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Ecorestoration of Coal Mine Overburden Dump to Prevent Environmental Degradation: A Review

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ABSTRACT
Mine reclamation, ecorestoration and rehabilitation are some of the key techniques applied for the betterment of the mining area. Various types of mine waste are generated in mining (coal and other minerals exploration). These mine waste are probably dumped on the same site due to lack of any proper waste management system that will affects the environment vigorously. Ground pollution due to leaching of heavy metals, surface water pollution due to drainage of polluted water, air pollution due to simultaneous combustion of mine wastes are some of the important environmental problems in mining sites. Coal mining wastes in form of waste rock or Over Burden (OB) material produced from coal mining is traditionally dumped over the valuable lands India and worldwide. These OB dump pollutes the air, soil, water and landscape by dust, leachate and self-ignition due to lack of suitable ecorestoration practices. However, the impact of different disposal and treatment of coal mining wastes on environment and farmland has not been probed in detail. Bioaccumulation of heavy metals is another threat to the nearby living biota, it may be lethal too. Bioremediation, phytoremediation are some other valuable the techniques, which is frequently applied to various mine sites and shown positive outcome. In some instances poor mineral condition of this waste is not suitable for such type of waste management. Reutilization and reduction of these mine waste is important in this concern. Utilization of mine OB in mine backfilling might be good enough to reduce the volume of this waste.

Key words: Ecorestoration, over burden, subsidence, bioaccumulation, mine backfilling

INTRODUCTION
Coal, which is the most abundant fossil fuel resource present in India is performed with both open cast as well as underground mining techniques. Open cast mining is dominant mining practice in India, which contributes about 80% of total coal production, while underground mining contributes only 20%. Both of these mining practices have number of environmental problems. Open-cast mining generates huge amount of waste rock as and this overlying rock is heaped in the form of overburden dumps (Ghosh, 2002). Wastes produced from the mining and extraction of metal, industrial mineral and energy resources constitute one of the largest waste streams on Earth. The volumes of these 'mine wastes' are predicted to increase at least two-fold over the next 100 years due to increasing demands for minerals and energy and lower ore grades.

These OB dumps may changes the natural land topography and affects the drainage system and prevent natural succession of plant growth (Bradshaw and Chadwick, 1980; Wali, 1987), resulting in delicate problems of soil erosion and environmental pollution (Singh *et al*., 1996).

Table 1: The OB production in Jharia coal fields (Source: BCCL regional office)

Area	OB-production in m^3 from 2009-2013
Kusunda	58634339
Katras	43230604
Bastacolla	27552772
Lodna	1835336
Sijua	37035002
PB Area	1745984
EJ Area	20453619
Barora	22623427
Govindpur	10620235

Traditionally, mines (coal and metal) are the sole mineral supply source and exploration for coal is conducted without any precaution, thus affect the environment adversely. Therefore, the coal mining industry is being placed under the red category (Chaoji, 2002). The key environmental problems related due to mining activities are changes in soil stratification, reduced biotic diversity and alteration of structure and functioning of ecosystems; these changes ultimately influence water and nutrient dynamics of the area (Matson *et al*., 1997; Almas *et al*., 2004; Ghose, 2004).

Large area of mine OB wasteland is generated annually (Table 1) in India due to open cast mining and dumped on nearby area. Presently, the north eastern coalfields of Coal India Limited (NECF-CIL), Margherita, Assam, have produced more than 1000 ha of mine OB wasteland. Reports are also available on the prospects and environmental issues related to the North East (NE) collieries (Chaoji, 2002). Due to the presence of high sulphur content (2-12%), the mine OB of the NE collieries is highly acidic (pH 2.0-3.0) (Deka Boruah *et al*., 2008). Consequently, ecological succession takes even longer.

Key objectives of this study is to provide a brief review on the current status of the various works to develop a ecorestoration and rehabilitation of the land at mining sites, their applications and suitability. On the other hand, this study also reviews different work what have been already done in the same context along with their success and future aspects of the study based on sustainable waste management at mining sites mainly in coal mining area. Stabilization of waste rock or over burden material (OB dump) at mining site and their utilization in other sectors are the main focus of this study. Land pollution with different elements, heavy metals and their consequences on environment have also been discussed along with their management aspects.

