Chapter 12

Issues and Challenges for Stone Mining Affected Forest Area Restoration Through Probiotic Interventions

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ABSTRACT

The sandstone quarrying and mining in Vidhyan region of Uttar Pradesh has severely devastated the floral biodiversity of the adjacent forest area. It is necessary to conserve these areas for the protection and sustainable use of forest resources. In most of the conservation program, microbial deficiency creates problems in establishment of the vegetation and delays the natural succession. Therefore, probiotic interventions were applied to conserve these areas promptly. The probiotic beneficial microbes’ interventions, due to their multifarious beneficial characters, may facilitate the upcoming of flora through enrichment of the soil, better nutrient absorption, providing resistance against different stresses, etc. Probiotic interventions may positively impact the conservation of floral diversity and restoration of stone mining-affected forest area.

1. INTRODUCTION

Mineral deposits are one of the major natural resource which can be used beneficially for the humankind. They are regarded as non-renewable resources and are mainly used by man for (a) materials for industry (b) sustenance of life and (c) energy. The mining is an age-old economic activity, though its nature and form has been changed over times. The dependence of primitive societies upon mined products is illu-
ated by the nomenclature of those epochs like Stone Age, Bronze Age and Iron Age, a sequence which also depicts the increasing complexity of society’s relationship with mining. In a sense, the history of mining is the history of human civilization (Khoshoo, 1991).

It is a vital sector of economy for all countries. In India, an area of about 683,671 ha is under mining leases in twenty one (21) states, maximum number of mines being in the states of Rajasthan, Jharkhand, Bihar and Orissa. Major share of the mineral production comes from the open cast mining all over the world and about 75 percent of the world mineral output comes from open cast operation (Dubey, 2010, 2018). Mining affects the environment in adverse ways depending on the type of material excavated, method of mining, surface overburden and mine spoils etc. The resultant environment is not suitable for any productive use, be it agriculture, forestry, pasture or recreation. (Saxena and Chatterji, 1988 a, 1988 b). Major environmental impacts of Mining Activities are sinking of land, removal of vegetation or deforestation, pollution hazards, change of land capability class, changes in hydrological pattern, overturning of soil-substratum sequence, degradation of land etc. In addition to these impacts, the mining operations lead to various sociological changes and adverse visual impacts (Khoshoo, 1991).

**STONE MINING**

There are an estimated 1,000 million tons of stone in India. India accounts for around 27% of the total natural stone production of the World. The Sandstone quarrying and mining in Vindhyan region, consisting mainly of tropical dry deciduous forest is mainly opencast type and carried out predominantly by private parties as artisanal mines and marketed as Slab stone, Millstone and Building stone and for cement production. The environmental impacts of these quarry operations can be large and far-reaching. Sandstone mining scars the landscape, disrupts ecosystems and destroys microbial communities (Srivastava, 1999; Sharma et. al., 2000; Liu et. al., 2009; Sarma, 2013; Verma et. al., 2014; Chatturvedi and Singh, 2017; Dubey, 2010; 2017; 2018; 2019, Upadhyay et. al., 2016; Jitendra et. al. 2019). Most of the mining areas are associated with forest, this exploration and exploitation of mineral wealth brings in complete destruction of forest and vegetation in the area and formation of new wastelands in the form of barren dumps of mine overburdens with consequential ecological disturbances and environmental hazards.

**Major Impacts of Stone Mining**

It is a well-established fact that mining, underground or opencast, is an environmentally unfriendly activity affecting five environmental components, namely, society, ecology, land, water and atmosphere (MINENVIS, 2006). The impacts of mining on the environment and people are manifold. It destroys the whole bionetwork. The present intense mining activity at the expense of the environment has resulted in a global awareness towards undertaking studies for providing the means to counter the environmental damage. The indiscriminate and unscientific mining, absence of post mining treatment and management of mined areas are making the already fragile ecosystems more vulnerable to environmental degradation and leading to large scale land cover and land use changes (Bhardwaj et al., 2000). There is a range of negative environmental impacts associated with extractive industries. This is especially true for opencast mining of the sort, used in extracting sandstone in India (Basu, 1986). The greatest impact is the destruction of the habitat where the quarrying occurs (Walker and del Moral, 2003; Walker, 2002 a, b,
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