institutions in our society. Family is defined as a group of related or nonrelated individuals who usually (although not necessarily), live together and whose production of income and consumption of goods are related. Family size can be an important determinant of quality of life. All members of a family are to be counted to determine the family size.

The comparison of mining and non-mining villages based on the family size is shown in Figure 1. Approximately 46% of households in mining villages have a family size between 5-7 members, followed by 42% of households having a family size below five members. Only 9% and 3% of households have a family size between 8-10 members and above ten members, respectively. However, in non–mining villages, about 46% of households have a family size of fewer than five persons, followed by 43% of households having a family size of 5-7 persons. Only 2% of households have a family size of more than ten members. Nevertheless, the Z-test results show that these family size differences are not significant (Table 2). These findings indicated that mining villages' preferences are comparatively more towards large families than non-mining villages as children are considered income earners in the mining region.

Figure 1: Distribution of household according to the size of the family (%)



Note: Field study

Table 2: Z-test for distribution of households according to their family size

Village	Family size (in persons)				
	Fewer than 5	**5 to 7**	**8 to 10**	**More than 10**	**Total**
Mining	75	82	17	6	180
	47.8%	51.3%	50%	66.7%	
Non-Mining	82	78	17	3	180
	52.2%	48.7%	50%	33.3%	
Total	157	160	34	9	360
Z-Value	-0.56	0.32	0	1	

Note: Field study

Further, the mean family size in persons is higher in mining areas (5.18) than in non-mining areas (5.04). To find if the difference in the family size is significant or not, a *t*-test was used. The results, as shown in Table 3, showed that the difference is non-significant.

Table 3: Independent test for the mean income of mining and non-mining villages

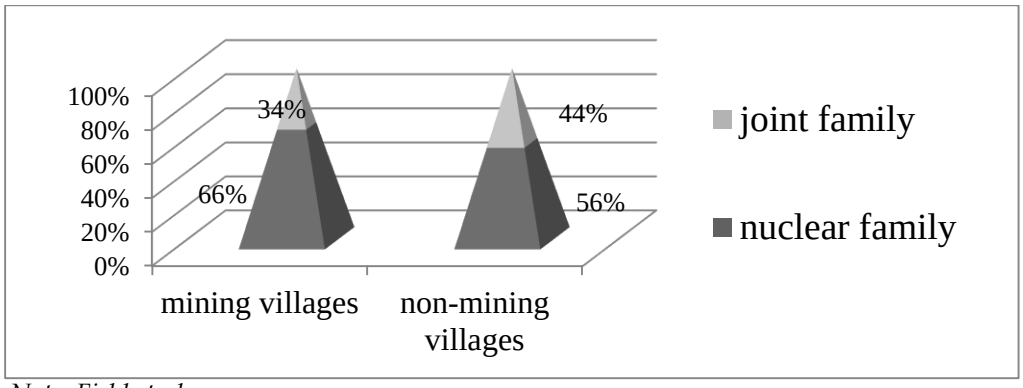
Variables		*t*-test for equality of means				
		t-value	**Degree of freedom**	**Probability -value (2-tailed)**	**Mean difference**	**S. E. Difference**
Family size	Equal variances assumed	0.57	358	0.567	0.14	0.24
	Equal variances not assumed	0.57	357.37	0.567	0.14	0.24

Note: Field study

Though the family is considered a universal social organization, sociologists and anthropologists have created family classifications based on the size and structure of the family. Accordingly, the family may be a nuclear family, a joint family, or extended family. A nuclear family is a basic social family unit consisting of a husband, wife, and unmarried children. In contrast, a joint family consists of a father, mother, sons and their wives, unmarried daughters, grandchildren, grandfather, grandmother, uncles, aunts, their children,

and so on. Figure 2 shows that 66% of the households in mining villages are nuclear families, whereas only 56% in non-mining villages are nuclear families. The joint family system is found more in non-mining villages (44%) than in mining villages (34%). However, there is a preference for the nuclear family in both regions as the percentage of nuclear families is higher in mining (66%) and non-mining villages (56%). The Z-test results show that these differences are not significant (Table 4).

