

Reclamation of degraded mining lands in eastern region of India: An action plan

V.P.UPADHYAY
Ministry of Environment and Forest
Eastern Regional Office, Bhubaneswar

Various natural and or anthropogenic activities pose numerous challenges and adverse impact on the environmental parameters, ecological productivity, food security and the quality of life. Loss of biodiversity, climate change and their impact on livelihoods is closely associated with land degradation. Land degradation leads to decline in land quality. Globally, land degradation adversely affects the ecological integrity and productivity of nearly 2 billion hectare, nearly one-quarter of all landscapes under human use. In India, over thirty-two percent, i.e.105 million hectare of the total geographic area of the country is undergoing processes of land degradation. With just two per cent of the total geographic area of the world and eighteen per cent of the world's population, land degradation can have far reaching impacts on the growth trajectory of the country (Source: PIB India). India has taken various programmes for treatment of degraded/ wastelands to bring them to productive use. Extracts of various reports brought out by the Government for management of wastelands are reproduced below in order to understand efforts made in this regard.

Sustainable land management system promotes and enriches the soil by nitrogen fixation, improves drainage, achieves efficient nutrient cycling and diversifies the land output. Water erosion is the major degradation process affecting 107 m ha of land. Nearly 10 m ha are degraded due to water logging. About 50 per cent



In India, over thirty-two percent, i.e.105 million hectare of the total geographic area of the country is undergoing processes of land degradation. With just two per cent of the total geographic area of the world and eighteen per cent of the world's population, land degradation can have far reaching impacts on the growth trajectory of the country. Land degradation leads to decline in land quality. Globally, land degradation adversely affects the ecological integrity and productivity of nearly 2 billion hectare, nearly one-quarter of all landscapes under human use.

of forest areas is suffering from various degree of degradation. Restoration of degraded lands and prevention of potentially vulnerable lands from degradation are crucial to sustainable land management system.

India action plan for management of degraded lands :

Various Watershed Development Programmes, with a view to prevent soil erosion and land degradation is implementing the

Ministry of Agriculture. These are (i) National Watershed Development Project for Rainfed Areas (NWDPA), (ii) Soil Conservation for Enhancing the Productivity of Degraded Lands in the Catchments of River Valley Project and Flood Prone River (RVP & FPR), (iii) Reclamation and Development of Alkali & Acid Soils (RADAS), (iv) Watershed Development Projects in Shifting Cultivation Areas (WDPSA).

Year	Milestones
1951	A voluntary and professional body was earlier set up in 1951 named The Soil Conservation Society of India (SCSI). The SCSI was instrumental in setting up the Soil and Water Conservation Division in 1963 in the Central Department of Agriculture and Cooperation under the Ministry of Agriculture.
1972	Integrated thinking about the need of a land use policy started.
May, 1985	A National wastelands Development Board (NWDB) set up in the Ministry of Environment and Forest with the objective of bringing 5 million hectares of lands under fuel wood and fodder plantations every year.
July, 1992	The NWDB was strengthened by its elevation to a full-fledged department, namely, <i>Department of Wastelands Development</i> under the Ministry of Rural Development.
April, 1999	The <i>Department of Land Resources</i> set up in April, 1999 under the Ministry of Rural Development renaming the then Department of Wastelands Development. The new Department comprises of two divisions viz. (i) Land Reforms Division and (ii) Wastelands Development Division.

