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OCCUPATIONAL HAZARDS AND RISK IN MINING INDUSTRY OF ODISHA

KEY WORDS: Occupational risk, coal mining, health hazards, safety measures.

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ABSTRACT

The insight of "occupational risk" is usually elucidated as the panorama of occurrence of the outcome of threats in any operational situation. These are obvious either as some sort of enduring or impermanent health damages, or abridged bodily and psychological prospective. Coal mining has substantial security threat to its workers for it precarious surroundings and unsafe exercises. Against this backdrop the present study tries to unearth the occupational risks and safety measures along with the causes of accidents at the coal mines of Mahanadi Coal Fields Limited besides measuring its impact on the socio-economic condition of its working communities. The study has been conducted at the Ib valley coalfield region of MCL covering both the mine setting and adjacent four villages. In addition to thirty contractual mine workers (both male and female), identified through purposive sampling method, doctors, field officers, engineer, contractors, welfare officers, and trade union leaders are also interviewed for getting a deeper understanding. The findings of the study conclude in a proficient manner that coal mining activities not only put disadvantageous impact on its workers with its risky working environment but also impede the socio-economic structure of the mining communities.

INTRODUCTION

In the era of industrialization and market economy, "working community" always execute an imperative part. Hence the environment and stipulation in which these workers execute their everyday jobs are evenly significant to that of resources and organization to endorse "sustainable development". The perception of "occupational risk" is generally explained as the prospect of happening of the consequence of perils in the working environment. These are apparent either as any kind of permanent or temporary health deportation or damages, or reduced physical and mental potential. The acquaintance of risk and its estimation materialize from the Polish labour code and the International Labour Organization (1995). In its archetypal appearance, "risk" is articulated as an amalgamation of the prospect of the incidence of an incident and its impacts or penalty. Usually, the idiom may be construe as the hazards related to the performed profession. To be more specific, it can be explained as the vulnerabilities associated to a certain workplace or, in particular, correlated to the act of labour. The outline of execution of authorized needs correlated to occupational risk is explicit by the provisions of universal and industry-definite regulation, counting the obligation to maintain credentials of the job-related hazard, functional essential preventative method over and above the growth and updating the security and vigour manuscript for the workers of the industry.

Being an unsafe procedure, mining has substantial security threat to its workers. Precarious surroundings and unsafe exercises in mines frequently bring about numerical mishaps and always act as origins of injury and loss of human lives. Furthermore it smashes up the assets and disrupts crop manufacture. As it has been conferred in the earlier part of the writing, "risk evaluation" is a methodical process of recognizing and scrutinizing the vulnerabilities allied with a bustle and founding an echelon of peril for every risk. Due to the active risks of "mining as an action" and the intricacy of mining equipments and tools and the allied schemes, measures and techniques, it is not probable to be logically harmless. Irrespective of how able-bodied the equipment or process are premeditated, grave mishaps will always be the potentials. Laul et al. (2006) acknowledged risks (chemical, electrical, physical, and industrial) and impending originators those could escort to a calamity. It is not feasible for an exterior group to guarantee the protection of an establishment such as a mining business nor of the apparatus or scheme does it employ. The chief accountability for the security of any meticulous mine and the mode in which it functions depends on the execution of that mine. It is extensively established within industries in a universal sense that the diverse methods of hazard evaluation donate significantly toward enhancement in the security of multifaceted manoeuvres and tools. In numerous industries there is legislative obligation for hazard measurement to be assumed of all perilous kit, apparatus and procedure taking explanation of the actions used for function, preservation, management and administration.

The existing situation of industrial security and physical well-being in hard coal mining, and particularly the figures and markers distinguishing job-related calamities and ailments, are a basis for questing current schemes and apparatus that would guard the life and physical well-being of the workers much capably. Kecojevic and Radomsky (2004) did their research on the loader and truck security and found out that the potentialities and integer of mishaps concerning loader and trucks are elevated comparing to other procedures. They recognized that the lethal kinds and reasons of catastrophes and manage schemes are talked about and assessed to augment risk alertness.

However, despite of it perilous disposition, mining is taking place in tribal regions since time immemorial being an important and steady kind of natural resource utilization. If it can be viewed from the standpoint of the mining industry, their push is to vigorously accomplish their acts of domination devoid of containing least concentration en route for the primordial inhabitants of their land. Undoubtedly mining took a footstep forward to empower the "project affected commune" by affording situations to gain job openings, lessening poverty and setting up new and designed linking roads school buildings etc. Simultaneously, it also endangered the authority of the aboriginal communes (Mishra, 2012; Turton, 2009). Consequently the neighbouring resources such as land, water, livelihood etc. are bumping into diverse facades of alteration (Bury & Jeffrey, 2002). Thus it is arguable, what occurred with the native communities, are they the recipients or sufferers? By executing everlasting mining conducts, indisputably India is becoming rich in resource but simultaneously it has conveyed dislocation, customized their living and also mistreated the communal and financial life of the aboriginal communities (Velath, 2009). However

gradually mines are opened and occupied spoiling large tracts of lands. This ultimately affects the forest ecosystem impinging on the social systems of tribal communities. Unfortunately as the mines are located largely in the traditional habitats of the tribes, they have been exploited in the name of national interest. Habitually, opencast mines necessitate outsized quantity of land and due to its nature of removal; it fosters quite a few socio-economic and ecological risks (Singh, 2015). As a result of this quite often their habitats and homelands are fragmented, their cultures are disrupted and their communities got shattered. In addition to that, they have been converted from owners of the resources within well knit contented communities to individual wage earners with uncertain futures and threatened existence. Deplorably the pledge of recovery and reuse of land, suitable rehabilitation etc. remains in the pen and paper only. Concurrently, the welfare measures helping unswervingly to the governing fragments and others stay as victims devoid of sufficient demonstrations of these so called development activities (Hilson, 2002; Andrew, 2003).

