

# **Impediments of Restoration of Mining Affected Water Bodies in Meghalaya**

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## **1. Introduction**

Meghalaya, one of the eight states of northeastern region of India is rich in coal deposits distributed along the southern fringe of Shillong plateau. It is being mined in all three hill regions, the Khasi Hills, Garo Hills and Jaintia Hills. Coal extraction is done by primitive mining method commonly known as 'rat-hole' mining. Most of the mining activities are small scale ventures controlled by individuals who own the land. Mining operation undoubtedly has brought wealth and employment opportunity in the state, but simultaneously has led to extensive environmental degradation and disruption of traditional values in the society. Environmental problems associated with mining have been felt severely because of the region's fragile ecosystems and rich biological and cultural diversity. Large scale denudation of forest cover, scarcity of water, pollution of air, water and soil and degradation of agricultural lands are some of the conspicuous environmental implications of coal mining in Meghalaya (Swar and Singh, 2003, 2004). Coal mining has also depleted the precious water resource as many streams and rivers of the area, which served as life lines for the people, are either completely disappearing from the face of the earth or becoming seasonal. Besides, a vast area has become physically disfigured due to haphazard dumping of overburden, caving in of the ground and subsidence of land.

The restoration of degraded ecosystems, particularly water bodies in Jaintia Hills is need of the hour. However, no significant activity has been undertaken in the area. In this article, some water related environmental problems caused by coal mining and major impediments in initiating the restoration activities in Meghalaya are discussed in brief.

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## **2. Degradation and depletion of Water Resources**

The water bodies are the greatest victims of the coal mining in Jaintia Hills, Meghalaya. The problems of water quality degradation and depletion and its adverse impacts on availability of potable and irrigation water, soil quality and agricultural productivity, and biodiversity in the area have been reported through various researchers. Water bodies are severely affected particularly in Jaintia Hills, where extensive coal mining is going on and the area is the major producer of coal in the state.

Our studies of last one decade have revealed that a large number of rivers and streams which drain the undulating landscape of the Jaintia Hills are badly affected by contamination of Acid Mine Drainage (AMD) originating from mines and spoils, leaching of heavy metals, organic enrichment and silting by coal and sand particles. Pollution of the water is evident by the data obtained on various physico-chemical and biological parameters, which are published from time to time. The colour of the water in most of the rivers and streams appear brownish to reddish orange due to formation of precipitates of iron hydroxide and contamination of other impurities. Most of the streams carry acidic water with pH as low as around 3-4. Analysis of water also revealed high electrical conductivity and high concentration of sulphates, iron and toxic heavy metals. Most of the water samples collected from the rivers of Jaintia Hills showed low dissolved oxygen (DO) and high BOD. Siltation of coal particles, sand, soil etc. and contamination of AMD and formation of iron hydroxide have been identified as some of the major causes of degradation of water quality.

Coal mining in Jaintia Hills has also adversely affected the water resources of the area in terms of its quantity and has resulted into depletion of precious water resource of the area. The entire coal mining area of the Jaintia hills has become full of mine pits and caves. These open, unfilled pits are the places where surface water percolates and disappears. As a result, smaller streams and rivers of the area, which served as life lines for the people, are either completely disappearing from the face of the earth or becoming seasonal. Consequently, the area is facing acute shortage of clean drinking and irrigation water.

The degradation and depletion of water resources have created an acute shortage of clean potable water in the area. Poor and disadvantageous sections are worst affected in terms their per capita consumption of water, hygiene, health, livelihood and socio-economic development.

## **3. Acidification of Soil**

Acidic water has adversely affected the soil environment by way of making the soil acidic and rich in inorganic component and poor in organic content. Deterioration of soil quality has severely affects the crop growth and yield in the area mainly due to high concentrations of hydrogen ions, which inactivate most enzyme systems, restrict respiration, and root uptake of salts and water by plants. It also leads to deficiency of nitrogen, phosphorous, calcium, magnesium, molybdenum and boron and toxicity of iron and manganese. Solubilization and transport of phosphorus from soil to the water environment due to acidity is an important issue associated with decreased agricultural productivity. Under such circumstances the yield of crops is recorded very poor in Jaintia Hills leading to abandonment of agricultural practice by many farmers.

