CHAPTER – V
Problems Due To Mining Activity

5.0 INTRODUCTION

Mining activities belong to primary activities group in Indian Census. Mining towns evolved at the time of British era, particularly by the British colonial people and this type of town is better classed as mining towns to which some of the towns of Asansol subdivision belong.

Mining is an important economic activity no doubt but it creates environmental hazards. These environmental problems not only hamper the city environs but also contribute towards health problems, infrastructure problems or in a word hamper every aspect of livability of a human habitat. Mining is now-a-days counted for subsidence of land which is really a very alarming issue. Apart from subsidence mining has given rise to a host of problems.

5.1 LAND SUBSIDENCE

It is the quantum of subsidence and the surface profile which determine the degree of damage to the land. The magnitude of the problem of subsidence is increasing day by day as more and more areas are being identified as unstable and new settlements are coming up on such unstable areas.

5.1.1 Alarming Situation

Land subsidence or downward movement of ground surface in Raniganj Coalfield has at places reached alarming proportions. According to Central Mine Planning Design Institute Ltd. (CMPDIL) 50 sq.km. of area has been affected by subsidence. (Table No. 5.1.1)
Plate 3: Cracks have developed inside General Manager’s (ECL) bungalow at Sanctoria due to Subsidence.

Plate 4: Subsidence crack in Sarisatali, Barabani.
Table No. 5.1.1
Area of Mining Subsidence in Asansol Subdivision

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Area</th>
<th>No. of Subsidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nirsa</td>
<td>37</td>
</tr>
<tr>
<td>2</td>
<td>Kapasara</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Sodepur</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Solanpur</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Sitarampur</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Sripur</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>Satgram</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Kunnotoria</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>Kenda</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Area XII of BCCL</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Ramnagar of IISCO</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>112</td>
</tr>
</tbody>
</table>

Source: Central Mine Planning and Design Institute Ltd. (CMPDIL), 1988.

5.1.2 Raniganj Coalfield Area

In Raniganj Coalfield area, good quality non-coking coal seams at shallow depth were mined indiscriminately with very small size pillars. During the years of the first world war, the demand increased and the coal production shot up from 6.12 million tonne in 1900 to 6.5 million tonnes in 1918. Despite conscious realization of the problems in 1922 (1st subsidence committee was formed), erstwhile coal mine operators continued their unscientific practices unabated. Small areas around the entries were worked out manually and pillars were reduced indiscriminately and caved in some places. Moreover, during World War – II in 1940’s heavy demand of coal resulted in undue splitting of standing pillars without any consideration of strength of the remnant pillar stocks.

In the old days when the surface was not densely populated, the operators had extracted as much coal as possible without stowing or supporting. Thus surface rights were generally not acquired. In course of time, when these holdings were abandoned, habitation started growing over these old abandoned workings. As a result, natural growth coupled with the
migration of population from distant villages and towns to areas adjoining coal mines in search of livelihood took place. This accelerated further after nationalization of coal mines in 1973 (Dasgupta and Dutta, 2005).

Large numbers of pot holes have occurred indicating ground movement. Ageing of pillars and subsequent weathering effects are also continuous with growing commercial importance of Asansol Sub-division, various townships have come up during the last century and further growth is going on even though some of the areas fall among those declared as unsafe by the Directorate General of Mines Safety.

5.1.3 Restrictive Rules

Despite promulgation of Act by West Bengal Government in 1979 to restrict any construction over unstable areas, proliferation continued unabated. The magnitude of the problem of subsidence in Raniganj coalfield due to unbridled exploitation of coal in the past and compounded by further injudicious growth of habitation over unsafe areas is a matter of serious consideration. (Fig. 20)

5.1.4 Difficulties Faced

Concerned authorities are finding it difficult to tackle this problem because of:

- The plans of the old workings could not be much relied upon.
- In some cases the plans are not available.
- The workings are inaccessible due to:
  (i) Water logging.
  (ii) Extensive roof-falls and collapses of entries.

There have been a number of cases of pre-mature collapse of small pillars formed during the early part of mining in this coal belt. Recently illegal mining has contributed effectively to this cause.
UNSTABLE LOCATIONS DUE TO MINING

Legend

- NH 2
- SH 5
- Road
- Railway Line
- Unstable Location
- Diversion Points

SOURCE: CENTRAL MINE PLANNING AND DESIGN INSTITUTE (CMPDI).
5.1.5 **Subsidence in Non-Residential Areas**

The problem of subsidence in non-residential areas is not as acute as that of residential areas. Currently when there is planned subsidence, land is acquired by ECL.