Mine waste generation from coal mines in India

Disposal of mine waste: Opencast mining produces huge amount of mining wastes as overburden materials, which are left over the land in the form of overburden dumps. These occupy large amount of land, which loses its original use and generally gets soil qualities degraded (Barapanda *et al*., 2001). As the dump materials are generally loose, fine particles from it, become highly prone to blowing by wind. These get spread over the surrounding fertile land, plant; disturb their natural quality and growth of fresh leaves. It has been found that overburden dump top materials are usually deficient in major nutrients. Hence, most of the overburden dumps do not support plantation. The physico chemical properties of overburden dump materials are site specific and differ from one dump to another dump due to different geological deposit of rocks (Lovesan *et al*., 1998).

Characterization of mine waste: Solid mine wastes contain a variety of minerals that can be considered as, resources and thus re-processed or re-mined or can be recycled. These minerals can

Table 2: Physicochemical properties of OB dump, Jharia coal field

Physicochemical parameters	Range
pH	4-5.5
Bulk density	1.4-1.65
Electronic conductivity (EC in dS m^{-1})	0.1-0.15
Organic matter (%)	1-1.4
Organic carbon (%)	0.6-0.8
Available Nitrogen (kg ha^{-1})	60-90
Available Phosphorous (kg ha^{-1})	3.2-5.2

also react with water and air to yield secondary minerals that contain metallic and metalloid elements and can thus also be considered as resources, be recycled, or require remediation. The major minerals of mine wastes can be sub-divided into four categories, namely primary sulphides, primary non-sulphides, compounds produced from ore processing and secondary minerals. Many of these are micro to nano-sized and are not easily characterized using traditional methods. A variety of traditional (e.g., X-ray diffraction, scanning electron microscopy, electron probe micro-analysis and X-ray mapping, etc.) and non-traditional methods (e.g., X-ray absorption spectroscopy, CT scanning, atomic force microscopy, etc.) are needed for this purpose.

Physicochemical properties of OB dump: Over the past few decades many investigators have concentrated on the physicochemical and environmental impacts of mine soil in India. Ghose (1988), Singh *et al*. (2000), Ghose (2002), Rai *et al*. (2011) and Maiti *et al*. (2002) have reported the physicochemical properties and environmental impact of overburden dump materials from coal mining areas of Jharia coalfields, Jharkhand. The metal content and toxicity of coalfield at Raniganj, West Bengal and India was analyzed by Das and Chakrapani (2011). Similarly, the total NPK value and heavy metal content in mine soils and their impact at Dhanbad was examined by Ghose (2004). The topsoil quality of the opencast mine (coal) soil was poor when compared to the other mine soil (Kundu and Ghose, 1994, 1997) (Table 2).

Biological investigation into OB dump material

Microbes in mine soil: Microbial population in soil is an important factor to enhance the productivity of the soil and improving the nutrient availability in soils thus the study of microorganisms present in the mine soils is an essential point to understand the biological rehabilitation possibilities (Teuben and Roelofsma, 1990; Kautz *et al*., 2001) for native plant growth and are also beneficial for the nutrition and especially, development of soil dependent animals (Zimmer, 1999; Kautz *et al*., 2001). Soil content regarding microbial population is an important parameter regarding ecorestoration of mine spoil or mine OB dump.

Ehrlich (1990) isolated the archaeal organisms (*Sulfolobus acidocaldarius*, *S. solfataricus*, *S. ambiens* and *Acidianus brierleyi*) and moderate thermophils (*S. thermosulfidooxidans* and *Thermophilic* sp.) from mine soils at McGraw-Hill, New York. Species of *Metallogenium*, *Leptospirillum ferrooxidans* and *Acidiphilium* have also been observed from mine soils. The microbial population on coal mine soil at Bangor, Gwynedd, of Wales England was studied by Williamson and Johnson (1990). Groudev and Groudeva (1993) have documented important findings on the microbial diversity in copper mine dump in Bulgaria. They isolated *Thiobacillus* species bacteria from mine soil such as *T. thiooxidans*, *T. acidophilus* (*T. orgmoparus*), *T. neupolitanus*, *T. alberti*, *T. thiopams* and *T. irttunnrdiu*. Similarly *Desulfovibrio* sp. and fourteen yeast varieties were identified from metal containing mine waste soil at Australia (Goodman *et al*., 1981). A few investigations were carried out on the microbial diversity of Indian mine soils.