Figure 2: Distribution of household according to the type of family (in %)



Note: Field study

Table 4: Z-test for distribution of households according to the type of family

Village	Type of Family		
	Nuclear Family	**Joint Family**	**Total**
Mining	119	61	180
	54%	44%	
Non-Mining	101	79	180
	46%	56%	
Total	220	140	360
Z-value	1.21	-1.52	

Note: Compiled by the author based on field survey

Participation of women

The occupational structure is a crucial component and manifestation of population composition. The occupational structure shows the ratio of working and non-working populations in an area. The working population is those who are engaged in waged work. Table 5 shows the occupational structure of the sample population according to gender. In the mining villages, the working population is not more than 40%, but in non-mining, it is more than 50%. Gender wise analysis revealed the male-female working gap in the sample villages. It can be seen that the female working population engaged in waged work in mining villages is less than the male working population. We could also see a gender gap in employment in non-mining villages.

The labor or workforce participation rate, the proportion of the working population to the total population, indicates the active portion of an economy labor force. The workforce participation rate, according to both genders in the region, is shown in Figure 3. It was found

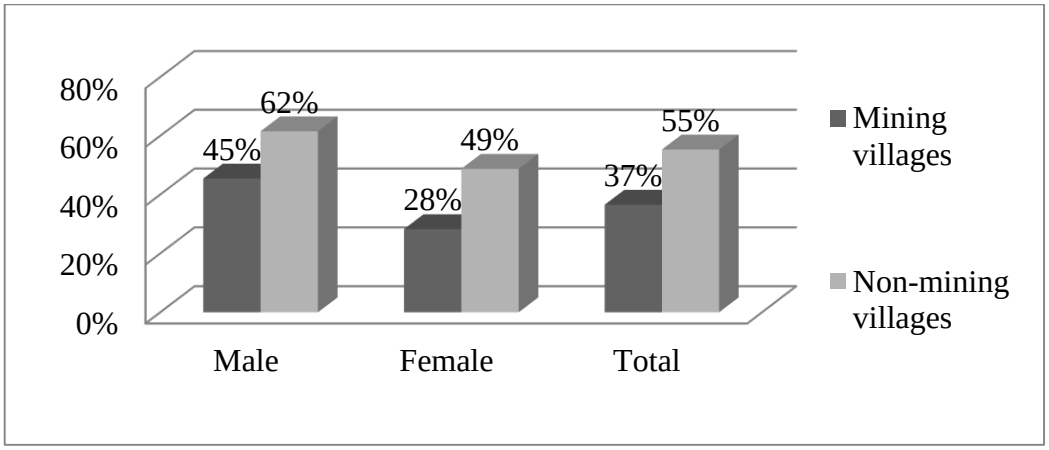
that the participation rate in non-mining villages (55%) is more than mining villages (37%). Moreover, the gender-wise participation rate shows that the mining region's male participation rate is more than the female participation rate, similar to the non-mining region scenario. However, we can see that male and female participation rate is higher in non-mining villages than in mining villages.

Table 5: Distribution of population according to the work and gender

Gender		Population		Total	Population		Total
		Working	Non-Working		Working	Non-Working	
		Mining villages			Non-mining villages		
Male	No.	205	246	451	288	180	468
	% within gender	45%	55%	100%	62%	38%	100%
	% within occupation	60%	41%	48%	57%	44%	51%
Female	No.	137	348	485	216	227	443
	% within gender	28%	72%	100%	49%	51%	100%
	% within occupation	40%	59%	52%	43%	56%	49%
Total	No.	342	594	936	504	407	911
	% within sex	37%	63%	100%	55%	45%	100%
	% within occupation	100%	100%	100%	100%	100%	100%

Note: Field study

Figure 3: Labor force participation rate of male and female in mining and non-mining villages



