

Socio-psychological dimension of sustainable coal mining: a conceptual model

Coal is the prime source of energy in India and is abundantly available. Sustainable coal mining is very important for energy security of the country. Community participation is one of the important factor which is essential for sustainable development of coal sector. Sustainability of the sector requires conservation of coal, best mining practices, protecting environment and inclusive growth of the community and stakeholders. Land and local community are important input to coal mining sector. Economic, social and environmental consideration are addressed while implementing various projects and taking approvals, however, psychological dimension of local community has not been addressed while resettlement and rehabilitation strategies are chalked out. In this paper, an attempt has been made to develop a conceptual model to understand psychological needs of the society, relationship of perception of society in generating positive psychological climate which will lead to community participation towards sustainable mining. Some attributes have also been identified and its presence in the community is expected to play an important role in converting positive psychological climate towards sustainability.

Keywords: Sustainability, coal mining, socio-psychological climate, model.

1.0 Introduction

Coal is prime source of energy in India. Sustainability in coal sector plays an important role in energy security of the country. Coal being input for various industries, its mining is quite beneficial to economy. However, it has an adverse impact on environmental and eventually negative health impacts. Sustainable development of coal sector can be achieved when proper attention to the economic, environmental and social dimensions. In practice, economic considerations are given higher importance to the environmental and social considerations in developing countries including India. Government of India has taken various measures to ensure environmental impact assessment

(EIA) to be conducted in the proposed area along with preparation of Environmental Management Plan (EMP) while granting environmental clearance to any coal mining project. As per EIA Notification, 2006, environmental impacts usually include environmental impacts due to various factors such as project location, project design, construction, method of work and rehabilitation when the project is complete. These also include actions taken to minimise adverse impacts, irreversible and irretrievable commitments of environmental components, assessment of significance of etc. The environmental attributes covered for assessment of environmental impacts are:

- (a) ambient air quality
- (b) water regime and water quality
- (c) ambient noise level
- (d) soil quality
- (e) land use pattern
- (f) existing flora and fauna
- (g) socio-economic profile of the area

Economic considerations are the primary reasons for taking up coal mining projects and the same is addressed while preparing pre-feasibility report and project reports to ensure a profitable business. Further, social and environmental impacts are assessed through suitable management plan i.e. EMP and the same is placed in public hearing to get it vetted for analyzing social impact. However, psychological dimensions are being ignored while dealing with impact. In various studies, it has been found that psychological antecedents which are positive in nature like emotions, capacities, virtues and strengths and positive psychological consequences plays an important role in the sustainable behaviours of local community.

2.0 Research gap

Coal as an energy mineral has always been considered as dirty fuel and efforts have been made to make the process of mining and use of coal environment friendly. The inherent problems for such transition of energy sectors can be seen in countries where the coal mining plays an important role in the economy and society. For a successful transition public

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support is very important. ¹Studies have shown that those who believe coal mining as necessary and cost-effective, tries to minimize both its negative environmental impacts as well as its safety hazards both to individual as well as community.

Coal mining has long been perceived to be associated with environmental and social harm for poor communities in developing countries like India. There has been serious criticism on the coal mining operations and use of coal being unfriendly to environment and local community and as such there are extreme reactions from the people since it not only displaces them but degrades the environment. In India, coal is a prime source of energy and as such has stimulated many mining companies to extract the natural resources. The growth of sector depends on enormous acres of land to extract coal from opencast mines and project is started with an assurance to community to get a healthier income-earning atmosphere. It also promises better infrastructural developments like well-connected roads, electricity, health care facilities etc. However, the growth of mining industry in a sustainable manner can be achieved only by ensuring better lifestyle to project affected communities in terms of economic and social development. Coal mining also results in loss of agricultural income, reduction of natural capital, pollution and ill health which are becoming a global concern worldwide and this needs to be taken care for sustainable development.

Though social and economic consideration is taken care of in the mining projects during various approval processes, no study has been made to understand the overall impact of the perception of the local community towards coal mining projects. The perception of community may be in the form of collective cognition, the support and justice one can derive from the company, the fair labour practices and collective commitment of the community towards coal mining sector in particular. There is a need to understand as to what are the behavioural factors influencing the adoption of external changes of residents of mining effected area.

3.0 Rationality of study

Coal mining contributes significantly towards economic development of the country. Coal is a major energy source in India and accounts for about 55% of energy requirement of the country. With huge estimated resource, coal is expected to be the main stay for the next two decades. Most of the local people are affected by opencast mining with dust and other health related problems (Al Jazeera Report, 2017). Though mining is important to economy, it has negative environmental impacts which further lead to negative health impacts. Most of the studies on coal mining have covered chiefly the economic and environmental aspects. Studies are lacking which can describe the social-psychological and socio-economic factors. This study is aimed at developing in-depth socio-economic as well as behavioural factors to explore and examine the adverse impact with a view to devise mitigating course of actions for the sustainable growth

Jharkhand would be a suitable locale for study because it is one of the poorest states in India with a large tribal population. Even being a mineral rich state, it has little progressed in the last decade.