Natarajan (1998, 2009) reported several bacterial species i.e., *Acidithiobacillus ferrooxidans*, *A. thioxidans*, *Thiomonas* sp., *Leptospirillum ferrooxidans* and *Desulfotomaculum nigrificans* were isolated from waste dumps of mines from Bangalore (Karnataka) mine soil. Similarly, the species of *Pseudomonas*, *Bacillus*, *Aerobacter*, *Caulobacter* and *Staphylococcus* isolated from waste dump of mines in India (Ray and Ray, 2009) and the effective conservation and utilization of microbial diversity in mine soil was reported by Kalia and Gupta (2005) investigated the microbial diversity from uranium mine dump at Jaduguda, India.

Environmental pollution in coal mining and its mitigation measures: The dumping of mine tailings and other reject materials like OB materials considered as a major contributor to the ecological and environmental degradation (Cherfas, 1992; Chaoji, 2002; Ghose, 2004; Deka Boruah *et al*., 2008). The OB materials are nutrient-poor, loosely adhered particles of shale, stones, boulders, cobbles and so forth and are devoid of true soil character (Raju and Hassan, 2003; Deka Boruah, 2006; Gogoi *et al*., 2007). Mine OB materials also contain elevated concentrations of trace metals. Consequently, ecological succession in a mine OB is a lengthy process. A minimum period of 50 years to a century is required to establish advanced specific plant species in denuded, mine OB-filled land but this long time scales due to specific problems can be overcome by artificial interventions, that once identified which are most successful if they use or mimic natural process (Dobson *et al*., 1997).

Acid Mine Drainage (AMD) due to mine waste dump: Coal and metal mining disturb large volumes of geological materials and are exposed to the environment. The exposure to air and water, the sulfide minerals commonly associated with coals and metal deposits are oxidized and hydrolyzed resulting in Acid Mine Drainage (Baruah and Khare, 2010). The AMD is a low pH, sulphate rich water with high amounts of acidity.

Prevention/mitigation of AMD Research on acid prevention and mitigation has been focused on three main areas:

- Chemical inhibition of acid generating reactions
- Inhibition of microbial activity in catalyzing formation of acid
- Physical or geotechnical treatments to minimize water contact and leaching

Cleanup and restoration of sites with areas formerly used to mine coal or hard rock ore (containing metals, such as; gold or copper or other resources like phosphorous) present unique challenges. Past activities typically included onsite extraction, crushing and separation of extracted mineral ore into useable material (beneficiation) and onsite or offsite processes, such as; smelting. Environmental contamination and degradation at mining sites commonly resulted from:

- Waste rock and beneficiation waste such as mill tailing piles often scattered in numerous surface impoundments
- Mining Influenced Water (MIW), including contaminated surface water, groundwater and seepage from former mine openings
- Waste in the form of slurry that was injected into abandoned coal mines
- Waste sludge (often containing surfactants and flocculants) that was discharged into unlined lagoons, or
- Aerial deposition of heavy metals and other contaminants from ore processing activities

In number of ways coal mining projects pollute environment. Environment problems related to coal mines are discussed below:

Air pollution: Air pollution in coal mines is mainly due to the fugitive emission of particulate matter and gases including methane (CH_4), sulphur dioxide (SO_2) and oxides of nitrogen (NO_x). The mining operations like drilling, blasting, movement of the heavy earth moving machinery on haul roads, collection, transportation and handling of coal, screening, sizing and segregation units are the major sources of such emissions. Under-ground mine fire is also a major source of air pollution in some mining areas.

High levels of suspended particulate matter increase respiratory diseases, such as; chronic bronchitis and asthma cases, while gaseous emissions contribute towards global warming besides causing health hazards to the exposed population.

Methane emission from coal mining depends on the mining methods, depth of coal mining, coal quality and entrapped gas content in coal seams.

Water pollution: The major source of water pollution in the coal mines is the carryover of the suspended solids in the drainage system of the mine sump water and storm water drainage. In some of the coal mines, acidic water is also found in the underground aquifers. In addition, waste water from coal preparation plant and mine water are other sources of water pollution.

Land degradation: The opencast coal mines are developed at the surface, because of that these mines are also called surface coal mines. The overburden, i.e., the rock or soil overlaid the coal seam, are removed before extraction of coal. This overburden material is dumped on surface, preferably on mined-out area. Therefore, this type of mining requires quite large area on surface. Many a times, large forest areas are transferred for coal mining purpose. The land degradation is the result of creation and expansion of opencast coal mines. The aspect of land degradation in underground coal mines is due to subsidence over the underground cavity resulted from underground caving.