In this post-independent era, occupational health and safety issues of tribal people are the major subject of concern for the researchers and policy makers as well due to continuous Industrial hazards. Kecojevic and Nor (2009) studied reports on equipment related fatal incidents and showed that underground mining equipment including continuous miners, shuttle cars, roof bolters, LHD s, longwall and hoisting contributed total of 69 fatalities. The study revealed the major hazards resulting in fatal incidents for continuous mining equipment, shuttle cars, roof bolters, LHD s and hoisting system were due to failure of victim to respect equipment working area, failure of mechanical component, working under unsupported roof, failure of management to provide safe working conditions, and failure of mechanical components.

There are serious environment concerns in case of Odisha and coal is a major contributor in that. Thus now it becomes a challenge for the coal industry is to reduce the emission of greenhouse gases along with making a contribution to the economy and energy security. Odisha, the most picturesque state in Eastern India, occupies a unique position in the tribal map of India having 62 scheduled tribal communities (as per 2011 census), unevenly distributed in forest and hilly areas. The tribal landscape presents a kaleidoscopic mosaic in Odisha with various ethnic, linguistic, cultural, religious, moral values, traditions, folklore styles, food habits, and genetic strands. They live in varied habitats, climatic conditions and ecological niches.

Against this backdrop, the present study tries to cover various dimensions such as: impact of coal mining on the socio-economic condition of the workers, occupational risks and safety measures, causes of accidents and compensation from MCL. The settings under which the workers execute their job have an immense impact on their common health, competence and efficiency. Their performance is affected by ecological predicament such as temperature, noise, ventilation, humidity, air quality in the working zone and ambient air quality etc. The unremitting exposure of the miners to such detrimental ambience leads to exhaustion and tedium eventually leading to the grave lethal mishaps.

Objectives

The objectives of the present study are:

- To understand the socio-economic dilemma of mining communities;
- To identify the risk factors and safety measures at mines and
- To explore and analyze the amount and type of compensation given to these workers for health hazards and accidents from MCL authority.

Area of Study

Ib valley coalfield is located at Jharsuguda and Sundargarh districts of Odisha. In 1900 it was discovered by Bengal Nagpur Railway when constructing a bridge through the Ib River. Amusingly it derived its name from the river Ib, a tributary of Mahanadi River. It has four operating areas i.e. Lakhanpur Area, IB valley Area, Orient Area and Basundhara-Garjanbahal Area. It comprises of 7 opencast and 5 underground mines. The first three areas are operating with five opencast mines at Jharsuguda district. The Basundhara-Garjanbahal area is having two opencast mines which operate at the Sundargarh district of Odisha. The Ib Valley Area is comprises of two opencast mines i.e. Lajkura Opencast project (LOCP) and Samaleswari Opencast project (SOCP). Lakhanpur area is operating through three opencast mines i.e. Belpahar Opencast Mines (BOCM), Lakhanpur Opencast Project (LKP-OCP) and Lilari Opencast Project (Lilari-OCP). The present study was conducted both in the mine setting and villages of the sample mine workers. These sample respondents are selected from four adjacent mining affected villages namely *Darlipali, Ubudu, Kudopalli and Ainlapali.* These are situated within the vicinity of 2-3 Km. from the Lajkura, Samaleswari and Lilari mine mine sites.

Methods Used:

The research design used in the current study is purely qualitative. Primary data have been collected from thirty sample respondents, working in the mines of Ib valley on contract basis and living in *Darlipali, Ubudu, Kudopalli and Ainlapali villages*. The samples are identified through purposive sampling method and composed of both male and female respondents. They are interviewed using an interview schedule for getting a deeper understanding of their socio-economic condition and different kinds of risks related to their hazardous occupation. To supplement and strengthen the information and especially gaining a better understanding about the risk and safety issues, doctors, field officers, engineer, contractors, welfare officers, and trade union leaders are interviewed as secondary respondents in the study. Their narrations are again cross-checked with the sample respondents. Secondary data is also collected from the official records of accidents and Annual Health Reports and other Health Reports from M.C.L central hospital situated at Brajrajnagar and four local dispensaries. Voices of the informants are also recorded.

RESULTS AND DISCUSSION

Mining and Socio-economic Aspects: An Overview

Despite of providing the showground for enhanced infrastructural progress and climb of pecuniary assets, coal mining is accountable for multiple socio-economic concerns. Perrry (1982) while researching on mining affected communises, found that besides holding accountable for feasible financial progress of a region, it falls short to convey parity amid the project affected communities (Perry, 1982). Regardless of conveying job openings and proving itself as a lucrative juncture for state and central level financial expansion, its regional impact is incredibly constrained in nature (Rolfe et al., 2007). Nevertheless, the mining companies are scattering the alertness amid the neighbouring communities concerning the short term profits and disregarding the dispersal of any consciousness concerning the off-putting upshots such as dislocation, relocation and pollution (Badera & Koco , 2014).The prologue of coal mining projects embrace several other socio-economic concerns like reduction of crop land, contamination of water bodies, and augmentation of landless farmers those utterly rely on land to uphold their living. But the extension of mining activities is not only relocating them from their key resources of income but concurrently compelling to turn out to be landless farmers (Hu et al., 2014). These circumstances force them to diverge from their own cultural legacies as they have emotional and cultural empathy with their native agricultural lands (Christison, 2003).