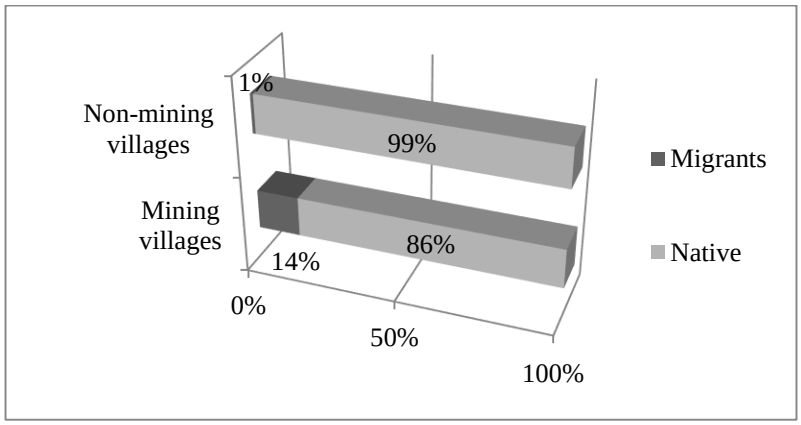
Note: Field study

Social Tension

Inward-migration

According to the Mining, Mineral, and Sustainable Development Final Report **(**2002**)**, one of the most significant impacts of mining activity is the migration of people into a mine area, particularly in remote parts of developing countries where the mine represents the single most important economic activity. Mining makes the region the land of opportunities and attracts people from other districts of the state and neighboring states for taking up work or business activities directly or indirectly related to mining (Das, 2013; Ware-Opoku, 2010). Within mining villages, Balda suffers from a maximum migration problem as the proportion of migrants in the village is 32%, followed by Kundaposi, which is occupied by 18% of migrant households. Non-mining villages do not face any migration problem. The influx of migrants in mining areas is due to job opportunities, as mentioned by some villagers, results in tensions leading to quarrels and conflicts between natives and outsiders in the society. Since Balda is nearest to the mines, the migration problem is more predominant in this village. As shown in Figure 4, migrants are more prevalent in mining villages than the non-mining villages. In mining villages, 14% of households are occupied by migrants, whereas migrants occupy only 1% of households in non-mining villages.

Figure 4: Distribution of household according to their originality (%)



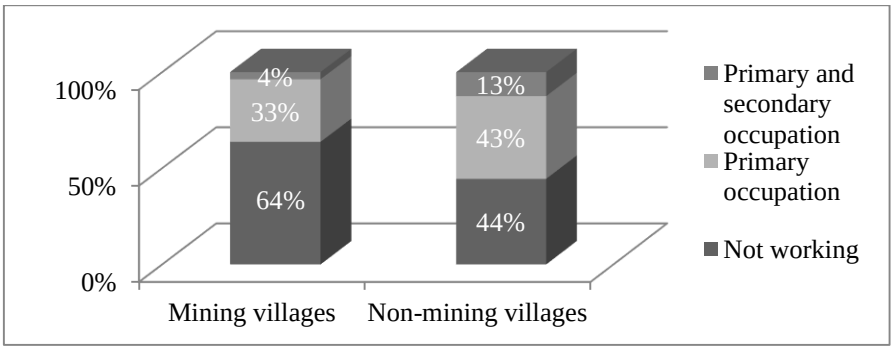
Note: Field study

Unemployment and Contractual jobs

Working as labor in the mines, or as staff in the mining offices, is the primary occupation of most mining villagers, whereas farming is considered the main occupation for non-mining people. Transport businesses, working as casual labor (e.g., daily wage labor in construction activities), and in Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA, a scheme by the Government of India that provides 100 days of guaranteed wage employment in a financial year to every rural household) are different secondary sources of income for mining villages. Likewise, the secondary occupations for non-mining people are casual agricultural labor, selling of forest products, casual industrial labor, and MGNREGA. The dependence of people on secondary occupations in non-mining villages (13%) is more than in mining villages (4%) (Figure 5). This dependency is because of the seasonal nature of agriculture, where people work for some months then remain idle for the rest of the year. Thus, to supplement their income, they engage in secondary work. This idleness is in contrast

to mining villages where people work throughout the year for the mining company. Therefore, the people in the mining villages need not look for other secondary sources of income. The percentage of people in primary occupation in mining villages (33%) is less than that of non-mining villages (44%). The population not engaged in waged work is higher in mining villages (64%) than in their non-mining counterparts (44%). This discrepancy may be due to higher wages from the primary occupation.

