Specific Impact of Pollution and Health Scenario around Iron Ore Mining area with Detailed Environmental Management Plan at Hospet Ballery Karnataka

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ABSTRACT: *Mining plays a major role in changing the surrounding environment. The mine degrades the natural resources around the mining zone which may adversely affect the local economy. The study deals with the effects of noise, air pollution and its control measures along with the health aspects in and around mining area. Collection of the air and noise data in three different regions A detailed environmental management plan to protect the natural ecosystem. The study deals with the complete comparison of the Mining, Steel and village area environmental conditions. The mitigation measures and the management plan is also predicted in this study. The special emphasis of the health conditions of workers, chemical exposure in the mining area and protection measures along with the health and environmental mitigation measures are figured out in this paper.*
KEY WORDS: *Air, Noise, Health, Socio-Economics, Environmental Management Plan*

I. INTRODUCTION

Mining is the major sector for development of the economic conditions. The excavation of the mine mineral causes the drastic effects of the environmental pollution. The Karnataka state is referred as one of the mineral rich states of the country.(Mining and quarrying, state of the environment report,2003).The goals of EMS are to increase the compliance and reduce the waste(Kola.O,Odeku 2017) The most environmental problems are water pollution soil contamination, air pollution, land degradation, loss of biodiversity, Noise pollution, health issues, landslides and other dangerous effects.Hospet ballery is the region with the dense biodiversity utilization of many minerals.(Census of India 2020).Extration of minerals cause the effects of the pollution. The study was undertaken for the environment management system on the basis of air, water and noise quality. The study is conducted to describe the severity of concentration levels of air pollutants in the mining area relative to the National Ambient Air Quality Standard (NAAQS) protocol, prescribed by the (CPCB, 1998). Different parameters for air pollutants water and noise were monitored for representing baseline status with the study area.

1.   Mining

Mining is the process of extraction of mineral ores from the earth. The important Processes of mining is the most important element for the development of the economic conditions. (Sinha.,S..Banerjee,S.P.1997).The extraction of mine consists of Desirable material like uranium iron ore, coal, diamonds, limestone, oil shale, rock salt, gold, granite, limestone, sand etc. Mining of valuable minerals includes the removal of the soil. It is the also causes the soil pollution and contamination by runoff. Mining also helps in extraction of non –renewable materials like petroleum, natural gas, crude oil exploration is also done.

2.   Study area:

The entire study is demarcated on the Survey of India toposheet (Fig. 1) D43E07,08,11, and 12. The study area is bounded with the latitude and longitude 15º12´0 N, 15º20´0 N.76º17´0 E, 76º35´0 E. The detailed study of water and soil pollution is published with the same study area as my research topic at Sandur taluka Hospet, Bellary district. The entire study is carried at Iron ore open cast mine, adjacent steel industries and village area. The impact of air and noise monitored and predicted within the buffer zone of 7 km radius in Bellary.
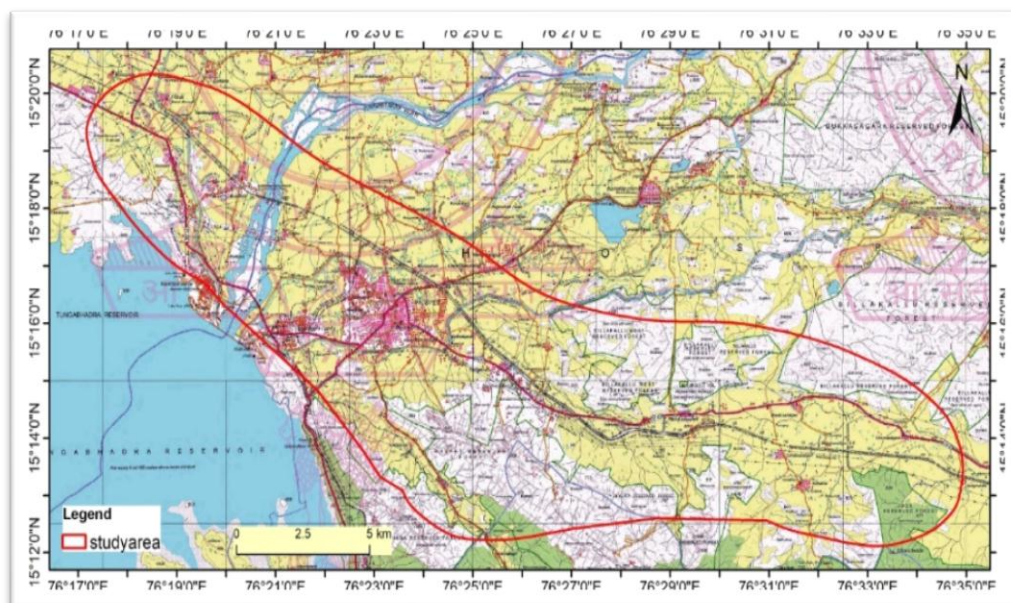
Figure 1 Topography Map 1:50000 Scale