Nevertheless, a nominal expansion is being arranged in the financial facet of project affected folks. This can be rather mentioned in the outline of infrastructural growth such as roads, schools, clinics, boreholes and pipe water supply (Appiah & Buaben, 2012). However the neighbouring inhabitants articulate their discontent concerning the financial expansion often leading to consequences like strikes, road obstructions, and obliteration of company's possessions (Garvin, McGee, Smoyer-Tomic, & Aubynn, 2009). Even if the mining corporations are validating their CSR conducts, but exclusive of the existence of community relationships and development (CRD) functions, they are accomplishing only core businesses. However for the unbeaten execution of sustainable growth programme, the practical impartiality needs to be founded (Kemp & Owen, 2013).

The study focuses on five socio-economic aspects affected by coal mines:

- Impact on Rural Social Structure
- Impact on Rural Livelihood
- Impact on Agriculture
- Impact on Status of Women &
- Impact on Health

***Mining and Rural Social Structure*:** Mining often upsets strong cultural knots of the aboriginal neighbourhood and furthermore collapses their traditions and distinctiveness. Besides disturbing the socio-cultural setup, it has also ruined the conventional socio-political arrangements leading to the disorganisation of the commune and their sagacity of harmony. With loss of farm land they are deviating from their conventional prototype of employment (Garvin, McGee, Smoyer-Tomic, & Aubynn, 2009). The opencast mines under Ib valley region put its major impact on the family structure, marriage pattern, kinship relation, caste system, *Jajmani* system, power structure of *Darlipali, Ubudu, Kudopalli and Ainlapali village*. While conducting the present study, respondents of these mining affected villages frequently reported that before the introduction of mining the communities used to practise joint family system and carry out social cohesiveness till the loss of their agricultural and farmstead land. It was land which used to act as prime source of their subsistence and connected members beneath one roof. But unfortunately when these lands got acquired for mining the adjoining communities become jobless. This turn results in disparity, incongruity and sometimes even intra-personal family conflicts. Following its Resettlement and Rehabilitation Policy, MCL organize the stipulation of employment for the eldest son of each permitted family whilst leaving the others with no pledge of any way of income. As result of this, when someone happens to a job owner, instantaneously he commences living independently. So the other family affiliates either move to the near areas or carry on existing in the same village in separate home. One of these sample respondents narrated his own experience like this,

"We were happy in past days. We were together. Our land was holding our family under single roof. But gradually our land got ruined because of polluted air and water. When my elder brother got permanent job in mine he starts running his family separately. Today me and my wife also do same work but on contract basis. The profit we used to get from our own land is no more anywhere".

(Contractual worker in Samaleswari Mine, Male, Age 32 years)

In some cases it is also observed that despite of co-existing beneath single roof, family members uphold a reserved relation amid themselves. However, prior to mining the respondents from these mining affected villages reported that they used to sustain stability by exhibiting their keenness towards a joint living and it is their land that has stood as a mediator to maintain equilibrium flanked by the family members. Since the resource of living was principally cramped to the land and forest, which requires a communal endeavour to plough and collect, villagers were residing jointly in a family. Unfortunately this synchronization was altered to idiosyncratic outlook when MCL started obtaining land and afforded reimbursement in modes of employment in the mines to a solo member of every project-affected family. This consecutively gives rise to envy, abhorrence, antagonism, and often for instinctive servitudes. Mining gradually helped to penetrate various exterior aspects for example urbanization, loss of conventional resource of living, migration etc. in the mining affected villages which amplified the price of existence for its people. Furthermore it has conveyed definite alterations in the arrangement of family, hardly any affiliates are left at house to take concern of children. Owing to all these rationales, parents are no longer engrossed in having more number of children. While conducting fieldwork, the respondents continuously reported that, although formerly, elder component accustomed to settle on the size of the family, these days, as maximum people are dwelling in nuclear families, it is the individual parents who make a decision of it. However, with the rise of mining, maximum family structures have transformed from being jointly engorged family to nuclear ones. As a result of all these, nonexistence of other kin members like grandparents and the hectic timetable of parents make it complicated for their offspring to learn family values, ethics etc. Besides this these budding kids appoint themselves in diverse socially inhibited promiscuities. In this study nearly every women in the cluster are functioning in close by mines beneath the administration of contractors where several times they are sexually subjugated by the contractors only to uphold a constancy of their occupation. Occasionally with the intention of maintaining an economic equilibrium in their family outflow and to deal with the hastily mounting market price, huddles of women get on with prostitution. With the rise of mining Industry, family members in the studied village chiefly crave to work in mines and other associated conducts rather than to put their effort in agricultural fields. Subsequently, economic significance of family turned down in multiple ways. Whilst there is no land left for cultivation and any other associated conducts, family as a component of financial support falls down and gradually turn out to be a unit of consumption rather than production. Regrettably with the mounting market price, while obscurity is created in satisfying individual interests, the earning members of family gradually feel apathetic to feed their old parents. In a nutshell, the productive component which was accountable for providing all the fundamental facilities to its every member lost keenness in taking the liability of the consumption component who were not attached to any kind of financial earning. Furthermore with popularisation of nuclear family structure the significance of caste, class, religion etc. ejected to be meagre notions of a venerable society and devoid of all these mining affected communities are in a contest to amplify their financial benchmark rather than social quality.

Surprisingly with the prologue of existing industrialised civilization, functions of marriage have undergone a serious alteration even amid the rural populace. In the study situate, the young generation was observed as reasonably doubtful concerning the foundation of marriage. Even if they are not utterly contrasting it, still their outlook on its utility is fairly dissimilar from the senior affiliates of their own families. Young people in these mining affected areas are more supportive for marriage-by-preference rather than marriage-by-negotiation. The narration of one young sample respondent supports this observation.