4.0 Literature review

4.1 MINING SECTOR: AN OVERVIEW

India is rich in mineral resources and there are about 90 mineral commodities including four fuel minerals, 10 metallic, 50 non-metallic, three atomic and 23 minor minerals that are produced in the country. These minerals also include energy minerals including coal. It is estimated that there are about 4,000 to 5,000 mines which are operating throughout the country and the majority of the mines are opencast mines. Many small opencast mines use manual mining methods and the annual production from these mines are quite low. Further, there are approximately 500 underground mines and most of them are small with non-mechanized operations. Major minerals produced are bauxite, chromite, copper, lead/zinc, hematite/magnetite, manganese, limestone, etc. India is second largest producer of chromites, barites and talc and is ranked third in coal and lignite production. India is 4th in production of iron ore (MOM, 2015). Jharkhand has the highest deposit in india in terms of various minerals including energy minerals.

Coal is predominantly helpful in power generation, cement manufacturing, coal gasification and iron making through DRI route. Coking coal is essential for the production of steel, merchant coke manufacturing and other metallurgical industries, whereas non-coking coal needed glass, ceramics, paper, chemical and brick manufacturing and other heating purposes. Indian coal is of high ash and the coking coal is also having weak caking property as such most of the coking coal in India is imported. The coking coal available in India is mostly washed before being used for coke making. about 80% of coal is being used in power sector and about 250 MT coal is imported to meet the domestic demand and to balance the demand supply gap in India.

4.2 MINING, MINE CLOSURE, REHABILITATION, RESETTLEMENT POLICIES

Mining is a scientific process that starts from exploration for search of mineral, project planning for establishing the economic and technical viability of project. the process of start of mining operation further require an effective mine closure plan, preparation of environment management plan after conducting environmental impact assessment and also conducting public hearing to take care of social impact and impact to population nearby.

Ministry of coal has brought guidelines in 2009 and 2013 with regard to mine closure wherein mandatory provisions have been made for opening of escrow account by mine operator as a commitment to complete concurrent and final mine closure operations which are mainly aimed at land

degradation and keeping the land profile similar to pre-mining profile.

Coal companies have adopted their own rehabilitation and resettlement policies and some companies provide employment in lieu of their land. Specific provisions have been made for diversion of forest land for non-forest person and special provisions have been made for the population dependent on proceeds from forest by seeking NoC from gram sabha under Forest Right Act.

The above is just to ensure that the negative impacts of coal mining are minimized resource rich earth is not damaged and through compensatory afforestation scheme, the situation is brought to normal. From the perspective of the mining sector, mining sector has taken a step forward to empower and facilitate the project affected communities by creating employment opportunities, business opportunities, better infrastructure in terms of schools, hospitals, road, light and connectivity etc. As a result, the local resources are facing varied faces of transformation (Bury, 2004).

4.3 SOCIO-ECONOMIC INDICATORS

4.3.1 Socio-cultural factors

The mining activities that influence the socio cultural aspects of the local community include economic growth, educational and cultural changes, infrastructure and access to outside world. Further, some other factors identified by Susan A. Joyce Golder Associates Ltd (2011) that mandatorily influence socio-cultural dynamics are pre-existing situations, engagement process of community, skill development and capacity building.

Similarly, mining activities also give rise to consequences like increase in anti-social activities, criminal activities along with depletion in agricultural land, environmental pollutions and increase in landless farmers (Das, 2015). Mining also results in rise in male population due to the sector being male specific works. Mining activities result in shift in socio-cultural aspects of rural community in mining town.

Mining sectors have some limitations also like increase in traffic in the area resulting in risk of accidents, increase in worker population causing discomfort to locals, and may lead to anti-social activities (Lockie et al, 2008). In his studies, Yeboah (2008) has revealed that mining has resulted in land degradation leading to less land for agricultural and increase pollution like air, noise and water, etc. resulting into health problems with high chance of diseases like malaria, skin disease and respiratory related disease, etc. in people of mines localities.

4.3.2 Economic factors

Mining sectors hugely affect economy of a country. Similarly, it has some immediate impact on the local areas where mining takes place. It dramatically increases the average income, which makes it difficult for the non-mining

people to live with a higher housing cost and other expenses. All these things result in migration of local people. Again, it also rises the inflation, so it increases price of goods and services in the area due to availability of more disposable income. But mining also has several favourable impacts like standard of living of the area increases more than the state averages, prosperity of people also rises. Local property values also climb, which benefitted the locals. It creates several associated jobs of mining for local people (Lockie et al, 2008). Mining also creates alternative job opportunities for local people. It helps subsistence businesses to grow. It also increases the food crop sell of local farmers, which is an interesting finding (Kitula, 2006). Additionally, government initiated Alternative Livelihood Program (ALP) for the people affected by mining activities by providing them alternative source of income and employment which is encouraging as these areas have limited land available for agricultural purpose (Yeboah, 2008). High prevalence of diseases in these mining areas hampered peoples' economic condition as they have to spend a good amount of income to save or recover them and their family from these diseases.