5.1.5.1 **Planned Subsidence**

According to the present tenets of mining, after the activity of final extraction of coal is complete, the roof of the mine is allowed to collapse. In this process there may occur some amount of subsidence of land surface above.

5.1.6 **Unsafe Areas**

Many areas have been declared unsafe by the Prasad Committee and accepted by the Office of the Director General of Mines Safety (DGMS) in 1984. Principally four towns and thirty-one villages have been declared unsafe. Recently DGMS have assessed 171 unstable locations (Interim Report, 1997). Synthesis of data available and field observation indicate that the area is under active mining since 1920s and is undergoing continuous land subsidence. (Table A.B.5.1)

5.1.7 **Extent of Area Affected**

According to the CMPDIL, subsidence has occurred in an area of 50 km² affecting a population of 6,65,996 either directly or indirectly. A reserve of 443 MT of coal has been blocked.

5.2 **LOWERING OF GROUND WATER TABLE**

Mining is associated with ground water problem. As such the operation causes the ground water level to fall in the whole adjacent area.
5.2.1 Plausible Reasons

The reasons may be analyzed as:

(i) In open cast mining, the unconfined aquifer gets affected due to continuous gravity drainage and conventional sump, pumping or advance dewatering schemes for efficient and safe working. As such, during this exercise, basically the water level has to be depressed or depleted below the working seam depth in which case large scale mine water pumping can not be avoided. Consequently the mine dewatering would drain out some area around the mine with decline in ground water levels. Depletion of ground water table has affected an area of 12.45 km².

(ii) The other reason for falling ground water table is due to existence of deep goafs. This leads to gradual fall of ground-water level in dug wells with those measured during the period 1967-98 indicates that there has been a significant fall in groundwater level at Sanctoria, Patmohana, Bartaria, Kankardanga etc. of Asansol Subdivision (Roychowdhury and Roy, 1998).

(iii) Subsidence of land may also be attributed towards the fall of ground water level. Subsidence of the surface destroys hydrological stability as a result of which the water level fluctuates widely during pre and post monsoon periods, and small water tanks which have traditionally sustained the various needs of local communities have become permanently dry.

(iv) Again, working of lower seams of the abandoned, water-logged mines sometimes induces cracks which drain out the water. Even in the case of open cast mining, cracks resulting from blasting lower the groundwater table in surrounding areas. (Table No. 5.2.1).
Table No. 5.2.1
Depth of Ground Water Level (in metre)

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Location</th>
<th>Pre-monsoon</th>
<th>Post-monsoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sanctoria</td>
<td>28.87</td>
<td>19.98</td>
</tr>
<tr>
<td>2</td>
<td>Dendua</td>
<td>80.54</td>
<td>42.8</td>
</tr>
<tr>
<td>3</td>
<td>Upper Kesia</td>
<td>65.35</td>
<td>43.72</td>
</tr>
<tr>
<td>4</td>
<td>Sarisatali</td>
<td>145.4</td>
<td>70.61</td>
</tr>
<tr>
<td>5</td>
<td>Bhuradanga</td>
<td>100.03</td>
<td>51.69</td>
</tr>
<tr>
<td>6</td>
<td>Banagram</td>
<td>76.12</td>
<td>45.89</td>
</tr>
<tr>
<td>7</td>
<td>Asansol</td>
<td>93.12</td>
<td>42.82</td>
</tr>
<tr>
<td>8</td>
<td>Barabani</td>
<td>89.36</td>
<td>59.03</td>
</tr>
<tr>
<td>9</td>
<td>Churulia</td>
<td>114.61</td>
<td>57.54</td>
</tr>
<tr>
<td>10</td>
<td>Jamuria</td>
<td>172.23</td>
<td>122.84</td>
</tr>
<tr>
<td>11</td>
<td>Chandanmore</td>
<td>92.91</td>
<td>35.89</td>
</tr>
<tr>
<td>12</td>
<td>Tira</td>
<td>57.17</td>
<td>32.24</td>
</tr>
<tr>
<td>13</td>
<td>Mangalpur</td>
<td>174.70</td>
<td>104.65</td>
</tr>
</tbody>
</table>


5.3 OVERBURDEN DUMPS

Overburden dumps are common in the colliery areas of Asansol Sub-division. These waste dumps from other cast mines and treatment plants create problems of being unsightly and sometimes very unsafe when these are near to the inhabited localities.