"We are three brothers and two sister altogether. I am youngest among them. Since last year only I started working in Lilari mine. I am only nineteen and everyone in my family now asking me to get married. But I am not ready for this. Even if in future days I

will be ready for this I will try to choose my bride at my own. I don't want to be like brothers in this matter."

(Contractual Worker in Lilari Mine, Male, Age 19 years).

The collapse of joint family system has diminished the significance of family chief and currently every person is a discrete unit to utilize his/her wishes. Moreover cultural diffusion somehow helped the local population particularly the younger generation to espouse the culture of outsiders. With the increase of individuality, nuclear family, money-orientated attitude, the households are hardly sticking to caste endogamy. Fascinatingly in these mining-affected arenas pervasiveness of dowry system is an admired subject. The persons who somehow managed to obtain a job along with the recompense package stipulate high dowries. What is more, the parents of the bride willingly proffer high dowry to compensate for protecting their daughter's upcoming days economically. Occasionally jobless persons inured to get involved in the exercise of demanding dowry frequently at petite gap finding it a resource to dig up cash. The antagonism for accomplishing an enhanced class has broken the age-old custom of caste system in these mining affected villages. Similarly, the caste based professions are not in practise at all. Formerly the *Brahmins* had the mere right to educate but currently even the scheduled caste and scheduled tribe people are functioning as educators in the *Anganwadi* centres and in the schools. Moreover the custom of taking '*pakka*' and '*kachcha*' food has also lost its sense. Throughout the study it was pragmatic that the higher caste populace too, attend social functions of lower castes and consume the similar food along with other people. In some way, the notion and exercise of untouchability, has completely departed. Astoundingly influx of mining fades away the traditional *Jajmani* system. The onset of type i.e. "land", "cow", "grain" etc. as a method of imbursement has been substituted by hard cash. The populace of studied villages in Ib valley previously celebrate "community level festivals" and "household level festivals".

The admired community level festivals were *Nuakhai, Pausha Purnima, Gokulastami Jatra, Rasa Purnima, Naam Yangya and Ranjta Festival those* have both historical and mythological base. But the intrusion of coal mining in this region has ruined the established cultural practises. Since maximum villagers got displaced they lost their social harmonization to arrange those festivals. Similarly these inhabitants used to do several domestic level festivals like *Savitri Brata, Bhai Jiuntia, Lakshmi puja* etc. But surprisingly despite the imposition of mining activities these household level festivals are still in practice.

Mining and Rural Livelihood: The prologue of coal mining ventures hold several other socio-economic matters like diminution of harvest land, contamination of water bodies, augmentation of landless cultivators etc. The rural population are exclusively reliant on land to maintain their living. But the extension of mining conducts is not merely relocating them from their chief resources of income but concurrently compelling them to turn out to be landless cultivators (Hu et al., 2014). Such circumstances compel them to depart from their personal cultural legacy as they contain emotional and cultural resemblance with their indigenous farming lands (Christison, 2003). Nevertheless, a nominal growth is happening in the financial facet of project affected persons. This can be mentioned in the shape of infrastructural expansion like schools, health clinics, road and rail network, and pipe water supply (Appiah & Buaben, 2012). Nevertheless the neighbouring inhabitants articulate their displeasure concerning the financial growth and express through road blocks, strikes and annihilation of company's possessions (Garvin, McGee, Smoyer-Tomic, & Aubynn, 2009). Astoundingly although the mining industries are mitigating their CSR conducts, but devoid of the existence of community relations and development (CRD) functions, they are accomplishing only 'core business'. However for the booming execution of sustainable growth agenda, efficient impartiality needs to be established (Kemp & Owen, 2013).

In the studied villages adjacent to Ib valley coalfield, the key foundation of living is mining. Since the extension of mining divisions had been taken away the productive farming lands already, the neighbourhood population are utterly depending on the mining conducts to maintain their living. Although farming was being practised much prior to the instigation of mining, it has lost its connotation in the apparent mining epoch. Even though it is a gainful monetary bustle still it is deficient in the pledge of absolute professional folder. Nevertheless, it is usual to state that the profit producing resources are the essential pyramid to create sustainable livings. But while a solitary resource of income falls short to deal with the requirements of home, the immediate requirement of various foundations of employment develops. The mining affected villages are striving to maintain dairy and other associated conducts as supportive foundation of living. Although these activities are practised by the villagers much prior to the mining period, they are gradually losing their implication by the ratification of this mining giant. Consequently a modification in the structure of continuing a living is pragmatic in case of mining affected villages. During fieldwork, it was reported that approximately 25% percent people from each village are occupied as untrained non-farm wage labourers who were notionally considered as agricultural labourers in pre-mining period. Nonetheless, maximum agricultural lands were grabbed by MCL already and the remaining ones are filled with coal dusts and waste elements which generates an unsure atmosphere for cultivation.

Women in the rural pockets of India are considered as the most helpless fragment of society who doesn't have the benefit of the identical position usually possessed by their male counterparts. In the current study previous to mining the location of women was merely limited to domestic activity amid which the most imperative was to nourish their family affiliates and to care for their children. Still they used to employ a quantity of precious time for the gathering of Minor Forest Products like firewood, timber, *chara, kendu* leaves, cereals, fibres etc which they used to put up for sale in the close by weekly market after satisfying the necessities of their individual domicile. This was the mere basis of earnings for these women individuals. But regrettably mining has troubled this activity exclusively. As it has been discussed in the earlier segment, the rural livelihood of Ib valley was chiefly agro-based and used to demand mutually man and woman to put their labour collectively. Previously women folks of SC and ST cluster were predominantly slot in seasonal farming deeds. But mining has shattered such conduct and due to this woman community are currently operating in the non-farm segments. Subsequent to a day-long hard work while male workforce are attaining 150 rupees, female labourers are receiving 120 rupees barely which specifies the age-old discrepancy by means of which women individuals are fighting. A major chunk of women of *Darlipali, Ubudu, Kudopalli and Ainlapali* villages are making *beedi* and receiving a few rupees out of this. By preparing *beedi* they are earning 500-600 rupees per month. Besides women community of lower caste groups, it is practiced by the females of upper castes too.