II. METHODOLOGY

Impacts due to mining on the environment are inevitable but can be minimized with proper mitigation measures. Further, the workers engaged in various mining operations and the Process industries are exposed to dust in ambient and workplace environments leading to Environmental Health problems. It is in this context the proposed study "Environmental Impact Assessment of Iron Ore Mining & Processing Industry with special emphasis on Environmental Health in Bellary, Karnataka. The Environmental Impact, Health Issues, and socioeconomic aspects among the laborers on-site and off-site. The research describes the environmental issues in three different zones.

Air samples collected at seven different locations at three different zones. The level of concentration PM10, PM2.5, SOx and Nox are figured out with NAAQM results. Mining area concentration are little high with comparison to the village and steel industrial area. The sample points are plotted in Fig.2 and Noise samples are predicted in Fig.3. The noise level are identified within the range in village area when compare to the mining area. The detailed study was carried on the Impact of pollution and Heath aspects of the labours.

More than 35,000 mine labours work 12-14 hours per day for rupees 1000 a week. Total of 25 workers were interrogated for their health conditions. Most common effects noticed are throat infection, stomach pain, hearing disability, skin diseases, asthama, diseased blood pressure etc and most probably villages using the contaminated Tunga badhra water at Hirehalli village in Bellary Karnataka. Mine owners are requested to perform periodic laboratory tests for workers with specific spirometry and x-ray diffractions to look in to the diseased conditions in workers' human body. NGOs also made the record of red alert document for health problems of mine workers.

3. Air

Air quality is a most significant problem in mining area. Air pollution is generated by drilling, loading and unloading the minerals and during the transportation. (Samadi, M., Bollorani, A.D.,2014). Particulate matter is one of the major pollutants releases during mine operations. (Matawle, J.L., Pervez, S.2015) The levels of NOx and Sox is observed within the limits of NAAQM standards. Mine location consists of dust emissions which contains free silica and respirable particulate matter which causes silicosis and siderosis. To control the minute cause of the pollution the action during excavation must be taken required precautions. The Table 1 shows the locations of the Air sample data, Table 2 & 3 indicates that the collected data from the field and the locations of the collected Air data shown in Fig.2.

Table 1 Sample Locations for air samples

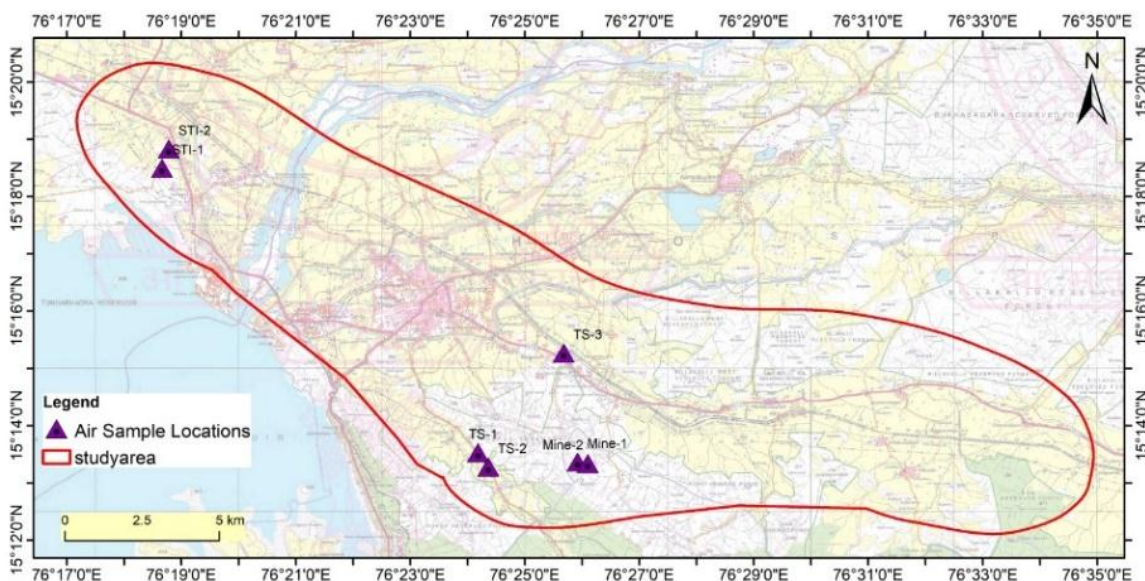| Sample ID	Latitude	Longitude	Location
Mine-1	15.22271	76.43199	Mine - 1
Mine-2	15.22229	76.43531	Mine - 2
STI-1	15.30833	76.31052	Hirekasankandi
STI-2	15.3139	76.31253	Hosahalli
TS-1	15.22545	76.4026	Rajapur
TS-2	15.22126	76.40612	Kallahalli
TS-3	15.25442	76.42831	kariganur

