RECLAMATION AND REVEGETATION OF MINING WASTELANDS IN INDIA

5

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Economically unproductive lands suffering from environmental deterioration and mining activity are known as **wastelands** . Mining activity initially begins with the removal of vegetation and upper fertile soil followed by deep excavations resulting in the formation of huge dumps of overburden. The ultimate result is the degradation of land because of loss in soil fertility and change in the topography of the mined area. The wastelands include salt affected lands, sandy areas, gullied areas, undulating uplands, barren hill ridge etc. More than half of our country's geographical area (about 175 million hectare) is estimated to be wasteland. Thus indicating the seriousness of the problem for a country.

Maximum wasteland areas in our country lie in Rajasthan (36 million ha.) followed by Madhya Pradesh and Andhra Pradesh. In Haryana, the wastelands cover about 8.4% of the total land area. Increasing misuse of land resources through development policies has resulted into wastelands.

Reclamation of mining wastelands starts with levelling of land followed by restoration of original fertility of the soil. After reclamation mining wastelands can be revegetated using suitable species of that area. Exotic and Indigenous species can be used in the revegetation programmed of mined out areas.

The review paper , highlights the ecological impacts on biodiversity of mining and reclamation and revegetation of wastelands. Wastelands are formed by natural processes, which include uplands, snow covered lands, coastal saline areas, sandy areas etc. or by Anthropogenic activities leading to eroded saline or waterlogged lands.

The major anthropogenic activities leading to wasteland formation are deforestation, overgrazing, mining and irregular agricultural practices.

Causes of Wasteland formation

Although wastelands formed by natural process but there are many anthropogenic activities which accelerate the formation of wasteland.

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Mined Areas

Most mining work has been unscientific with no environmental protection. There have developed large tracts that lost productivity. During 30-40 years a number of mining operations have been started in the country. These affected forest and cultivated land areas. Such operations have been taken mainly in U.P., Bihar, Jharkhand, M.P., Chhattisgarh, Orissa and Andhra Pradesh. The use of land on large scale for townships, communication, excavation and transport affected the socio economy and ecology of these areas. Ecological problems developed in coalmine areas in Ranchi, Hazaribagh (Jharkhand), Binna project (U.P.). In Ranchi several hundred sq. Km. of land has been converted to badlands. Establishment of other factories as cement (Chhattisgarh and M.P.) and super thermal power stations around coalmines have resulted in to environmental degradation.

Deforestation

Much of the minerals and their exploration in India and especially in M.P. has resulted in deforestation and erosion.

Reclamation of wasteland

The only way to raise land resources is by reclamation and developing degraded land (ravines, gullies, waterlogged, alkaline, saline and riverine lands, stony and gravelly lands etc.)

Wasteland reclamation and development in our country falls under the peer view of National Wasteland Development Board was established in 1985 to formulate action plan to arrest land degradation and deforestation. It looks for regeneration of degraded forest areas and reclamation of ravines, usarlands arid tracts, mine spoils etc. The NWDB was transferred in 1992 to the Ministry of Rural Development with a new department of Wasteland Development under a minister of state.

Some important reclamation practices are as follows:

Land development and leaching

For reclamation of the salt affected soil, it is necessary to remove the salts from the root zone technology which is usually achieved by leaching.

Drainage

This is required for water logged soil reclamation where excess water is removed by artificial drainage.

Surface and subsurface drainage

This is used in areas where water stands on the fields after heavy rains by providing ditches to run off the excess water. Horizontal sub surface drainage is provided in the form of perforated corrugated PVC pipes or open jointed pipes with an envelope below to the land surface.

Irrigation practices

Surface irrigation with precise land leveling, smoothening and efficient hydraulic design help to reduce water logging and salinity.

Selection of crops tolerant and crop rotations

Tolerance of crops to salts is found to range from sensitive, semi-tolerant, tolerant to highly tolerant. *Hordeum vulgare* (Barley), *Beta vulgaris* (sugar beet) and *Phoenix sp.* (date palm) are highly tolerant crops. Wheat, sorghum, Pearl millet, soyabean, Mustard and coconut are salt tolerant crops. Rice, millets, maize, pulses, sunflower, sugarcane, bottlegourd, brinjal etc. are semi tolerant.