4.3.3 Behavioural factor

Mine expansion in current years leads to increase in the issues related to social and behavioural aspect of the people who are influenced by the mining related activities, these includes rise in traffic and road accidents due to fatigue, increased pressure on emergency services, increased in job burn-out and stresses in workers due to more job demand from them, and it also increases in criminal and other anti-social behaviour in mining and nearby areas (Lockie et al., 2009). Accidents in mine have far reaching implications which not only impact the life of a family but also affect the local community with stress and short/long term effect on mental health. Moreover, these types of stress and related behavioural problems affect the decision making power of miners and workers and can have a negative impact on their behaviour as it increases anxiety, difficulty in sleeping and nightmares, event specific fears, anger and rage, etc. Long work hours can also have serious health and safety consequences like irritation, injuries, cardiovascular disorders, stress, discomfort, work-family conflict and increase in risky behaviours, etc.

Existing literature shown a dearth or no study related to behavioural aspects, thus setting plausibility to explore the behavioural aspect along with the above said factors and their impact on workers and people residing in mining areas. Integration of behavioural aspects in the proposed framework will improve robustness of the model and add more insight to the existing knowledge.

5.0 Conceptualized framework

In order to understand the perception of local community towards coal mining sector, the expectation of the local

community has been grouped in five sub heads. It is important to note the impact of these subgroups on creating positive psychological climate. Presence of various qualities in the local community is expected to improve community participation in sustainable mining.

A model on community participation in sustainable mining instigated by positive situational and socio psychological antecedents

6.0 Discussions

In view of the demand for coal as a source of energy, sustainable development of coal mining sector requires detailed study on the mining-related social, environmental and health injustices which have remained eminently salient. The conceptual model proposed in the paper analyses the relationship of perception of community towards coal mining sector and generating positive psychological climate.

As per definitions from Oxford Languages, perception is the ability to hear, see, or become aware of something through the senses. In other words, perception is sensory experience which involves recognizing environmental stimuli and also actions to be taken in response to these stimuli. In the perceptual process, we usually gain information about the properties and elements of the environment that are very critical to our survival.

In broader sense, each community develops certain perception towards an industry. These perceptions can be grouped in five heads to examine the relationship of perception and positive psychological climate. Collective cognition in respect of coal mining is mainly on environmental impact due to mining of coal and the impact due to combustion of coal. Illegal mining have resulted in safety issues to the local community and a lot of awareness has been generated due to various norms fixed by the society while dealing with these issues specially in coalfields. Awareness of consequences of these cognitions not only help in generating societal norms but also develop some practices in the society which help in developing subjective norm.

Coal sector in general has helped local community in economic well-being and has also supported the people in terms of education, skill development and health care. Perception of support in the mind of local community has helped in creating positive approach in the mind of people towards the sector. Coal mining sector depends a lot on local community in terms of land input and manpower. The rehabilitation and resettlement (R&R) policies of the company plays an important role and must be such as to appear giving justice to land oustees.

Collective commitment is a bilateral relationship between the community and company. Presence of the companies in coal sector has supported the entire economy of the region and as such the perception of the sector collectively in the society plays an important role in generating acceptance

about the sector. Similarly the perception about company's behaviours towards its employee also plays an important role. Most of the employees reside in the same area or belong to the local community and fair labour practices are very important in the overall perception about the company.

Positive psychological climate can result in community participation in sustainable mining only when some attributes are present in the local community. These attributes have been grouped into four heads in this model. Subjective norms can be termed as societal norms and the acceptance of people to adopt these actions. These norms are usually framed by the society based on awareness of consequences of collective cognition of the sector. Virtues and strength in terms of motivation, obligations towards society, determination, rigidity to work etc help in converting the perception towards participation of community in mining activities.

Coal mining sector brings a lot of changes in the community in terms of business, economy, education, health etc and also change in the general life of the community. Openness to change is very important and a major factor which must be studied in ensuring sustainable mining. Further, there are seven critical character traits such as resilience; sense of curiosity and wonder; social intelligence; gratitude; kindness; self-control and optimism. Presence of these traits in the community is very important and must be studied for ensuring the positive psychological climate resulting in community participation in sustainable mining.

7.0 Conclusions

Social, economic, and environmental challenges are mostly responsible for mining communities to have unfavourable attitude towards mining operations. However, psychological factors plays important role in generating acceptance in local community towards coal mining. Conceptual model has been developed to understand the impact of socio psychological factors that may affect the sustainability in coal mining sector.

Perception of local community towards mining operator is very important; as such the image created by coal companies towards support to local community through corporate social responsibility (CSR) activities are very important. The policies of company towards fair labour practices, justified approach in dealing with issues of local community as well as employees and collective commitment towards society creates a positive psychological climate in the local community.

Presence of some attributes like subjective norms, virtues and strength, openness to change and positive traits help in leveraging the benefit of positive psychological climate towards sustainable mining.

8.0 Limitation of the study

The conceptual model has been developed on the basis of theory and has not taken into account various moderators

and mediators like ownership status of the sector public/private, political influence and affiliation and also the effect of presence of other industries.

9.0 Scope of future research

The model developed is conceptual and it would be intriguing idea to validate the relationship through field surveys in some mines to understand the impact of each relationship and to generate an index to measure the impact of socio psychological factors on sustainable mining.

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