Mining and Agriculture: As it was conversed in the earlier segment, inhabitants of *Darlipali, Ubudu, Kudopalli and Ainlapali village* are highly affected by coal mining activities. According to the people residing there, agriculture was practised till the introduction of mining projects. But the establishment as well as expansion of opencast mining projects restricted them to continue the same. Hence, the mining affected crowd is barely depending on any kind of agricultural productivity. Agriculture is the central source of sustenance for the rural people of Odisha and Ib valley region is not beyond that. Unfortunately in this coalfield area the principal reason at the back of the non-performance and

deterioration of cultivation is the appearance of coal mining businesses. As it was articulated in the previous segment, MCL is dispersing its chains and the requirement for land is flagging the neighbouring populace from any category of farming exercise. However an incredibly inconsequential division of rural populace is still carrying out cultivation as their minor basis of livings. Although the inhabitants of Jharsuguda district practise both Rabi and Kharif crops, owing to a rain fed region, most of the occupants of the Ib valley coalfield practise only Kharif crops. However, the respondents from the sample villages reported that it begins with the influx of monsoon season and come to an end during the middle of winter season. Ironically, it was observed that amongst these four mining affected villages, though the inhabitants of only two villages were continuing agriculture regrettably none of them emerges keen concerning farming. However, MCL has already snatched away maximum of the cultivable lands and in response a number of the land holding families have already got their recompenses. Apart from *Ainlapali* village, the other ones have lost their farming land either partially or completely. Although the mentioned village is merely 3 kilometres away from Samaleswari OCP, still MCL did acquire a solitary scrap of land. Undoubtedly the land holding families are carrying out agriculture but because of the dust generated through mining they fall short to plough the complete land. Being a road side village some of its cultivable domains are situated close to the roads. Subsequently the usual movement of coal burdened trucks are the unremitting reasons for the discharge of coal dusts that consecutively making it unfeasible to foster any agricultural action. With the augmentation of the production of coal MCL is obtaining land growingly and the rural folks are departing behind their agricultural lands. Hence the illustration of farming exercise has hindered at some point in post mining period. Repercussions of mining are not only obstructing them from crop production but also departing them to farm the total land they own. While the cropping prototype is putrefying, it is approximately unfeasible to envisage diversified crop that is viewed as one of the chief imperative standards for financial expansion (Bharati, De and Pal, 2015). Anyhow, dilapidation of farming land, contamination of toxic elements in land and water bodies, discharge of dust and smoke, elevated price of labour and the vagueness of rainwater are the reasons following the non-practice of agriculture. In a nutshell even with some optimistic insinuations lying on a few facets of living, mining has probable unconstructive effects on cultivation.

Mining and Status of Women: Interestingly in these mining affected villages the significance and situation of women is moderately altered. With the growth of market economy women folk are availing monetary engagement in the nearby mines. Usually the SC and ST women are going out of the house and involving themselves in some mining related activities. When asked about their wage rate they revealed that they are received Rupees 120 per day while male members got Rupees 150 per day. So it is debatable that why a female labour is getting relatively lower amount in comparison to their male counterparts in spite of putting same effort and equal working hours? In fact the age-old practice of patriarchal superiority still holds its root even in the much developed industrialised economy. A cluster of working women articulated that by becoming independent they were not only able to contribute in the family income but they also developed self-esteem among themselves. But the non-working bunch mentioned that the patriarchal pattern, jealousy and superstition of male counter parts were the factors which restricted them to involve themselves in certain economic activities. In the mining affected villages a majority of women communities were involved in *Bidi* making process. For one thousand *Bidi* they were earning 50-60 rupees and by practising this they could earn 600-700 rupees in a month. In addition, they were also making their presence felt in the local political bodies and educational institutions. Though the women folk in the mining affected villages are economically empowered to a certain extent, they are still not free from the issues like domestic violence, human trafficking and involuntary servitudes. Furthermore, at work place they faced mental and physical exploitation by contractors and fellow workers.

Mining and Health: The prologue of mining has not merely augmented the incidences of diseases in mining affected locales but in addition amplified the cost of health and sickness. Regardless of working and non-working communes, maximum people in the studied villages are affected by different kinds of diseases. Based on the perception of the villagers and researchers' observation, the causes behind these health troubles are identified. Owing to unremitting mining activities coal allied squanders and sludge is frequently infused in the adjacent water bodies and makes it unhealthy for household use. Even occasionally it has contaminated the ground water levels. Due to not having much water resources, the villagers have no alternatives than using it which often results into fatal diseases. For women, on account of containing direct contact with these contaminated water resources for accomplishing domestic conducts like washing clothes, bathing children and collecting water, this has resulted in evident skin irritation, chocking in respiratory tract, nasal ulcers, pneumonia etc. Furthermore, emission of loud noise during mining related activities has upset the lives of neighbourhood communities. Withdrawal from the complete access to forest and agriculture has conveyed an immense loss in their quality of life by depreciating their health and nutrition. The variety of crops which were cultivated by the villagers previously over and above the forest stuffs such as roots, fruits, and traditional herbs used to supply balanced nourishment to them. But in the present-day, such access to forests, nutrition and fruits has been choked-up totally. Villagers who inhabits near coal mines are the awfully affected. Nonstop inhalation of air pollutants has given rise to asthma attacks, respiratory disease and changes in their lung function. Following the hospital and household survey data, asthma, infections, malaria and tuberculosis are the mostly rampant diseases in this belt. From the narrations of the villagers and local health care givers, the frequency of diseases like tuberculosis, cough and cold, malaria, skin diseases, diarrhoea, joints pain, arthritis, gastro-intestinal infection, eye-allergy and high BP like have increased in diverse ways. Lamentably the health policy of MCL is not observed as a strong one because of its non-coverage to the contractual employees. Surprisingly they do not have liberated access to medicine though are evenly affected. Moreover, other than organizing irregular health camps, MCL is not taking much initiative to supply better health services to all the villagers in these mining affected villages.