5.3.1 Usual hazard

Overburden dumps are usual hazard to the environment due to open cast mining. These can be seen as hillocks in chains on either side of the old and existing quarries. Many of the dumps are old (Nimcha, near Raniganj). Many of the dumps are recent (Patmohona in Kulti). The height and width of the existing overburden dumps varies from 10 to 30 m and 20 to 50 m respectively. According to the Master Plan prepared by Central Mine
Planning And Design Institute, the future open cast projects will have dumps as high as 90 m.

5.3.2 Composition of Overburden Dumps

The overburden dumps of the working quarries generally comprise of loose, rock materials that are not consolidated, usually unstable in character. The slopes are steep varying between 70 – 75 m. The slopes of dumps are sometimes kept steep and unstable due to shortage of land as the overburden to be removed had to be accommodated to open up coal deposits.

5.3.3 Impact of Rains

Impact of raindrops on these unprotected materials result in loosening of the particles. A heavy shower on the soil dump causes sliding of surface particles resulting in opening up of gullies on top of the overburden dump. The rain water comes down through the water gullies formed on dumps and affects the residential areas and agricultural land in the vicinity.

5.4 MINE FIRE

Mine fire cause tremendous thermal pollution of the area. Besides this, it adds to the pollutant load of the air through release of gases and unburnt hydrocarbons.

5.4.1 One of the Major Problems

Fires constitute an ever present hazard in mines (Ramulu, 1974). They occur wherever combustible materials are present in mine workings. As reported by CMPDI, an area of 6.37 km² of land has been affected by mine fire in this belt. Mine fire is one of the major problems of bicentennial Indian Coal mining (Mitra, Pal, Singh and Singh, 2000).
Plate 5: Mine Fire at Sarisatali, Barabani.

Plate 6: Destruction of green blanket by Mine fire at Sarisatali, Barabani.
5.4.2 History of Mine Fire

In fact the history of mine fire itself can be traced back in 1865 when the first occurrence of fire was reported in Raniganj Coalfield (Dhar, 1996). About seventy-five percent of nine fires occur due to spontaneous heating. Coal seams of Raniganj measure in Raniganj Coalfield are highly susceptible to spontaneous heating. Hazards of heating and fire have therefore never been uncommon since the inception of coal mining in this area.

5.4.3 Spontaneous Heating

Spontaneous heating in underground coal mines involves the oxidation of coal deposits. All coals oxidize to some extent when exposed to the atmosphere. Since oxidation is an exothermic reaction between coal and the oxygen component of the atmosphere, heat is constantly being released. This reaction is directly related to temperature, if the heat released by the oxidation reaction is not dissipated, the temperature of the mass increases. The heating can continue and the temperature will rise at an increasing rate until smouldering combustion occurs. Spontaneous heating typically occurs when the quantity of air passing through the coal is sufficient to support oxidation but is inadequate to carry off the heat produced by the oxidation reaction.

5.4.4 Character of Indian Coalfields

The important characteristics of Indian Coalfields which contribute to the occurrence of fires in mines are as follows:

- Great thickness of coal seams.
- Close proximity of contiguous seams.
- Abundance of coal left in the goaf.
- In many cases high susceptibility to combustion.
Plate 7: Overburden Dump of an abandoned open cast mine at Patmohona.

Plate 8: Open cast mining has inflicted aesthetic injury.
5.4.5 Fire Affected Areas

According to CMPDI Report (1988), fire affected areas have been identified at Dishergarh, Sanctoria, Amritnagar, Jay Kay Nagar, Laikdih, Victoria West and Damogoria. Fire has also been reported from private mining areas like Sarisatali in Barabani.

5.4.6 Mine Fire related Problems

Mine fires lead to direct loss of human life, property and valuable coal resources. It also degrades the environment by polluting air, water and land. The problem of mine fire needs due attention to avoid such incidences like death of 55 miners in New Kenda colliery area in the mid-nineties.

5.5 LAND DEGRADATION

Extraction of coal has significantly damaged the land in Asansol sub-division. Land degradation has been brought about by mining and its associated activities.

5.5.1 Types of Mining

Mining in this region is generally carried out in two methods viz. i) Open Cast (ii) Underground. Both the processes are responsible for creating land degradation of which open cast mining is said to be more harmful. According to Central Mine Planning and Design Institute (CMPDI), Asansol, an area of 20 km² of land has been degraded.

5.5.2 Open Cast Mining

There are 13 open cast mines within the study area. The effects of open cast mining vary from place to place according to the character of the natural, social and human environment, along with technology, type and mining operations. Open cast mining was the earliest form of coal mining in this region. These Pukuria Khads were shallow, small in scale and used more labour intensive technology than capital intensive ones. However, the recent thrust on highly mechanized open cast mining with power driven dozers,
Plate 9: Open cast mining leading to degradation of land at Damagoria, Salanpur.