Figure 2 Air sampling location map

Table 2 Collected Air sample data

S.No	Parameters	Locations	Mine-1	Mine -2	Hirekasankandi	Hosahalli	Limits	Method
		Time	8hrs	8hrs	8hrs	8hrs	-	-
		Units						
1	PM10	$\mu g/m^3$	64	60	52	47	100	IS:5182 Part 23- 2006(RA-2017
2	PM2.5	$\mu g/m^3$	34	30	27	26	60	IS:5182 P-24 :2019
3	SO2	$\mu g/m^3$	13	11	10	9	80	IS:5182 Part 2 - 2006 (RA-2017)
4	NOX	$\mu g/m^3$	17	14	13	14	80	IS:5182 Part – 6 2006 (RA-2017)

Table 3 Collected Air sample data

S.No	Parameters	Locations	Rajapur	Kallahalli	Kariganur	Limits	Method
		Time	8 hrs	8 hrs	8 hrs	-	-
		Units					
1	PM10	$\mu g/m^3$	41	39	35	100	IS:5182 Part 23- 2006(RA-2017)
2	PM2.5	$\mu g/m^3$	29	22	20	60	IS:5182 P-24 :2019
3	SO2	$\mu g/m^3$	11	11	08	80	IS:5182 Part 2-2006(RA-

							2017)
4	NOX	µg/m^3	12	15	13	80	IS:5182 Part -6 2006(RA-2017)

4. Noise

The noise will be generated by the drilling and blasting process, and also with the movement of trucks on haul roads. The Noise level is measured in decibels. The collection of noise levels in above locations are pointed for the study area except in the mining area. (Srujan Sinha, Rabindra.N,.2007.) The capacity and intensity of the sound is less where coming to the vibration the mine is at dense forest area. The complete process is done only by drilling so there is a problem with the workers' health conditions. The Table 4 shows the Noise level monitoring locations, Table 5 indicates the Noise level monitoring report and Fig.3 shows the location map of the Noise level monitoring data.

Table 4 Locations of Noise level monitoring

SampleID	Latitude	Longitude	Location
N1	15.22126	76.40612	Kallahalli Village
N2	15.25442	76.42831	Kariganuru Village
N3	15.23826	76.46969	Vadrahalli Village
N4	15.22048	76.52805	GundlavadgiriVillage
N5	15.22271	76.43199	Core Zone ML Area
N6	15.2226	76.43178	Haulage Road

Table 5 Noise level monitoring report

Code No.	Monitoring Stations	Day			Night		
		L Min	L eq	LMax	LMin	LMin	Min
N1	Kallahalli Village	39.3	50.5	58.3	34.0	41.2	48.4
N2	Kariganuru Village	36.8	48.3	58.0	34.0	41.4	47.6
N3	Vadrahalli Village	37.0	47.9	56.7	34.8	41.3	47.5
N4	GundlavadgiriVillage	36.0	48.0	56.4	35.0	41.2	49.0
N5	Core Zone ML Area	41.0	48.2	63.0	35.0	39.7	49.5
N6	Haulage Road	45.0	63.2	80.0	During Operation		