Risk Assessment and Safety measures at Coal Mines:

Risk evaluation is the procedure that helps to verify the probability that people might be vulnerable to a damage, ill health or ailment in the place of work. It crops up from one condition recognized at the time of danger detection procedure before contemplation or execution of control process. Risk takes place while an individual is exposed to a perilous condition. It is the probability that such contact to a risk will escort to a wound or a health concern. In a nutshell this is an evaluation of the prospect and probable harshness of damage or loss. Nor et al. (2008) calculated risk associated with loaders and dozers and after that measured and graded them. From the analysis he found that, the dangers "failure to follow sufficient protection process" and "failure of motorized / electrical/ hydraulic machinery" were the maximum harsh and recurrent perils for the loaders and they comes under the category of elevated risk. On the other side, Dziubinski et al. (2006) measured fundamental causes for the failure of pipeline and its credible penalties considering individual and societal risk and anticipated methods of risk appraisal for

dangers linked with dangerous substance transport in long pipelines. Considering that method as instance, succeeding phases of risk examination were measured paying particular concentration to the useful methods and computation forms. A particular attribute of this method was an amalgamation of qualitative and quantitative procedure which proffers a likelihood of a complete risk evaluation for long pipelines.

A "Hazard Identification and Risk Analysis" or in short HIRA is a methodical technique to recognize and examine dangers and settle on their extent, effect and the susceptibility of the constructed atmosphere to those risks. Saying more clearly, its intention is to make certain that there is a prescribed procedure for risk detection, danger evaluation and direction to efficiently administer dangers that might happen inside the workstations. Orsulak et al. (2010) offered a submission of a hazard evaluation approach concerning the dangers allied with security infringement in underground bituminous mines at Pennsylvania with the use of Mine Safety and Health Administration (MSHA) reference record. In this research quantitative danger evaluation is executed, which authorized the measurement of the incidence of occasion of security infringement (through allied credentials) over and above the penalties of them in terms of consequence appraisals.

Evaluation or assessment of risk is executed in sequence of allied conducts those construct a depiction of the vulnerabilities and hazards which elucidates catastrophic actions. While conducting fieldwork in the sample coal mines of IB valley, the mine engineers and officials concurrently reported the subsequent terminologies caught up in risk detection and hazard examination:

Damage: It denotes any kind of bodily damage or injury to the physical condition of individuals either in a straight way or circuitously as a consequence of harm to belongings or to the atmosphere.

Hazard: It is a condition that pretences a stratum of peril to life, physical condition, possessions or atmosphere. Maximum dangers are latent with merely a hypothetical hazard of damage. Anyhow one time a danger turn out to be vigorous it is competent to generate disaster circumstances.

***Hazardous Circumstance*:** It indicates a condition where an individual is exposed to a danger.

***Hazardous Occurrence*:** It is nothing but a perilous condition which produces damage.

Accident: It is a precise, unrecognizable, unanticipated, strange and unintentional perpetual act that happens in a meticulous instance and situate with no obvious and premeditated grounds but with obvious consequence.

Risk: It apprehends the departure of one or more consequences of one or more potential incidents from their accepted significance.

Tolerable Risk: It is that kind of risk which is conventional in a known situation depending on the existing standards of society.

***Defensive Measure*:** It is the amalgamation of danger lessening schemes occupied to attain at least the reasonable risk. It comprises risk diminution by intrinsic security, defensive strategies, and individual defensive apparatus, information for exercise and fixing and guidance.

Severity: It is utilized for the extent of something unwanted.

As it has been discussed that analysis of risk is methodical exercise of obtainable information to settle on how frequently particular proceedings may crop up and the degree of their probable penalties. It's assessment helps to decide risk management precedence by estimating and evaluating the echelon of risk aligned with prearranged values, target risk intensities or other measures. Some suitable alternatives can be opted for dealing with risks. The engineers in the studied mines employ three types of hazard identification and risk assessments:

- Baseline hazard identification and risk analysis
- Issue-based hazard identification risk analysis
- Continuous hazard identification and risk analysis.

These are all inter-related and outline an essential fraction of a management system.