Noise pollution: Main sources of noise pollution are blasting, movement of heavy earth moving machines, drilling and coal handling plants etc.

Solid waste: Major source of solid waste in a coal mine is the overburden. Segregation of the stones in the coal handling plants and the coal breeze also contribute to the solid waste generation. Over-burden to coal ratio in the open cast mining is about 2 m^3 t^{-1} of coal or sometime more. Therefore, the quantum of overburden generated and its proper management is the main concern area in dealing with the environmental issue of open-cast coal mines.

Deforestation: As explained, the requirement of land for a big opencast coal projects are quite large. Many of the forest area, many times, are converted to mining field. Therefore, large forest areas are deforested to make a way for large open-cast coal mines.

The unscientific mining practices undertaken result in large degradation of land in the form of subsidence, underground goaf filled with water, mine fires, destruction of vegetation, generation of wind blow dust etc. To mitigate above environmental problems several control measures, generally, are adopted. Some of the control measures are discussed below:

Subsidence: Subsidence of surface takes place due to extraction of coal by underground mining. Subsidence is exhibited by cracks on surface and lowering of land in the worked out areas compared to surroundings. The surface is rehabilitated by dozing and sealing of cracks followed by plantation of trees. The subsided areas with medium-sized depressions are ideal for developing water pools and sustain green vegetation and also to meet the water needs of local people.

Abandoned mines: The mined-out areas are to be backfilled and then rehabilitated for development of vegetation. In the quarried areas water reservoir is developed for water harvesting. The big voids created by open-pit mining cause land degradation. These voids can be gainfully utilized to serve as, water reservoirs. This water provides moisture for vegetation in the surroundings areas. The water is used for domestic supply after necessary treatment. Irrigation to nearby agricultural land also may be thought off.

External over burden dump: The external dump area presents an unaesthetic appearance unless rehabilitated. Vegetative rehabilitation of these dumps prevents erosion and also improves aesthetics.

Mine fire: The measures for controlling the mine fires include dozing, levelling and blanketing with soil to prevent the entry of oxygen and to stabilize the land for vegetal growth.

Water and air pollution control: Mine water is pumped to a lagoon which acts as, a sedimentation pond. The overflow water which is fairly clean, is drained out to natural drain or used for dust suppression activities. Similarly, washery effluent is re-circulated through thickener and slime ponds. For reducing air pollution, water spraying and sprinkling is done on the haul /transport roads to suppress the dust generation.

Ecorestoration and Remediation strategies of mine OB dump: Eco-restoration of mine Over Burden (OB) or abandoned mine sites is a major environmental concern (Dowarah *et al*., 2009).

Selection of plant species for revegetation of Over Burden (OB) dumps depends on various parameters such as physical and chemical properties of dump materials (Singh and Jha, 1992).

Though there are many success stories of ecorestoration around the world (Cunningham and Berti, 1993; Mendez and Maier, 2008; Gonzailez and Gonzauilez-Chaivez, 2006; Wong, 2003). This investigation sought to achieve eco-restoration of a high-sulphur containing coal mine OB dumping site through primary and secondary ecological succession of plants. Emphasis was given to the physico-chemical characteristics of the mine OB waste, planting methodology, amendment of organic matter and establishment of the plant species. The entire *in situ* experiment was conducted in the Tirap opencast coal mine overburden dumping site in Assam.

The remediation of soil that is heavily contaminated due to coal or metal mining involves excavation, removal of soil to secured land fields and filling of top soil, which is expensive and requires site restoration. Alternatively, the contaminated soil may be dealt with bioremediation or phytoremediation, which is the use of plants or other biological measures to remove destroy or sequester hazardous substances from the soil and waste piles (Table 3).

About 90% of the mining wastes come from the extraction of metals as, sulfides (Moore and Luoma, 1990) and these wastes contains high concentrations of toxic heavy metals especially Cu, Zn, Cd and Pb (Leyval *et al*., 1997). These metals can be cause a widespread contamination of soils

Table 3: Common plant species used for the reclamation of OB dumps (Maiti, 2007)