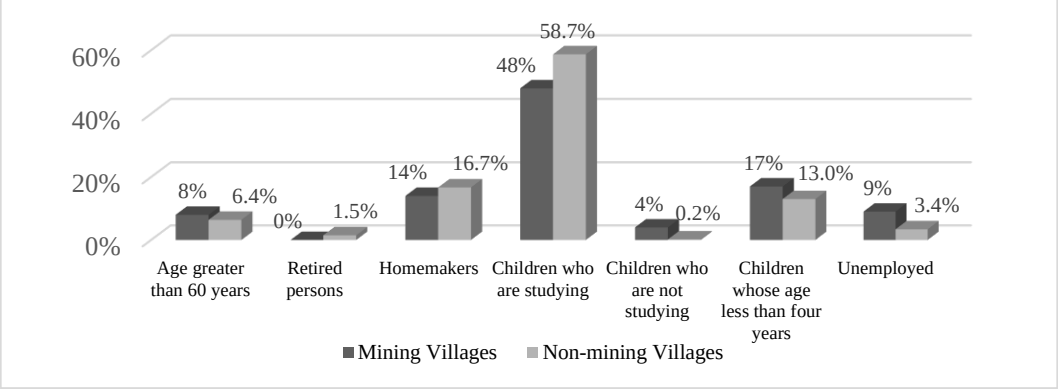
Figure 5: Distribution of population according to the nature of occupation (in %)



Note: Field study

Now, with regard to the non-working population, they have been categorized into children, homemakers, old age, unemployed, and retired pensioners. Figure 6 shows that the non-working population in mining villages is higher than in non-mining villages. Among the non-working population, information on unemployment is of utmost importance. Mining villages have more unemployed persons than non-mining villages due to mining companies' mechanization of some mining operations. Interestingly, 4% of children in mining villages are not participating in any formal education. It was found that such types of children usually involved themselves in earning money by doing some casual jobs like working in garages, roadside hotels, and the like.

Figure 6: Distribution of non-working members of households in mining and non-mining villages



Note: Field study

In order to recognize the significance of these differences in the distribution of the non-working population, a Z-test was carried out (Table 6). The results show significant differences in all categories of the non-working population between mining and non-mining villages, except homemakers.

Table 6: Z-test for non-working members of the household between mining and non-mining villages

Villages	Age greater than 60	Retired person	Homemaker	Children			Unemployed	Total
				Studying	Not-studying	Age less than 4		
Mining Villages	46 64%	0 0%	84 55%	285 54%	26 96%	101 66%	52 79%	594
Non-Mining Villages	26 36.1%	6 100%	68 44.7%	239 45.6%	1 3.7%	53 34.4%	14 21.2%	407
Total	72	6	152	524	27	154	66	1001
z-value	2.36**	-2.45**	1.3	2.01**	4.81*	3.87*	4.68*	

Note: Field study

*Note: * implies value to be significant at 1% and ** at 5% level of significance*

Besides the unemployment issue, there is also the problem of contractual jobs in the mining region. The study found that the mining company had 166 on-roll employees (those employed directly by the mining company) and 1037 off-roll employees (those employed by contractors). The mining company had seven contractors engaged in the mining operation**.** Out of these contractors, 60% of employees belonged to the local villages of Balda, Bada Kalimati, Nayagarh, Kundaposi, and Guruda. Nearly half of the sample households (48%) worked in the mining company, with 15% engaged in the mining company's office. The rest worked as mining laborers (90% being contractual laborers and earning daily wages). The mining laborers receive daily wages as per the Government's Minimum Wage Act, 2014, i.e., INR220, INR276, and INR329 per day under unskilled, semi-skilled, and skilled categories, respectively. While the permanent mining laborer receives a monthly wage, contractual laborers are paid depending upon the number of days they work. In addition to their monthly wage, permanent workers enjoy leave, gratuity, and bonuses. Since many laborers are contractual, there is always a demand to regularize their work, and sometimes this leads to strikes and conflicts with the management, and a hostile environment is created in the workplace.

Non-payment of compensation for land acquisition

A mining company requires a large amount of land to carry out its operation. For this, the mining companies are generally used to acquiring land from the community. The land may be agricultural land, fallow land, or homestead. Serajuddin & Co. also acquired land for mining purposes, but there was no displacement and rehabilitation problem in sample mining villages as agricultural land was mostly acquired. Compensation can be in the form of physical payment (e.g., a job in the mines), monetary compensation, or both. The nature of the position one could get in mine will be based on the person's educational qualification. As per the government rate of 2014, the mining company has to pay a minimum of INR500,000 to INR600,000 per acre of land in this region. It was learned from villagers that the mining company had even paid up to INR2.5 million for 1 acre of land. Tables 7 and 8 show the distribution of households in mining villages according to the type and size of land lost to the mining company.