Furthermore they have added that maximum identified risks are related to:

1. Explosion in mines (Flying rocks while blasting or hanging of unsupported rock mass on the working face of the mine. Generally it happens if blasting is not done by an authorised person)
2. Admission of new workers
3. Release of dust
4. Loading in coal faces & OB (Poor supervision at loading)
5. Disburse loaders procedure at stock yard (Accident due to movement of pay loaders)
6. Apply of HEMM
7. Discarding region of coal and OB
8. Deluge (Sudden inrush of river water)
9. Absence of footpath for the movement of trucks and tippers
10. Overcrowding of vehicles &
11. Conflict with the code of work practice. (strikes)

Apart from all these, dust(silica), chemicals (petrol, diesel, oils, degreasers, solvents) and hazardous substances (Chemical fumes such as from welding/ cutting, grinding etc or Gases such as H^2S, CO, CO^2 emitted during mining concurrently effect the workers every day. Furthermore during inspection mishaps like contact with electricity during high voltage installation, electrical energy emissions from equipments like cables, transformers, switch gear, connections, occur to workers most often. Other than this, explosives lead to major accidents especially during fly rock occurrences. It also originates noise and vibrations for the neighbouring communes. While mine road design and construction fall and dislodgement of earth and rock, falling of high wall / pit wall / stockpiles, volatility of the dig and adjacent construction, fall of things such as tools, structures , objects on people initiate accidents for workers every year. Apart from these, mishandlings of equipments such as earth moving machinery (trucks, loaders, dozers, etc.), rail, winders, e-equipment such as drills, shovels, excavator, loss of control of a vehicle or other machinery at the mine, unintentional fire or explosion also make the workers vulnerable to occupational risks every day. Furthermore, unusual rain event, water intrusion in mine (directly or indirectly), road drainage, flow failure of pumping system like outlet blockage) generate severe troubles for them. Risk or hazards are also crafted every year by the working environment like noise, manual handling of hazards, wildlife such as snakes, spiders, insects, biological, such as exposure to work related diseases, vibration, lack of ventilation and insufficient hygiene facilities.

Regrettably, when these facts are again cross-checked with the narrations of workers, it seemed to be a half-told truth and almost showed their existence in only pen and paper. Voice of a senior contractual labour, can support this argument undeniably.

"We workers are not safe at all. Every day when we come to work there we don't have any guaranty of our job and life. We are not even in a position to argue with our supervisors and contractors. In rare cases we are allowed to talk to the officers and engineers.

Though they are telling you, they are taking care of our safeties; it is only in pen and paper."
(Contractual Worker in *Lilari* Mine, Male, Age 42 years)

The above narration clearly reveals how these workers find them unsafe in this perilous mining situation and such vulnerability amplifies when their voices get unheard.

Accidents in Mines & Compensation from M.C.L Authority:

***Accidents*:** Mining is undoubtedly a death-defying process which contains substantial ecological, wellbeing and security hazards to miners. Insecure settings in mines bring about several mishaps and grounds loss and damage to human lives, harm to property, disruption in production etc. While executing fieldwork, the officers, engineers and labours of Ib valley coal mines well-versed about diverse risks in surface and underground mines and statistics of accidents in their mines. As per them, every year maximum accidents (around 80-90%) ensue in their work zone while surveying, clearance, laying out, drilling, at the time of dealing with explosives, face instability, loading, transporting and processing of minerals. Generally mishaps take place due to fall from heights or get thrown from overturning vehicles while accomplishing the job of surveying. Besides this calamities also take place during the time of clearance, while getting struck by falling tree and debris from demolition building. As per the, engineers, it can be avoided either by using trained operator, using power saw or other equipment employed for removal of top soil or by wearing full personal protection by operator. Accidents also crop up during the operation of laying out. Construction of building or roadways, overhead electricity lines, falling while working at height, individual struck by moving vehicle or plant moving out of control can lead to severe mishaps more often. During the drilling operation, falling from the edge of a bench, inhalation of dust, noise or entrapment of being struck by a moving and revolving part of the drill equipment habitually also turns into brutal misfortunes. Furthermore while dealing with explosives, poorly designed shots often result in early ignition and flying rock. Falling or sliding of heavy rock makes the worker vulnerable to any kind of hardship as well. While accomplishing the loading operation, rock falling on the driver, plant toppling over due to uneven ground, failure of hydraulic system, fires, fall while gaining access to operating cabin, electrocution in draglines and failure of wire ropes in draglines too generate hazardous situations for the workforce time and again. Above and beyond these, while transporting, brake failure, lack of all-around visibility from driver position, vehicle movements particularly while reversing, rollover, vibrations, generated noise and dust lack of maintenance make the workers susceptible to unsafe life. Last but not the least, while processing of minerals like crushing, grinding and screening varied exposures to physical plights are encountered by them such as blockages, high noise, dust, vibrations, entrapment in confined spaces, contact with chemical additives, vibration and sudden fall from height during maintenance. Apart from predicaments in opencast mining, workers also encounter several kinds of hazards in underground mining. Engineers along with the sample workers while being interviewed narrated about those catastrophes which crop up during falling of roof and sides, collapse of pillar, air blast , rock burst and bumps, runaway of tubs due to breakage of rope, failure of attachment to rope, failure of couplings and drawbars, non functionality of safety devices., travelling along haulage roadway, uncontrolled movement of tubs, derailment of tubs, poor construction of curves , electric shock and/or burn, ignition of firedamp or coal dust, fire arising from electric defects and inundation.

Compensations: Workers' compensation system or WCS was actually created to offer imbursement for medical care and healing services for labours who encounter work-related injuries and impairments. It also provides income maintenance for the injured workers and their dependants during the period of disability. Such compensation ensures the lives of the workers by creating a social security system. Besides whenever an accident at work or work-related illness occurs, specialised healthcare is provided to minimise the physical consequences of the accident. Therefore while sustaining an injury or contracting a disease while working in coal mines as a as a result of the dirty and dusty environment, the workers are found to be entitled to receive compensation from the organization they are working for.