Plate 10: Area affected by subsidence and fire at Sarisatali, Barabani.
shovels, etc. make them much larger in scale and faster in their operation, thereby leading to a greater overall environmental impact than the old *Khads* (Lahiri Dutt, 1997).

5.5.3 **Problems due to Open Cast Mining**

This form of mining result in loss of valuable land. After mining the quarries are left in unreclaimed condition. They become filled with water or are covered with bushes. The present and future quarries will cause damage to a still much greater area. Significant areas of forest land are damaged due to mining operations. Agriculture potentiality of these lands is totally lost and possibility of pisciculture on a commercial scale is still in a state of speculation. Thus the main hazard of open cast mining is degradation of land due to creation of depressions, elevations.

5.5.4 **Problems due to Underground Mining**

On the other hand, underground mining degrades land by causing subsidence, fire, depressions, damage due to underground caving, spontaneous heating etc. About 38 sq.km. in the eastern part of this belt has become follow. Therefore, mining has led to degradation of land making it unsuitable for agricultural and residential purposes in certain parts of this region. (Fig. 21 and 22)

5.6 **DERELICTION OF LAND**

Land degradation has been the primary case responsible for dereliction of lands in this belt.

5.6.1 **Disturbance of land**

The principle operations in mining especially in open cast like drilling, loading, dumping etc. create drastic disturbance of the land surface by changing the chemical and physical properties of the soil. These altered properties often create a hostile environment for seed germination and plant growth. Open cast mining also removes the developed and mature soils which have all the nutrients to support plant life.
Because of the quick returns available from mining, agricultural lands begin to turn into mining area. A transformation of agricultural-rural environment to an industrial-urban one takes place.

Thus, generation of huge mine waste material, infertile soils, destruction of agricultural land can be attributed towards wide expanse of dereliction of land in this belt. (Table A.B.5.2)

5.7 AIR POLLUTION

Among the environmental parameters air is the most sensitive to accumulate pollutants (gaseous and particulates) in it and is a vital material necessary for the survival of all living being in general and human being in particular. Any deviation from its normal quality will lead to poor survival and low production in mine.

5.7.1 Sources of Pollutants

The various operations associated with coal mining result in generation of significant amount of dust are as follows:-

- Removal of vegetation.
- Removal of top-soil and sub-soil and their handling.
- Drilling and blasting.
- Handling of over-burden dump.
- Transportation of coal by dumpers.
- Handling of coal through coal handling plant.
- Loading of coal.
- Solid Waste Disposal.
- Reclamation.
- Haul road both paved and unpaved type.
- Wind erosion from coal stock piles, overburden dumps (Master Plan, 1985).
- Open burning of coal for making soft coke is one of the major sources of air pollution in this belt.
In addition to these mine fires discharge polluting gases like Oxides of Carbon and Sulphur. Suspended particulate matter is also discharged from mine fire.

5.7.2 Ambient Air Quality

Generation of suspended particulate matter is high in Salanpur, Kulti and Jamuria as well as in Barabani. Salanpur mines generate high amount of respirable particulate matter. The various dust generating sources can be attributed to the existence of high amount of SPM and RPM in air. (Fig. 23)

5.7.2.2 Oxides of Sulphur and Nitrogen

Sulphur dioxide (SO₂) and oxides of nitrogen is high in Barabani and Kulti respectively is released from operation of vehicles and combustion of coal. Oxides of nitrogen in such pollutants are released from operation of vehicles, heavy earth moving machineries and combustion of coal.

5.7.2.3 Norms and level

According to the norms, laid down by Ministry of Forests and Environment, for old mining belt like Raniganj, Government of India in their notification (2000); RPM value of Salanpur (325 µg/m³) and SPM value (790 µg/m³) of ICML of Barabani have crossed the permissible limit.

5.8 POLLUTION OF WATER

Water is a renewable but finite resource. The main sources of liquid effluents from a mine are:

1) Dewatering of mine water.
2) Spent water from dust extraction and suppressing system.
3) Leachate run-off from waste dumps.

5.8.1 Contamination of mine water

According to the report on Advance Environmental Planning by CMPDIL, typical mine water is contaminated by suspended solids, iron
AMBIENT AIR QUALITY AND NOISE LEVEL IN THE MINING AREAS (2004)

Source: Central Mine Planning & Design Institute Ltd. (CMPDIL)
compounds, chlorides, acidic sulphates etc. and has high BOD and some oil and grease mine water by itself is generally not potable. Nitrate content in the water from open cast mines is high. This may be due to the use of high nitrate based explosives used in blasting of overburden rocks. Mine fire also contributes to the deterioration of water quality (Singh, 2004).