Land acquisition has mostly taken place in the Balda village due to its proximity to the mine site and the mining office. Nearly 26% of the sample households in this village had lost their

unirrigated agricultural land to the mining company. There has also been the acquisition of irrigated agriculture land from 8% of the households. Similarly, in Kundaposi, 6% and 10% of households have lost their irrigated and unirrigated agricultural land, respectively. Very few lands were acquired in Kalimati and Uchaballi.

Table 7: Distribution of households according to the type of land lost to the mining company

Mining Villages	No land acquisition	Type of acquired land			Total
		Irrigated agricultural land	Unirrigated agricultural land	Fallow land	
Balda	33	4	13	0	50
	66%	8%	26%	0%	100%
Kundaposi	40	3	5	2	50
	80%	6%	10%	4%	100%
Kalimati	38	2	0	0	40
	95%	5%	0%	0%	100%
Uchaballi	36	0	3	1	40
	90%	0%	7.5%	2.5%	100%
Total	147	9	21	3	180
	82%	5%	12%	2%	100%

Note: Field study

Most of the acquired lands were of a marginal size less than or equal to 1 hectare (2.47 acres). Besides, some percentage of small land landholdings between 1-2 hectares (2.47-4.94 acres) and semi-medium landholding of 2-4 hectares (4.94-9.88 acres) had also been lost to the mining company.

Table 8: Distribution of households in mining villages according to the size of land lost to the mining company

Mining village	Size of land acquisition				
	No land acquisition	Marginal land	Small land	Semi-medium land	Total
Balda	33	16	1	0	50
	66%	32%	2%	0%	100%
Kundaposi	40	6	3	1	50
	80%	12%	6%	2%	100%
Kalimati	38	2	0	0	40
	95%	5%	0%	0%	100%
Uchaballi	36	1	3	0	40
	90%	2.5%	7.5%	0%	100%
Total	147	25	7	1	180
	82%	14%	4%	1%	100%

Note: Field study

A very high monetary compensation of INR1 million to INR2.5 million per acre was paid to households who lost their land. Households preferred to take monetary payment so that they could purchase a Dumper Tipper (dump truck) and utilize the dump truck in the transportation of minerals. Some households in mining villages, except in Uchaballi, have still

not received compensation due to some dispute over ownership of the land. Disputes are substantial in Kalimati. Moreover, all the households have payment in cash except in Kundaposi, where 30% of households have received jobs for land acquired by the mining company (Table 9). Further, the percentage of people who have either not received compensation or have received payment in terms of cash is significant at a 1% significance level (Table 10).

Table 9: Distribution of households according to compensation paid for land acquisition

Mining Village	No Compensation	Forms of received compensation		Total
		Cash	Job	
Balda	6	11	-	17
	35.3%	64.7%	-	100%
Kundaposi	5	2	3	10
	50%	20%	30%	100%
Kalimati	4	2	-	6
	66.7%	33.3%	-	100%
Uchaballi	0	4	-	4
	0%	100%	-	100%
Total	15	19	3	37
	41%	51%	8%	100%

Note: Field study

Table 10: F- test for the nature of compensation to the households

Nature of Compensation	Observed frequency	Expected frequency	F-Calculated
No Compensation	15	12.3	3.2*
Cash	19	12.3	4.0*
Job	3	12.3	0.6
Total	37	37	