The soil formation and soil erosion is a natural process, occurring simultaneously to maintain the equilibrium in eco-system. As per the study conducted (2005) by National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) - Indian Council of Agricultural Research (ICAR) Regional Center, Nagpur, out of country's total geographical area of 328.60 million ha, about 146.82 million ha area (45%) is suffering from various kinds of land degradation as per break up given below:-

The Wastelands Atlas of India, the first of its kind, by the Department of Land Resources, in collaboration with the National Remote Sensing Agency (NRSA), Hyderabad, identified the extent of wastelands/degraded lands. 63.85 million ha is the extent of Wastelands in the country, grouped into 13 categories. This accounts for 20.17% of total geographical area

S.No.	Type of Land Degradation	Extent of Area in million ha.
1.	Water Erosion	93.68
2.	Wind Erosion	9.48
3.	Water Logging	14.30
4.	Salinity/Alkalinity	5.95
5.	Soil Acidity	16.03
6.	Complex Problem	7.38
	Total	146.82

New initiatives under the Integrated Watershed Management Programme:

Following three major area development programmes are being implemented on watershed basis since 1995-96 to check the diminishing productivity of wastelands and loss of natural resources:-

- Drought Prone Areas Programme (DPAP)
- Desert Development Programme (DDP)
- Integrated Wastelands Development Programme (IWDP)

These programmes are being implemented on the basis guidelines, norms, funding patterns and technical components. DDP is focusing on reforestation to arrest the growth of hot and cold deserts. DPAP concentrates on non-arable lands and drainage lines for in-situ soil and moisture conservation, agro-forestry, pasture development, horticulture and alternate land uses. IWDP adopts silvipasture, soil and moisture conservation as prominent activities on wastelands under the control of government, community or private individuals.

The Forest Survey of India classifies forests into Very Dense Forest (all lands having tree cover with canopy density more than 70%), Moderately Dense (all lands having tree cover with canopy forest density between 40% and 70%), Open Forest (all lands having tree cover with canopy density between 10% and 40%), and Scrub (all forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent). The last two categories, namely, Open, and Scrub having forest canopy density less than 40% are commonly categorized as degraded forests.

Sustainable Land and Ecosystem Management PROGRAMME (slem) AND Poverty Alleviation by Enhanced Efficiency of Natural Resource Use:

It is a joint initiative between the Government of India (GOI) and the Global Environmental Facility (GEF). The objective is to secure larger-scale and sustained impact on the global environment through integrating global environment objectives into national or regional strategies and plans through partnerships. This consists of a number of projects spread across diverse ecological zones, with an overarching objective of poverty alleviation by promoting sustainable land management practices. These practices would lead to improved land and ecosystem productivity, and also reduce vulnerability to extreme weather events, including the effects of climate change.

Major objectives of SLEM:

- (i) Prevention and/or control of land degradation by restoration of degraded (agricultural and forested) lands and biomass cover and make sustainable use of natural resources in selected project areas;
- (ii) Enhancement of local capacity and institution building to strengthen land and ecosystem management;
- (iii) Replication and scaling up of successful land and ecosystem management practices and technologies to maximise synergies across the UN Conventions on Biological Diversity (CBD), Climate Change (FCCC), and Combating Desertification (CCD) conventions.

Policy Coordination:

To ensure a smooth functioning across the SLEM Programme, coordination on policy will be achieved through a National Steering Committee (NSC), under the Chairpersonship of Addl. Secretary, Ministry of Environment and Forests (MoEF), Government of India to provide policy guidance. NSC will identify key policy and institutional reforms related to mainstreaming and up-scaling of best practices in the areas of Land management, Water Harvesting and Conservation, Biodiversity Conservation, Adaptation to Climate Change etc; and suggest appropriate measures.

RESTORATION AND PROTECTION OF FOREST COVER:

Two major afforestation and eco-restoration schemes of the Government of India, National Afforestation Programme (NAP) and Additional Central Assistance for Accelerated Programme Of Restoration and

Regeneration of Forest Cover can contribute to increasing the forest and tree cover of the country including the northern states Under Accelerated Programme of Restoration and Regeneration of Forest Cover” scheme, There is an “Integrated Forest Protection Scheme” renamed as “Intensification of Forest Management Scheme” aims at protection of forests in the country and not at increasing the forest cover. The targets for afforestation/tree planting fixed annually and monitored under 20 Point Programme for the year 2002-03 to 2006-07 in 10th Five Year Plan and from 2007-08 to 2009-10 up to October 2009 in 11th Five Year Plan are as given below:

Five Year Plan	Year	Target	Achievement
Tenth	2002-03	1.53	1.14
	2003-04	1.50	1.22
	2004-05	2.12	1.58
	2005-06	2.26	1.99
	2006-07	2.61	2.32
Eleventh	2007-08	1.86	1.54
	2008-09	1.77	1.67
	2009-10	1.81	1.05 *

*Achievement upto October 2009

Following steps have been taken by the Government for Afforestation / Tree Planting:

- (i) The Ministry of Environment and Forests is implementing a major scheme namely: National Afforestation Programme (NAP), a Centrally Sponsored Scheme for regeneration of degraded forests and adjoining areas in the country. As on 18-02-2010, 800 FDA projects have been approved in 28 States to cover a project area of 1.69 million ha. Rs.2231.10 crore has been released so far under NAP Scheme.
- (ii) Two new Eco- Task Force (ETF) Battalions have been operationalised by the Ministry for ecorestoration of degraded areas in Assam, in addition to supporting the existing four ETF battalions in the country.
- (iii) A new scheme for afforestation involving Panchayati Raj Institution, Gram/ Panchayat Van Yojana has been mooted by the Ministry.
- (iv) Tree planting is a permissible activity under a number of schemes of other Ministries of Government of India, notably NREGS, Ministry of Rural Development, Ministry of Agriculture etc.
- (v) Under National Action Plan on Climate Change announced by the Prime Minister, National Mission for a Green India is included as one of the eight missions.
- (vi) A new state plan scheme of 'Additional Central Assistance for Accelerated Programme of Restoration and Regeneration of Forest Cover' has been introduced during 2009-10.

Indira Priyadarshini Vrikshamitra Award

The Ministry of Environment and Forests, Government of India instituted Indira Priyadarshini Vrikshamitra Awards (IPVM) in 1986 to recognize the pioneering and innovative contribution made by the individuals and institutions in the field of afforestation/wasteland development every year. Since 2006, awards are given in four categories namely Individuals including Government Servants, Institutions/ Organizations under Government Joint Forest Management Committee (JFMC) and Non-Governmental Institutions/ Organizations

IPVM Awards are given in the field of afforestation and wasteland development and assessed on the basis of criteria like replicability, innovativeness/creativity, setting up of grassroot level organizations, soil and moisture conservation work and other related activities, target groups like women/weaker sections of society, people in inaccessible/remote areas, work being done over and above the call of duty/involving personal courage, tangible impact in relation to resources mobilized, educative and awareness creating values, etc. IPVM awards for the States are presented on the basis of percentage increase in the forest and tree cover to the geographical area of the state on the basis of India State of Forest Report published by Forest Survey of

RECLAMATION OF DEGRADED MINING LANDS

In addition to above programmes of central and state Governments which largely cover Government revenue/forest lands or agriculture croplands, There are other degraded sites due to mining and industrial operations. The eastern region of the country has large number of mining projects affecting the biodiversity because these are mostly located in side rich forests areas of the region. The fragmentation of habitats and pollution are the major issues which affect the ecological settings as well as community livelihood. Decline in ecological services due to developmental activities and extraction of natural resources by mining; create Animal-Human conflicts as well as Industry-People conflicts. Therefore, a sustainable strategy for rehabilitation of degraded mining areas and restoring the ecological services is the need of the hour. This action will ensure intactness of biodiversity components and stability of ecosystem.

The provisions of various laws make it mandatory for the Mine Owners of the country to reclaim and rehabilitate the mined out and degraded mining areas before handing over back to the Government or individuals from whom the area was taken for mining. Further, the State Forest Departments also take up compensatory afforestation in lieu of forest areas diverted for mining under the provisions of the Forest (Conservation) Act, 1980 at the cost of the mining project.