Common name (English name)	Scientific name and family	Relative density (%)
Acacia (Australian wattle)	*Acacia uriculiformis A. Cunn.* (Mimosaceae, fabaceae)	10
Mangium acacia	*Acacia mangium* L. (Mimosaceae, fabaceae)	20
Gamhar white (Teak)	*Gmelina arborea* Roxb. (Verbenaceae)	5
Subabul	*Leucaena leucocephala* L. (Mimoseae, fabaceae)	5
Kanrnj (Indian beech)	*Pongamia innata.* Pierrer (= *Derris indica* (Lam, bennett) (Papilionaceae. Fabaceae)	5
Chakundi (Indian wood tree)	*Cassia seamea* L. (Papilionaceae, fabaceae)	15
Eucalyptus	*Eucalyptus* sp. (Myrtaceae)	5
Shisam (Sissoo)	*Dalbergia sissu* L. (Paplionaceae)	20
Neem (Margosa tree)	*Azadirachta indica* A. Juss. (Meliaceae)	5
Radhachura (The copper pod or Rusty shield-bearer)	*Peltaphorum ineme* L. (= syn. *P. ferruineum* Benth. *P. pterocarpum,* DC (backer) (Ceslpinear, Fabaceae)	5
Bamboo	*Bambusa arundanacea* L. (Poaceae)	5

and sediments in the vicinity of the mining areas (Zhou *et al*., 2007). The intensive mining activities effects are soil erosion, disruption of surface and subsurface drainage, wet or pond areas, reduction of agricultural yields (Tripathi *et al*., 2009) and human illness (Tiryakioglu *et al*., 2006). Therefore, the ecological restoration and reclamation on waste dump of mine is vital for sustainable development. Excellent planning and environmental management will minimize the impacts of mining on the environment and thus help in preserving eco-diversity (Sheoran *et al*., 2010). At the global level many modern technologies are currently used to clean the metal contaminated soils (Achal *et al*., 2011) but none of these techniques are universally accepted as best option, because either they offer a temporary solution, or immobilize the metals or are costly, when applied in large scale (Yamamoto *et al*., 1993). The modern biological treatments are found to be an effective source for heavy metal remediation from soil (Gadd, 2010). There are several reports stated that the toxicity of metals are responsible for inhibited root growth, photosynthesis (Drazkiewicz *et al*., 2003), cell division and genotoxicity in plants (Steinkellner *et al*., 1998; Fojtova and Kovarik *et al*., 2000; Yi and Meng, 2003). Thus, the global level review of literature was briefly describe about the physicochemical properties, microbial diversity and biological remediation on metal contaminated soils and metal induced genotoxicity impacts on plants/crops. Various methods for remediation of soils having radioactive elements are known but only few of them have been applied under large-scale conditions. The exploration and transportation of the heavily polluted soils to specific depositories is still a common practice in most countries.

Bioremediation of heavy metals: Bioremediation is a natural reduction process for beneficiation of contaminated soils by microbes like bacteria and fungi. Indeed, initially the hypothesis of the bioremediation process was based on the idea formulated by Lovelock (1979) in his Gaia theory (Lovelock, 2000; Farhadian *et al*., 2008). Sulphate-Reducing Bacteria (SRB) and facultative methylotrophic metal-tolerant sulfate-reducing bacteria were predominantly used for acid mine drainage treatment and metal polluted soils (Martins *et al*., 2010; Hard *et al*., 1997).

In India, the heavy metal contained mine soils have been treated by using bacteria, such as; *Thiobacillus ferrooxidans*, *T. thiooxidans*, *T. acidophilus*, *T. orgmoparus*, *T. neupolitanus*, *T. alberti*, *T. thiopams*, *T. irttunnrdiu*, *Metallogenium* sp. and *Leptospirillum* sp. (Groudev and Groudeva, 1993; Cohen, 2006). Further, another bacterial species from the genera like *Bacillus*, *Enterobacter*, *Escherichia* and *Pseudomonas* were used for effective bioremediation of metal contaminated soils (Ray and Ray, 2009). The fungi *Aspergillus niger*, *A. fumigatus*, *Penicillium* sp., *Simplicissimum* sp., *Rhizopus* sp., *Mucor* sp., *Trichoderma* sp., etc., were effectively used for the remediation of mine/metal contaminated soils (Rao *et al*., 2005; Ren *et al*., 2009). Chaulya *et al*. (2000), Maiti *et al*. (2002) and Sheoran *et al*. (2010) also conducted and suggested an innovative approach for bioreclamation on mine soil from abandoned mine land at Jharia coalfield, Jharkhand. Worldwide, several researchers have adopted different approaches f or bioremediation of metal contaminated soils. Cortez *et al*. (2010), described the bioremediation possibilities on opencast metalliferous mine soil. Importance of microbes on heavy metal remediation on waste dumps of mines was reported by Cohen (2006). Sulfate reducing bacteria (*Thiobacillus* sp.) and fungal species (like *Rhizopus* sp., *Mucor* sp., *Trichoderma* sp., *Aspergillus* sp., *Penicillium* sp., etc.) were predominantly used for remediation of acid mine drainage.

