

ECOLOGICAL RESTORATION



***SINGLE-TIER, MONOCULTURE PLANTATION
OVER SUBSIDED AREA, KATRAS***

***THREE-TIER NATIVE SPECIES PLANTATION
AT OB DUMP, GKKC, KUSUNDA***

BCCL is the pioneer company in the mining industry for conducting ecological restoration in its degraded and mined out lands. Ecological Restoration involves three tier plantation with native species consisting of lower level grasses, middle level shrubs/ bushes and top level trees. The objective being establishing a natural forest eco-system with biodiversity and to bring back original normalcy of function, structure, potential, service and process of eco system as existed prior to mining activity. BCCL had prepared a Road map for ecological restoration of degraded and mined out lands of BCCL through Forest Research Institute (FRI), Dehradun in July 2011 and constituted a dedicated team for successful implementation.

Earlier massive plantation work was taken up by BCCL in the coalfield through state forest department over 3676 Ha. However such single tier plantation shows green canopy in aerial view only and not effective in checking erosion, recharging ground water and establishing bio-diversity. Further selection of species was not considered to meet socio-economic requirement of the local community.

Ecological restoration is the process of short-circuiting the natural recovery of degraded ecosystems through ecological interventions. The ecological restoration is to establish a three-tier vegetation comprising of native species grasses as lower tier, shrubs and bushes as middle tier and trees as upper tier with an objective to establish biodiversity and food chain; to improve the local climate regime and socio-economic condition. Removal of invasive weeds and addition of biomass to the degraded land creates an opportunity for the native species to germinate and establish biodiversity. Ecological restoration enhances biodiversity at faster rate and over time, 300 species may develop creating natural forest over OB dump. Therefore ecological restoration of mined out areas is the most appropriate ecologically and socio-economically compatible measure. Such restored area can serve as replacement of Reserve forest below which the presence of mineral is found in future. It will be like to like replacement & will fulfill energy security of the country

The mined dumps were composed of big and small boulders of shaly sandstone, sandstone, shale and with traces of soil. Earlier, these dumps were profusely invaded by exotic weeds like Parthenium Hysterophorus, Croton Bonplandianus, Xanthium Strumarium and Eupatorium Odoratum, Lantana Camara. Due to more than 100 years of mining and severe land degradation, there is no soil cover on the dumps and was poor in nutrients.

In 2011, BCCL in association with Forest Research Institute (FRI), Dehradun and Prof. CR Babu, Centre for Environmental Management of Degraded Ecosystem (CEMDE), Delhi University started ecological restoration of the mined out degraded land and overburden dumps. Efforts were specially made in selection of species which are native to the region; generate the large quantity of biomass to enrich the soil; ability to stabilize the soil structure; utility to the local community. Therefore, species of trees, shrubs, herbs, grasses with multiple use value like fuel, fodder, fruit, medicine were used during the process of ecological restoration.

Subsequent to the success of the above pilot projects, BCCL has identified surplus man power for taking up Ecological restoration departmentally. BCCL has drawn up a plan for ecological restoration of about 226 ha mine degraded land in 5 years. Ecological restoration has been done over 69 Ha of mined out land/OB dump and ecological restoration over further 51.69 Ha is taken up in current year. With a vision to develop a forestry team dedicated to ecological restoration in all the 12 operational areas of BCCL, more than 135 BCCL workers from all the Areas of BCCL have been trained at VTCs of different Areas.

The grass species introduced are *Cenchrus ciliaris*, *Cenchrus setigerus*, *Pennisetum pedicellatum*, *Heteropogon*, *Stylosanthes*, *Chrysopogon*, *Bothriochloa*, *thysanolaena latifolia*, *Dichanthium*, *Arundo*, *Eragrostis*, *Cynodon dactylon*, *Chloris*, *Digitaria*, *Saccharum spontaneum*, *Hamata*, and *Panicum Nitidum*. In addition, Shrub species *Dodonaea viscosa*, *Vitex negundo*, *Dendrocalamus strictus*, *Dendrocalamus asper* and *Bambusa bambos*, *Woodfordia fruticosa*, *Calotropis procera*, *Cassia tora*, *Datura stramonium*, *Ziziphus Mauritiana*, *tephrosia purpurea*, *Adhatoda zeylanica* and *Agave sislana* and the tree species *Albizia procera*, *Dalbergia sissoo*, *Phyllanthus embilica*, *Albizia lebbeck*, *Bahunia variegata*, *Aegle Marmelos*, *Madhuca indica*, *Ficus religios*, *Ficus hispida*, *Syzygium cumini*, *Casia Fistula* etc have been introduced.

The grass seeds have been procured from the reputed institutions like Central Arid Zone Research Institute(CAZRI), Jodhpur; CAZRI, Pali-Marwar and Indian Grassland and Fodder Research Institute(IGFRI), Jhansi and IGFRI, Dharwad etc. The saplings of the native species are being procured locally.

The results are extremely good and encouraging. The species which were practically vanished from the region are resurfaced after removal of weeds and introduction of supporting native species. Surrounding communities have found fodder for their cattle and will further be benefitted by forest produce in future. The ecological restoration work implemented by BCCL is highly appreciated by experts and dignitaries. BCCL has also undertaken the carbon sequestration study for quantifying the carbon dioxide being sequestered by the ecological restoration sites for a better understanding of the benefits by ecological restoration.



OB dump at Tetulmari, Sijua before Ecological restoration



OB dump at Tetulmari, Sijua after Ecological restoration



OB dump at Damoda, Barora before Ecological restoration



OB dump at Damoda, Barora after Ecological restoration



GKKC, Kusunda site before Ecological restoration



GKKC, Kusunda site after Ecological restoration



ROCP, Bastacola Area site before Ecological restoration



Present status of ROCP, Bastacola Area site before Ecological restoration



A villager taking fodder from ER site ROCP, Bastacolla





Fauna at ER sites

Ecological restoration with Cultural theme

At Lodna area, an ecological park is being developed with socio-cultural aspects and to benefits the local people of the region. The aim is to develop and dedicate the park to local community of the region.

A complex of temples have been constructed on the topmost point of the site to respect the sentiments and religious feelings of the local communities and connect them with the ecological work being done. The other features of the site are the development of the fruit orchard, bamboo satum, native species tress, flower garden, picnic spot and park for the locals to recreate, rejuvenate and relax will also be incorporated in the park.



Lodna ecological & cultural restoration over earlier fire area of NT/ST OC (dragline can be seen in in background)