Note: Field study
*Note: * implies value significant at 1% level*

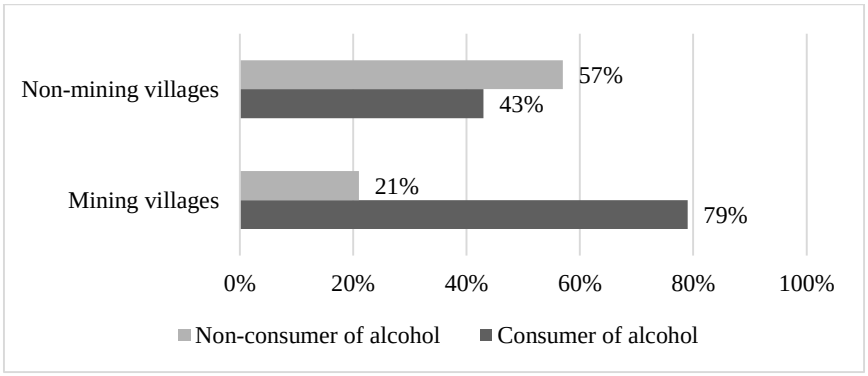
Social illness

Studies have found that many social vices, including alcoholism, have been on the rise in mining regions (Akabzaa & Darimani, 2001; Das, 2013; World Bank & International Finance Corporation, 2002). Alcoholism is a great social evil and health concern of mining workers, and has had a detrimental effect on the workers' lives. The result could be described as the excessive and regular use of alcohol, leading to alcohol-related problems. Brubacher and Associates (2002) found that alcohol has had a significant negative social impact on many individuals and families in the mining community. A large percentage of offenses, including convictions, assaults, and bankruptcies, are related to alcohol abuse (Gibson & Klinck, 2005).

In the study area, excessive and regular alcohol consumption is common among laborers in the sample mining villages. The laborers brew local alcohol known as '*Handia*' in their homes. The laborers generally consume this alcohol in the evening after returning home, with excessive consumption on holiday. There general thinking among the workers that drinking this locally made alcohol will relieve tiredness and body pain. During February and March,

there is another type of local alcohol prepared by some families from a flower called mahua is '*Mahuli*.' However, since the government bans the sale of this local alcohol, *Mahuli* is sometimes secretly sold in the private homes. Police would raid the suspicious homes in the mining villages frequently. Consumption of alcohol is more in mining villages than in non-mining villages (Figure 7). The percentage of respondents in consuming alcohol in mining villages (79%) is higher than in non-mining villages (43%) with a significance of 1% (Table 11). On the other hand, those who do not consume alcohol were significantly higher in non-mining villages.

Figure 7: Alcohol consumption in mining and non-mining villages



Note: Field study

Table 11: Z- test for the number of alcohol consumers between mining and non-mining villages

Village	Consumers of alcohol	Non-consumers of alcohol	Total
Mining	143	37	180
	65%	27%	
Non-mining	78	102	180
	35%	73%	
Total	221	139	360
Z-Value	4.37*	-5.51*	

Source: Field study
*Note: * implies value significant at 1% level*

The average quantity of alcohol consumption is more in mining villages (2-3 liters per week) than the non-mining villages (1 liter per week). This difference may be due to a higher income status of mining households.

Social network and participation in associations and groups

Living in the community and being part of an association helps the workers to derive social benefits**.** Thus, a strong social network can act as a coping mechanism during any crisis (Adjei, 2007). The study found that community development centers were built by the mining company in mining villages for the inhabitants and local authorities to conduct meetings, discuss information related to the generation of self-employment, and the development of Self Help Groups (SHGs). However, it was found that few community meetings and discussions

were held, and when held, were on an irregular basis, as revealed by village leaders. This irregularity was due to a lack of community participation in these discussions. There have been quarrels among the villagers on many occasions, sometimes even among the family members related to monetary matters like the compensation amount received for the acquired land. However, whenever villagers had any complaints related to the mining company or any other village matters, they came together and unanimously put the grievance before the mining authority. Thus, the study found weak social networks and connectedness.

Corporate Social Responsibility (CSR) policies of the Mining company

The mining company, as a part of its Corporate Social Responsibility (CSR), has contributed to the communities in the areas of medical and health care, drinking water purification, and education, as well as the development of village infrastructure (road networks), and electricity in its surrounding villages, namely Jalpaposi, Kalimati, Balda, Guruda, Tadapani, Palasa, Handibhanga, Nayagarh, and Kundaposi. Besides, the mining company has also undertaken several social welfare measures for the betterment of the society. These measures include the construction of bathing ghats (bathing places along a river) and village ponds, and community development centers. The mining company also contributes money for the celebration of different festivals in the community. It also encourages people to participate in sports by distributing sports kits to villagers. Maintaining temples and helping Self Help Groups are some of the other social welfare activities done by the mining company.