Mine refuse in form of mine waste rock or overburden material is dumped on the mining site which affects adversely to the environment. Various techniques have been incorporated for the better mine waste management, such as; waste land management, mine waste management, Reutilization of these mine waste in other civil sectors etc. Eco-restoration of mine OB or discarded mine sites is a major environmental concern (Dowarah *et al*., 2009). Soil remediation at mining site that is contaminated with coal or metal mining includes, removal of soil to secured land field and filling of upper strata that is expensive and needs for site restoration. The contaminated soil may be remediate with phytoremediation, bioremediation techniques, which involves the use of plants or other biological measures to remove destroy or sequestrate the hazardous elements from the soil and waste piles (Salt *et al*., 1995; Cunningham and Ow, 1996; Ernst, 1996). In most of the coal regions in India, the OB dumps are not suitable for planting a tree easily; it takes long time to get suitable condition. There is a Lack of true soil characteristics such as low biological activity and acidic pH (2.0) were unique phenomena in a mine OB dumping site in NECFCIL, Margherita. Trace metal concentrations were also significantly higher in the mine OB environment compared to unmined soil. Under these adverse conditions, establishment of plant species takes a long period of time and ecological degradation is enormous (Dowarah *et al*., 2009). One thing should also be consider that the outcome of eco-restoration depends on the nature of the plant distribution after restoration of the sites. Thus, the record of ecological succession and processes is important to prove the success of eco-restoration (Eamus *et al*., 2005).

Mine waste management as per ecorestoration, phytoremediation or Bioremediation techniques has shown their significance in different mine regions, either coal or other mineral mines. All these techniques can only provide a good results if the affected soil contains some of the valuable elements. Organic carbon, nitrogen, phosphorus and moisture are some of the important constituents of the soil that is required for better ecorestoration. In case of soil or waste in form of waste rock or OB which is having limited mineral composition these mine waste management strategies are not significant. The OB samples are poor in organic carbon, available nitrogen and available phosphorus due to lower microbial activities (Yaseen *et al*., 2012). Phosphorus content of OB samples have been recorded lower in samples of RaniGanj coalfields with a range of 0.765-9.4 kg ha^{-1} (Tripathy *et al*., 1998). Available nitrogen is also not good enough to support vegetation in OB dumps, it was found in the range of 60-90 kg ha^{-1} in RaniGanj coalfields (Yaseen *et al*., 2012). In this condition management of the OB or waste rock is only possible by reducing the volume and provides their utilization in other sectors.

In near future there will be a big pressure on mining industries to manage the waste produced due to mining practices. As the population increased tremendously more and more mineral is required to be mined out from the mining industries that results more waste productions. Seeking to exploit large reserves in more remote wilderness environments, greater innovation in new technologies, such as; the in situ extraction of metals through leaching, the increasing needs to regulate and develop environmental management in the artisanal and small mining sector and the imperative to incorporate policies of sustainable development as far as possible. Reduction of mine waste might be a good approach for mine waste management. Such type of mine waste reduction may be possible by using this waste in civil sectors as building materials or using this waste in mine backfilling. Backfilling may provide an ecofriendly acceptable method for the disposal of waste materials (Karfakis *et al*., 1996).

CONCLUSION

Mine waste management which is one of the burning issues in the mining sectors is the key interest of this review. Whole of this study is based on the various parts of mine waste, their impacts on environment and management strategies such as ecorestoration, mine reclamation etc. Numbers of pollution issues are there in mining sectors due to lack of better waste management plan. Development of vegetation as per ecorestoration is one of the suitable and easy aspect of mine waste management it is environment as well as, economic friendly. Coal mines in India which produces huge amount of waste rock as OB dump is affects environment in number of ways. These mine waste are generally dumped in nearby area and stay as, it is for long period. Sometimes, ecorestoration of these OB dump is not found suitable due to their mineral composition and drainage properties. In such condition utilization of these waste in other civil sectors or mine filling might be of more suitable action.

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