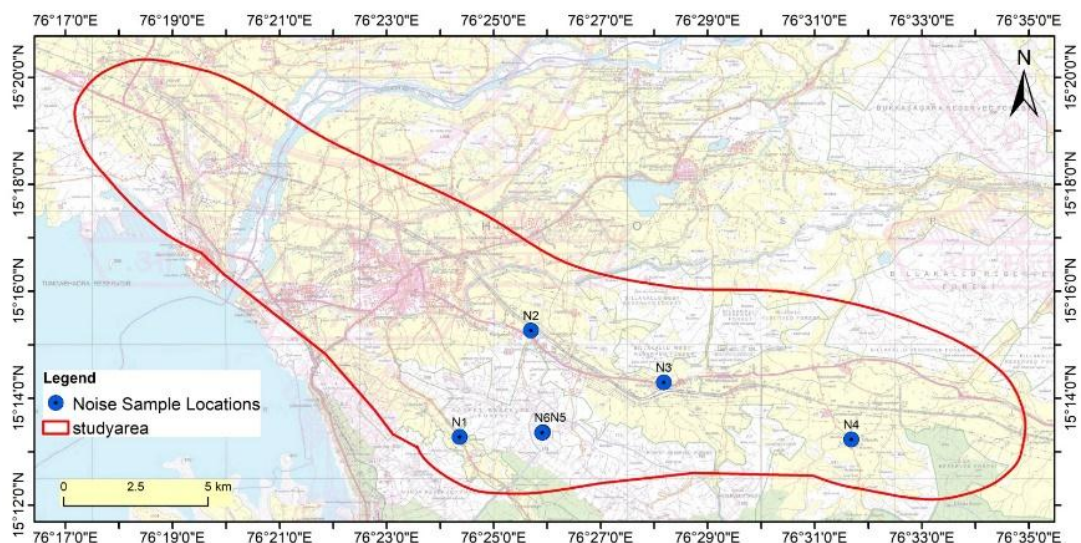| Permissible Limits as Per ILO Code of Practice For Un-protected ear -8 Hrs Working Shift Warning Limits - 85 dB(A) Danger Limits - 90 dB(A) Worker not to be exposed for more than 115 dB(A) With Ear Protection - 130 dB(A) 'Impulse' or 120 dB(A) 'Fast' No entry when the noise level exceeds 140 dB(A)	Permissible Limits of Ambient Noise Levels as per CPCB Guidelines Leq. Limits Decibles(A) Day Night Industrial areas 75 70 Commercial Area 65 55 Residential Area 55 45

Figure 3 Noise sampling location map

5.   Socio-Economics

The details of mine includes the description of the demography and availability of the basic amenities for workers and people living in the surrounding areas. The detailed socio-economic data on the demographic pattern, population, characteristics, and information related to literacy, and occupational structure have been compiled from various secondary sources including government and semi-government offices. Education, Health camps, (Hanumantha G.2018) water supply sanitation in villages, plantation in villages, and employment will be provided   for   the   people   staying   nearby   the   5km   zone   from   the   site area.(Anand,V.Kulkarni1,H.M.Jayasheela,2017) Mining Industry gaining monument in establishing the steel sector with the high production of the iron ore as a raw material extraction as much as extraction done the impact is predicted to be high. The total socio-economic activity recorded with the increase in steel industries establishment.

III.   RESULTS

The entire study describes the major cause of Air and Noise pollution, Socio economics and Health aspects mitigation measures. Identification of the health effects due to the chemical exposures are identified and safety requirements for labors is predicted in this paper.

6.   Health conditions

After the primary and secondary survey with comparison to the size of the particulate matter produced onsite at the mine region is higher than the village areas and steel industrial area. The source of emission of dust fumes are causing the major effect. (Basavaraja.T ,Dr.Veerendra kumar,2020)The total suspended particulate matter of the particles from size of 30µm and above has no risk but the size below 10µm directly enter into the respiratory track during inhalation. The major diseases are:

6.1 Silicosis: National Institute of Mineral Health, Nagpur studies had shown increased occurrence of the respiratory diseases, such as silicosis and bronchitis in the mining ambient air. This disease is caused due to the higher exposure to harmful chemicals releases from the mine.

6.2 Siderosis: It is occupational lung disease and also known as Iron ore pneumoconiosis which is caused by the inhalation of the dust or the fumes of Iron or oxides of Iron particles. A part from this there is the evidence that the person working in the iron ore mining area is predicted at high risk of lung cancer and respiratory diseases.

The major occupation health aspects and practices found the major health effects that re figured in the Table –6. The Table 7 shows the chemical exposure during the mining activity.