#### **4. Restoration of Water and Soil Environment**

Environmental degradation and its impact on water resources, agriculture, socio-economy and flora and fauna have been discussed in detail and measures for rehabilitation and eco-restoration of degraded ecosystems have been suggested by different researchers (Das Gupta et al., 2002; Swer and Singh, 2004). Under prevailing grave conditions of degradation of water, soil and environment in Jaintia Hills, there is an urgent need for initiating activities for eco-restoration of the affected components, particularly water. Measures such as filling of mine pits, channeling of acidic seepage for checking AMD contamination of water bodies and agricultural fields, extensive afforestation, neutralization of acidity, conservation of topsoil etc. have been suggested for amelioration of the environmental problems (Skousen et al., 1998).

Proper management of AMD and surface water in mining areas can be of great use in mitigation of water pollution. Restoration of water bodies shall be helpful in improving the soil quality and agriculture productivity. Use of proper water management techniques to prevent contamination of water bodies with AMD and neutralization acidity of water by active and passive treatment methods such as aerobic and anaerobic wetlands, wetland liming, open limestone channels, anoxic limestone drains, in-stream limestone sand application, limestone diversion wells, vertical flow systems etc. will prove advantageous in restoration of water bodies as these methods have successfully been applied in other parts of the world.

#### **5. Impediments of Restoration**

Despite the grave situation and urgency of quantitative and qualitative improvement in water resources almost nothing significant has been done towards restoration of water bodies of the area. Some of the impediments in undertaking restoration work and as pointed out at various forum are discussed in below:

(i) **Land Tenure System**

The land tenure system in Meghalaya is a serious impediment in undertaking restoration work of environmental components such as water, soil etc. In fact, the land tenure system in Meghalaya can broadly be divided in to three systems (a) land under community ownership, (b) land under individual ownership and (c) land under the ownership of government which have been acquired by the government from community or individual in past. The land under community ownership cannot be transferred whereas land under individual ownership can be transferred within the local tribal communities. Most of the land in Meghalaya is under the community or individual ownership (Sarma, 2010). Very small area is under government control, which is mostly under forest cover. Hence, there is difficulty in finding land for undertaking activities or pilot project related to restoration of water bodies by way of constructing of wetlands and structures for limestone treatments to neutralize the acidity and improvement of water quality.

(ii) **Policy and Regulations**

Mining of minerals including coal is important economic activity and provides employment and income to a large population. However, its negative environmental and social impacts are multifarious and impinge on a vast area and population. A variety of consequences of mining, which take place before, during and after the mining operations have been well documented by different researchers. The extent and nature of impacts can range from minimal to significant depending on a range of factors associated with ongoing mining processes as well as post mining management of the affected landscapes. The sensitivity of the local environment also determines the magnitude of the problem. Usually, an ecologically fragile environment has been found highly vulnerable, attracting long term ecological impacts. It is therefore desirable that mining should be done in regulated manner under clear cut policy and guidelines of the regulating agencies. Mining Policy in Meghalaya has been formulated only recently and its full scope is still to be understood by a majority of stakeholders including mine owners, regulators and NGOs and academicians. Under the present scenario, there is hardly any activity for restriction of environmental degradation.

(iii) **Implementation of existing regulations**

As mentioned above the policy and regulations are still to be understood by stakeholders, its implementation is in its nascent stage and much more needs to be done. All concerned stakeholders are required to follow the regulations and regulatory authorities need to take necessary action for implementation of the regulations and guidelines.

(iv) **Lack of Appreciation of Sustainability**

Of course, the coal mining in Meghalaya has benefited the people and the state and has been a means of wealth generation for some people of the coal mining area. However, it also

a bare fact that the benefit of coal mining is going to small group of people, whereas a majority are excluded to share the benefit due to various reasons. Thus, the gap between rich and poor is increasing rapidly. The livelihood of a large population is at stake due to degradation of water and soil quality and reduction in agricultural productivity. Traditional craft and artisanal skills are also fast disappearing. Very little concern for future sustainability is visible in the society.

(v) **Awareness and Peoples Participation**

Sufficient information is available on environmental degradation including the degradation and scarcity of water resources. However, awareness in masses is limited and the initiatives so far undertaken are in rudimentary stage. Hence, there is need for creating awareness so that people can come forward and volunteer for restoration activities.

In conclusion, it can be said that more or less similar situation exists in other parts of the state as well as in most parts of the northeastern region. Hence, it is essential that all stakeholders should take serious note of the environmental problems including water resource degradation and depletion in mountains of northeastern and try to find solution to the impediments mentioned above.

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