5.8.2 Surface Water Quality

All methods of surface and underground mining result in the generation of wastes that affect surface water quality (Fig. 24).

5.8.2.1 Suspended Solid

Quantity of suspended solid in Salanpur area is high, close to the permissible limit i.e. 250 mg/l (effluent standard, Ministry of environment and forest, government of India).

5.8.2.2 Spillage from Residue

Spillage of residue from coal washing operations contains fine coal and silt particles along with large quantities of loosened soil comprise the suspended solids.

5.8.2.3 Oil and Grease

Oil and grease is high in Barabani and is close to the permissible limit of 10 mg/l (effluent standard, MOEF). Oil and grease is produced as a result of operation of large number of heavy earth moving machineries. Thus the effluents from the mines discharge the impurities into the water channels which ultimately drain into rivers like Damodar, Ajay and Barakar, and therefore disturb not only the aquatic ecosystem but also the quality of water.

5.9 UNDESIRABLE NOISE AND VIBRATION

Majority of the mining operations produce significant noise especially in the work environment. The neighbouring areas are also affected at times.
CONCENTRATION OF POLLUTANTS IN THE EFFLUENTS FROM MINES IN ASANSOL SUBDIVISION (2004)

Source: Central Mine Planning & Design Institute Ltd. (CMPDIL)
5.9.1 **Sources of Noise**

Operation of heavy earth moving machines and deep hole blasting are the main source of noise and vibration. Along with these drilling, loading and dumping also generate considerable amount of noise.

5.9.2 **Noise Level**

Operation of coal handling, mechanised ventilators and blasting have been found to produce noise levels ranging over 110 decibels as against the safe limits of 85 decibels. Noise is high in the Integrated Coal Mines Ltd., a private concern in Barabani.

5.9.3 **Vibration**

Due to ground vibration cracks in the neighbouring residential areas may develop. Such cracks have appeared in quite a number of residential houses in Chotodighari, Asansol. People of Chotodighari area have also disclosed about vibration and sound of blasting in the neighbouring Patmohona underground mine (Field observation).

5.10 **SAND QUARRYING**

In the recent past sand quarrying from the river beds has emerged as a problem in this belt. The mining concerns are quite oblivious of this existing problem in this tract.

5.10.1 **Sand Stowing**

Sand stowing is a method used for stabilization of the roofs of underground mines. This is carried out to prevent collapse of overlying rock strata after quarriable coal reserve is extracted from a particular mine.

5.10.2 **Physical Socio-Economic Condition Changes**

Sand quarrying from the beds of river Ajay and Damodar meets the requirement of sand stowing. It is an auxiliary activity of coal mining. This activity contributes significantly to the alteration of the physical and socio-
economic conditions by changing the river bed, though the magnitude and implications of this change is not clearly understood or discussed.

5.10.3 Source of Pollution

The quarried sand, transported to areas near the collieries through densely populated settlements increases the suspended particulate matter which is already high in this belt. Moreover, stored sand occupies large fertile areas destroying fertility of the agricultural land.

5.11 WATER LOGGING

Along with other problems of mining water logging need mention. To some extent faulty planning may be said to be responsible for creating this problem.

5.11.1 Causes of Water Logging

To ease the process of mining the natural channels of many tributaries like Nunia of Damodar were diverted. The overburden waste materials from the quarries are often washed off to the rivulets, thereby choking their course.

The constriction or choking of their courses in turn causes flooding of other cultivable areas on the upstream side during rainy season.

5.12 DEFORESTATION

This belt had widespread deforestation in the fist wave of mining expansion. As a result of early denudation of forest cover, much of the surface land had turned into pasture or agricultural land.

5.13 VISUAL INTRUSION

Mining operation has produced on adverse visual (Srivastava and Singh, 1990) sight, characterized by overburden dumps, depressions, water filled potholes, treeless barren look in the mining areas of this belt.
5.14 CONCLUSION

In view of the whole gamut of problems discussed so long, mining has posed a threat to human well being. The area has undergone extensive changes resulting in the modification of natural environment (Bhattacharya, Bhattacharya and Mallick, 1997). Therefore, steps should be taken by the concerned authorities to cause least negative impact on the residents by adopting suitable preventive and ameliorative measures.

West Bengal Pollution Control Board has to shoulder the monitoring of these activities so as to reduce the pollution level of the region. Moreover, awareness is equally needed in order to restore the stability of the region together with conformity towards the environmental sustainability.

REFERENCE