Table 6 The major health effects at the study area

Source	Area	Problems	Hazards	Reason
Temperature	Mine onsite	High temperature exposure	Heatstroke Irritability, lowered morale Bp	Deep work at mining area
Cold	Mine onsite	Low temperature exposure	neuralgia toothache; Joint pains (bends), paranasal sinusitis	Regular exposure to the cold region
Low working space	Mine onsite	Continuous work exposure in same area.	Beat disease (cellulitis Bursitis of joints); Dis-location of joints	Working at a narrow seam at ore region with the contorted position.
Noise	Mine and Steel Industrial area	Continuous haring effect	Occupational deafness	Rock drilling and blasting
Vibration	Mine and Steel Industrial area	Continuous working	Raynaud's syndrome	Rock drilling
VISION	Mine onsite	Continuous dust emissions and dust emissions	Blur vision visual acuity giddiness	Loss of vision and eye infections
Ionizing radiation	Mine onsite	Ore body exposure	Radiation Hazard	Working with radioactive ore

Table 7 Details of chemical exposure during mining

Source	Chemical exposure	Work	Diseases
Dust	Poison. by lead, Arsenic, Mercury, Manganese, etc	Working with the mineral dust both in and out of mine area	Pneumoconiosis (silicosis, siderosis) Induced and aggravated respiratory disease;
Mine released water	Occupational Dermatoses	Underwater work in the mine pit	Skin disorders

Oxygen deficiency	Gases poisoning (CO, NOx, S02, C02, Methane)	Blasting; inadequate ventilation	Anoxia, dizziness and dyspnoea
Biological Disorders			
Source	Organism	Work	Disease
Mine water	Parasitic and fungalinfections	Due to highhumidity in the mine pit parasites along with the fungus grow easily owing to the poor sanitation	Sporotrichosis, Ankylostomiasis , capitis, tinea pedis ,leptospirosis -Weil's disease

7. Few of the Expressed issues and problems raised by the workers at the mining area

➢ The long-time health investments are not provided for the truck driver and mine workers.
➢ Raising of mine fumes and dust pollution from the overloaded trucks and heavy vehicles.
➢ No doctors, no pharmacies and No Health care centers available during nights.
➢ Heat stress, high humidity low wages, water scarcity due to mining activity workers depended on the tankers which are regularly irregular
➢ Loss of Fire woods, poor soil fertility due soil erosion and loss of agricultural lands.
➢ Noise pollution during mine operation and while passing the trucks.
➢ Respiratory problems and sun burns.
➢ Financial problem to worker families due to meagre salaries of husbands.
➢ Women were joined for work along with the husbands facing the same issues at work.
➢ Lack of the good governmental rules to address the reasons for the raised problems from workers
➢ and immediate measure to mitigate the communal issues.

8. Recommendations to the government
➢ Good Governance must be followed and proper care must be taken for the mine works.
➢ Financial stability of the labor families, Health and environmental issue must be addressed asper the requirements.
➢ Improvement of the laboratories for regular test like X-ray, Spirometry tests, Blood tests (CBP) and Scanning.
➢ Training for the laboratory technicians for the best procurement and operation of the instruments.
➢ Immediate availability of doctors must be available during night times. Health and educational policies made by the government must be implemented and availed regularly to the mining labors.

IV. ENVIRONMENTAL MANAGEMENT PLAN

Environmental management plan is the major responsibility to protect or conserve the natural resources and the ecosystem. (Jagdish Krishnaswamy,2006). Mining of the deposits extends to the impact to of the environment. The sustainability management techniques implementation may stop the negative impacts before, during and after the mining. Major key role for the sustainable future is the Environmental management plan and the mitigation measures mentioned in this plan. (S.S.Narayan kayet,(2019).This plan consists of the major developments of the projects without effecting the nature. It even gives the commitment to the project proponent to provide the initial benefits to the public before establishment. (Parivesh kumar,2019) Government also involved to monitor the safe guards related to the project and provide necessary rules to protect nature and the people.