Fertilizers, Bio fertilizers and Green manures

Use of farm yard manure or nitrogen fertilizers have been found to improve saline soils. Green manuring with *Sesbania aculeate* (Dhaincha), sunhemp or guar also to improve salt affected soils. Blue green algae like *Nostoc, Anabaena, Chlorobium* use as biofertilizers for improving salt affected soils.

Afforestation programmes

The National Commission on Agriculture launched several afforestation schemes in the sixth plan to cope up with the problem of spreading wasteland. The National Wasteland Development Board, Ministry of Environment and Forests has set a target of bringing 5 million hectare. of wasteland annually under firewood and fodder plantation.

Revegetation of mining wastelands

It is evident that a mined area may become as productive as native undisturbed site. If it is revegetated with suitable species compatible to the environment of the area. Revegetation of mined areas in Australia, USA and other western counries has been found to be very successful. In India, several attempts have been made to green the mining wastelands in different parts of our country.

Both exotic as well as indigenous species have been tried. In Madhya Pradesh and Chhattisgarh revegetation has been done in the bauxite, coal, dolomite, limestone and iron ore mining areas. *E. camaldulensis, E. tereticornis* and *Eucalyptus* hybrid have been found to be most successful.

Revegetation of wasteland by social Forestry/ Agroforesty Programmes

These programmes mostly involve strip plantation on road, rail and canal sides, rehabilation of degraded forest lands, farm forestry, wasteland forest development, etc.

Afforestation of Railway line

Agave, Arundodonex, Saccharum, Ipomoea sp. In sandy and loamy soil *Tectona grandis, Syzygium*

cuminii, Eucalyptus, Acacia arabica, Acacia nilotica and *Anoegissus latifolia* etc. *Butea monosperma* plantation in saline soil.

Afforestation of canal banks

Along canal banks plantation like *Syzygium cuminii, Dalbergia sissoo, Mangifera indica, Acacia arabica, Terminalia arjuna, Michalia champa, Tamarindus indica, Azedirachata indica, Eucalyptus and Causuarina* sp. In stony soil *Agave* plantation is very effeicient.

Afforestation in marshy and waterlogged area are *Salix tetrasperma, Sesbania grandiflora, Eugenia jambolana, Bambusa arundinacea* etc. In wasteland area of village side *Eucalyptus, Azedirachta indica, Pongamia glabra, Albizzia lebbeka, Acacia arabica, Bossia latifolia, Casuarina equisitfolia, Acacia coniamna* and *Acacia auriculiformis* are planted.

Discussion

The total forest area of the world in 1990 was estimated to be 7,000 million hectares which was reduced to 2890 million ha in 1975 and fell down to just 2,300 million ha. by 2000. The forested area in India seems to have stabilized since 1982 with about 0.04% decline annually between 1982-90 FAO (1983) estimated that about 1.44 m.ha. of land was brought under afforestation during this period leading to stabilization. As per FAO estimates, the deforestation rate per unit population in India is the lowest amongst the major tropical countries.

As per our National Forest Policy as we are still having only 19.27% of our land area (63.38 mha) covered by forests based on satellite data (MoEF, 1998). Large scale deforestation has been reported in Mussoorie and Dehradun valley due to indiscriminate mining of various minerals over a length of about 40 km. Indiscriminate mining in forests of Goa since 1961 has destroyed more than 50000 ha. of forest land. Coal mining in Jharia, Raniganj and Singrauli areas have caused extensive deforestation in Jharkhand. Mining of magnesite and soap- stones have destroyed 14 ha. of forest in the hill slopes at Khirakot, Kosi valley , Almora. The rich forests of Western Ghats are also facing the same threat due to mining projects for excavation of copper, chromites, bauxite and magnetite. About 200 open cost mining and quarrying centers in Udaipur (Rajasthan) about half of which are illegal are involved in stone mining, including soapstone, building stone, rock phosphate and dolomite. The mines spread over 15000 hectares in Udaipur have caused many adverse impacts on environment. The mining activity of sand and stone excavation in Morena, Bhind district in M.P. also adversely affected

the flora and fauna have disappeared from the mining area. Sand mining operations within and around the National Chambal Gharial sanctuary has left many areas permanent infertile and barren.

These activities are also responsible for loss of vegetal cover and denudation of extensive land areas leading to desertification.

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