Deplorably MCL does not afford any sort of reimbursement or compensation to its contractual labourers as they do not come under the direct employment policies. They only endow such benefit only with their direct employees who regularly draw salary from them. For these recruits same nature and amount of compensations are given to both tribal and non-tribal employers among which the coal mine workers are also included. The coal mine labourers who come directly under the employment of MCL though very small in number are provided with benefits both in case of death and partial disability. In case of death on duty, social security is provided in the form of employment to the spouse and dependent children above 18 years depending on the level of competency. If the family members of the dead mine worker are not interested in employment in lieu of that company provides monetary benefits. According to Benevolent Fund Scheme 2,5000/- is immediately handed over the spouse or next dependent for funeral ceremony and under Life Cover Scheme 60,000/- is handed over to the nominee. In case of partial disability the Apex Medical Board of Mahanadi Coal Field will certify the affected labour whether he is fit or unfit for the job. If found unfit, the rules of death compensation will be applicable for his family and if fit the Apex Medical Board again will decide the particular amount of compensation which is already predefined under the rules of compensation structure. Astoundingly, for the contractual workers working under the contractors of MCL, the scenario is completely reverse. Leave aside compensation; they even don't get their daily wages regularly. As per the welfare officers and trade union leaders because of the prevalence of time-wage system of payments among them workers are paid according to the time for which they are working which is usually 8 hours per day or sometime even more than that. Since the wage rate is fixed for specific unit of time irrespective of the amount of work done by the employee under this system, the contractual labourers often get exploited by this. In spite of working for even more than 8 hours they get deprived of their proper recompense. According to these labourers, contractors always take the advantages of their lack of education and immense poverty and denied them from their right. One of them recounted about such denial like this:

"We are tribal people. We are uneducated. So we are poor. Who will listen to us? Company does not think of us as their people and so never give us our right. Contractors exploit us whenever they want and there is no one to stop them. Forget about compensation, we never get our proper wage".

(Contractual Worker of Lilari Coal Mine)

Thus the above narration unearths the level of abuse on the part of the contractors and frustration on the part of the tribal labourers. Because of the presence of middle man, they always feel difficult to get any type of facility from MCL.

Furthermore some of them also added about those instances when jobs were snatched from them by these contractors due to their inefficiency of work for injury or illness. According to some of the mining engineers and supervisors, these contractors often take the advantages of the alcoholism of the tribal people and often fool them by giving only little amount of money to buy alcohol and in place of proper wage. In addition to this, they over and over again left without proper leave needed for their treatment when get affected by severe occupational diseases or mine accidents.

Final Remarks

Coal, the major non-renewable natural resource, always affords satisfactory atmosphere for India's economic expansion and personifies its affluence as a whole. Besides escalating mining operations, it has engendered job openings, set up new infrastructures, and kicked off battle against poverty. But the speedy mining conducts have however lessened down the efficacy and usefulness of natural resources. In addition to the pertaining literatures the present study also tries to echo how the utilization of coal through opencast and underground mines is accountable for diverse socio-economic issues, demur in agricultural productivity, occupational risks and detrimental accidents.

While analysing the study in a proficient manner that coal mining activities not only put disadvantageous impact on its workers with its risky working environment but also impedes the socio-economic structure of the mining communities. Besides amplifying diverse employment and business opportunities brings absolute negative impact on social structure, livelihood, agriculture and heath aspect of the residents of Ib valley. The initial finding of the study revolves around socio-economic issues of the mining communities. However, it is observed that, in the four mining affected villages the structure of family system remains chiefly nuclear, functions of family have been altered due to the busy schedule of parents, absence of senior household members, increased cost of living and development of self-centric attitude. Besides these, marriage by choice has become a popular concept rather than marriage by arrangement, the concepts of caste endogamy is getting dismantled and clan exogamy is losing its importance. The glory of case system has been dimmed due to declining relevance of agro-centric economy and the secularist service of the *jajamani* relation is completely disappeared though the ritual aspect is present in case of few households. Even though some of the rituals and festivals are in practice, the mode of celebration changed in post-mining era. Agriculture is mostly replaced by non-farm activities and and mining activities has disturbed the livelihood pattern. The primary cause behind the non-practise and weakening of agriculture is the emergence of coal mining industries and the other associated reasons are: scarcity of water and agricultural labourer, use of more inputs, loss of production, pollution etc. Whilst mining has supplied the possibility for economic up-liftmen, it is also held accountable for diverse health concerns. Together with enhanced infrastructure, it has paradoxically produced advantageous stipulation for polluted air, water and noise. Regrettably though the proviso of medical support is obtainable, it is merely limited to the labour force of MCL.

The study also concentrates on the credible risks and safety measures for the workers at the studied coal mines. It explores how mining activity engages varied sort of risks for the daily labourers due to its very nature of the operation, intricacy of the schemes, procedures and techniques. Besides depicting the actual situation of the applicability of safety measures, it identifies the hazard mechanisms by which undesirable event could occur in a mine and estimate its degree, range and probability of damaging effects. In a nutshell it helps to bring a conjecture that hazard detection and risk analysis should be carried for identification of undesirable events that can leads to vulnerability for those people who consider mines as their prime source of livelihood.

The study finally portrays the causes of accidents in the studied mines and how the workers get recompensed for this. While working in an insecure site the workers often encounter several mishaps those leads to and grounds loss and damage to their lives. The opening portion of this finding mainly strives to categorize diverse breeds of catastrophes, crop up during mining operations and strengthen the insight that the probabilities of occupational risks are quite high in the coal mines and workers vulnerable to fatality. Subsequent to this, the next section concentrates on the reimbursement or compensation policies of MCL and exposes how the mode of payment varies with the categories of workers. Hence Coal mining in India is at a very critical juncture and there is no doubt that safety has taken a back seat for the workers and neighbouring communities. Despite of substantial influence on the global economy it progressively involves itself with widespread social, economic, environmental and ecological complications.

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