Environmental Management plan is site specific developed plan to ensure the best practice for the environmental management to project.
• Improve the contribution of Management so that an EMP can be used effectively
• Ensure the minimum standards and continuous approach with the implementation of EMP
• Ensure with the commitments done as part of the project's EIA implemented throughout the project life
• Ensure the detailed environment management plan is captured and well documented during all the stages of a project

9. Air pollution

The sources of air pollution are due iron mining in sandur taluka Ballery region. Mine cause of the pollution is due to the activities performed in mining area i.e. drilling, blasting, waste dumping and ore transportation. The measure to take for the dust control is done by sprinkling of water on the benches and haul roads may reduce the air pollution (Kuki, K.N,2009). Providing Personal protective equipment (PPE) kit to the workers may also reduce most effects. The values of Sox and NOx remains within the limits, foaming agents or

surfactants are the chemical agents used in wet suppression Plantation include green belt development with the dust filtering trees

10. Mitigation measures

- To mitigate air pollution during operation of the mine crucial tools like dust screens and water sprinklers are used effectively, regular water sprinkling is employed in the mining area.
- Workers in the dust prone areas, equipped with the dust masks, ensuring their safety in respiratory system. Afforestation will be carried out by planting trees on the approach roads and also at nearby villages.
- Mineral transportation process carried by trucks covered with the tarpaulin sheet to avoid the fugitive dust emissions. All the vehicles are required to travel with the Pollution under control certificate.
- Periodically air quality monitoring is carried to check air pollution status as per the norms of NAAQM. (National Ambient Air Quality Monitoring) and (KSPCB) Karnataka state pollution control board.

11. Noise and Vibration

During operation of mining process. Noise and vibration generate automatically in opencast mine drilling, excavation, sizing and transportation of ores. The noise sources will be generated in two different plant source fixed plant source generate noise by Crushing, screens, conveyers and mobile plant sources generate noise by drilling, blasting, loading haulage onsite. Hence the mine process is done by digging there will be a little effect of mobile plant source. During the mining activity the movement of the vehicles generates vibrations.

12. Mitigation measures

- To overcome the noise pollution proper measures should be taken
- Mining staff working closure during the operation of mine should be provided the proper insulated enclosures to avoid high source of noise.
- Personnel working will be provided Personnel protective equipment (PPE)to avoid the risk due to mining operations
- Attention should be maintained properly to minimize generation of noise and the Silencers, mufflers and Earmuff and self-protective devices must provide to the staff working at the noise prone areas.
- Restrictions on the power horns must be imposed on vehicles in forest areas. Proper maintenance of the vibrations caused during the mining operation must be monitored and precautions are to be take accordingly
- Proper maintenance of the equipment's will be carried out. The well-tuned vehicles will be used during the operation phase.
- Plantation carried along the approach roads and nearby villages. Plantation serves a dual role
- To check the values of peak particle velocity of vibrations. The values are maintained within the prescribed limit by DGMS.

13. Socio economic management

- Comprehensive awareness programs will be implemented to educate individuals about potential occupational health hazards, enabling proactive measures to be implemented for prevention and mitigation.
- Workers occupational health along with the safety measures within the organization will be promoted and developed healthier and safer way of work will be developed.
- Accident investigations and supervision of unsafe working conditions will identify causes and provide recommendations for remedial action.
- Comprehensive training sessions on health, safety practices, and legislation will be developed
- Aspects Probable Source Mitigation Measures delivered to management, supervisors, and workers. Emergency procedures for mine rescues will be developed and coordinated.
- Open communication channels will be established to facilitate regular reporting on health, safety, and risk status to management.
- This will enable the development and review of comprehensive worker's occupational health and safety measured strategies and systems, encompassing policy procedure, and work manuals.

14. Important Health Safety requirements for Mining Labors

➢ Emergency First Aid Facility

- ➢ Regular health checkup camps
- ➢ Safety trainings
- ➢ Providing necessary PPE kits
- ➢ Providing Health policies
- ➢ Improvement of labs for identification of Disease.

V. CONCLUSION

The study predicts the major pollution caused due to exposure of mine chemicals causes and exposure of mine chemicals causes and impacts. It also helps in the prediction of impact with the respective mitigation measures and the above air and noise pollution are measured are moderate compare to the mine lease area the health of the workers are exposed to the chemicals dust and causes the sederosis and sclerosis diseases due to continuous exposure to the exposures released from the mine.

The best treatment measures for the workers is to provide the PPE kits to the employees and the regular health care camps must be conducted among the workers at mine.

The total study is predicted moderate effect in producing the air and noise pollution. Due to lower wages the labors are exploited economically and there is the long-term exposure of the chemicals which leads to the diseased conditions for workers in future.

Proper care must be taken among the labors and socio-economic benefits for the villages are granted quickly education facilities and health camps re conducted regularly.

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