However, many respondents believe that the mining company has failed in terms of promises of development and other social benefits made to the people. The mining company should take sincere steps in fulfilling its promises of infrastructural development and investment, particularly with the roads, drinking water measures (especially during summer), electricity, transportation facilities, and communication facilities at low or no cost to the local communities. Some respondents feel that educational facilities in the mining villages are deplorable. Undoubtedly, the mining company provides some educational facilities to villages, but these are not adequate to improve students' academic status. So, it is imperative that the mining company must come forward and provide essential facilities like building schools, provision of infrastructures like playgrounds, equipment, computers, scholarships, and prizes for deserving students, and support adult education programs in the region. With regard to health services, though the mining company is providing medical services, their involvement in community health issues is reactive rather than pro-active. Therefore, mining companies must take bold steps like regularly providing mobile healthcare dispensaries to surrounding villages and the appointment of healthcare workers to improve the existing health situation of said villages.

To sum up, it can be said that mining has an overall adverse impact on the social capital of the local communities. It has been found that there is more preference for the nuclear family in the mining villages, yet mining households prefer large families more than non-mining households. Additionally, mining operations in the region have attracted people from other districts of the state and from other states for securing jobs or businesses related to mining activities. This movement has resulted in the inward-migration process in the mining villages. This inward-migration sometimes creates quarrels and conflicts among natives and outsiders and, as a result, disturbs the social harmony of the mining villages. Besides, mining villages have more unemployed persons than non-mining villages. In addition to the above chaos, those hired by the mining companies are employed as contractual labor.

Apart from the aforementioned, the present study shows that the mining company's acquisitions of land in mining villages tend to create social tension when the compensation is not paid or inadequately paid for the acquired land. The mining company has given compensation in either cash or jobs, or both, to those who have lost their land. However, a significant proportion of households have not yet received any compensation. This oversight is due to legal problems regarding land ownership, which has further created tension between households and the mining company. The study has also found that the rise of social stigmas, such as alcoholism, in mining villages has a negative impact on social capital, with the excessive consumption of alcohol being found more in mining villages than in non-mining villages. Drinking local liquor (popularly called *Handia)* is common among laborers in mining villages. The percentage of respondents in consuming excessive alcohol in mining villages is significantly more than in non-mining villages. The reason for such excessive consumption may be due to higher earnings from mining activities.

Mining operations are often seen as widening gender disparities within communities. The present study also found low work participation of women in mining villages. This lack of involvement of women was due to the high income earned by male members of the households from mining, and the women were made to look after the household affairs and the children. This disparity shows that women are in a disadvantaged position compared with men. Even participation in associations and groups is low, and connectedness and social networks have been weak among people in the mining regions. Finally, the mining companies' infrastructure development, educational and medical facilities under CSR policies are not satisfactory.

Conclusion

Mining, no doubt, plays a vital role in the growth of the mineral-rich regions, but the present study shows that mining has a negative impact on social capital. Mining communities were found to have more preference for both nuclear and large families; social tensions were high due to considerable unemployment and contractual labor, inward migration, non-payment of compensation for land acquisition, and a higher level of alcohol consumption; and low workforce participation of women, and less participation in associations and groups with weak connectedness and social network and unsatisfactory CSR policies. Thus, mining activities in the regions have led to the deterioration, rather than improving, the social capital of the areas.

Therefore, adequate measures should be taken by the mining company to improve the social capital of the local communities. Open dialogue among the stakeholders should preferably be used by the mining company to resolve the conflict and tension within the societies. In order to increase workforce participation among women, the mining company could initiate a vocational training center or orientation program for self-employment, especially among women. The government also owes the responsibility and should frame policies that will ensure sustainable development and the betterment of social capital in the local communities within the mineral-rich regions of Odisha, India.

Ethical standards

This study is a part of the author's Doctoral Research approved and awarded by Ravenshaw University (Ph.D./Economics-122/2016 dated 18 March 2016). All ethical codes of conduct were adhered to during this research process, including the informed consent process.

Acknowledgments

The author would like to especially thank her supervisors, Dr. Dharmabrata Mohapatra and Dr. Dukhabandhu Sahoo, for their guidance and suggestions throughout her research work.

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