**Table 1 : STATE WISE SUMMARY OF MINE LEASE DISTRIBUTION:
(As on 31/03/2009)**

S.NO.	STATE	NUMBER OF LEASES	LEASE AREA(ha)
1	BIHAR	10	2030.16
2	JHARKHAND	323	36974.67
3	ORISSA	387	67212.90
4	WEST BENGAL	70	4090.10
TOTAL			110307.83

These mine leases are mostly located inside the forest areas; some areas are very rich in biodiversity. Mining activity leads to fragmentation of habitats and wild life corridors also get affected. There is also impact on regeneration potential of certain species which may need animal or wind as a media to reach

to far off places in forests. The buildings, roads, mine pits etc. act as a obstacle in continuity in ecosystem structure and function. From the below given table, one can imagine the importance of forests in mineral production and loss of valuable flora and fauna.

Table 2 : State-wise coal mining projects approved under Forest (Conservation) Act, 1980.

25.10.1980 and 16.07.2009 As on :16/07/2009

STATE/UT	No.Proposals	Forest Land Diverted (Ha.)
Andaman & Nicobar islands	0	0.00
Bihar	0	0.00
Jharkhand	57	7545.33
Orissa	23	2899.99
West Bengal	3	260.03
Total	83	10704.35

The target area of the action plan:

We have large number of industrial and mining projects in the region which are covered under the mechanism of environmental impact assessment and for monitoring. The

mining projects with lease area under 5 ha are not covered under EIA notification. It means there could be far greater number of projects where we need to intervene to restore the degraded areas.

Sl. No.	Projects	ORISSA	WEST BENGAL	JHARKHAND	BIHAR	A & N ISLANDS	TOTAL
2	Mining	150	34	86	NIL	NIL	270
3	Industry	101	111	32	12	2	258

The safeguards which are generally stipulated and need to be implemented by mining projects are given below which are agents of better restoration options and mainly stipulated as a measure for implementing best environmental management practices.

- ♦ GREENBELT DEVELOPMENT
- ♦ GARLAND DRAINS BE MADE AND PROPERLY MAINTAINED.
- ♦ TOP SOIL PROPERLY MANAGED FOR SPREADING ON THE TOP OF THE OB DUMPS TO RAISE PLANTATIONS;
- ♦ CONCURRENT BACKFILLING AND BIOLOGICAL RECLAMATION OF THE MINED AREAS
- ♦ MANAGEMENT OF OB DUMPS BY LIMITING 28 DEGREES SLOPE OF THE OB DUMPS ;THE SLOPES TO BE STABILIZED; TERRACING BENCHING CONCEPT TO BE ADOPTED AND DUMP HEIGHT STIPULATED

THE JAPAN EXAMPLE OF RESTORATION:

In Japan, there are a few institutions and NPOs (non profit organizations) involved in rehabilitation of degraded lands by following scientific ecological principles. The industry and other organizations have also applied restoration method advocated by Professor Akira Miyawaki in several areas in Japan, China, Laos, Indonesia and Kenya. I attended a training course which was mainly on the Miyawaki's Method methods of rehabilitation As part of this training course I could visit a few Rehabilitation projects in central Japan(Kanagawa Prefecture) and I observed that these sites have success-

fully been rehabilitated with support from Industries and communities by following Miyawaki's Rehabilitation methods. The success of the programmes is due to availability of scientific method, involvement of people and full support from coordinating NPOs. Professor Miyawaki himself takes up and joins the majority of rehabilitation programmes to educate the people in the field. Unlike other countries where most planting schemes center around non native and low ecological value species, the method of Professor Miyawaki lays an emphasis on planting only species of the "vegetation" (PNV) of the Area. The Species of PNV are selected on the basis of phytosociological study of the nearby natural forests to inventories the Potential Natural Species. I have made a tabular format to describe the details of the planting technique and schedule under Miyawaki method:

Conclusion :

Rehabilitation and restoration is a very critical and sensitive issue for any mining project. Rehabilitation process is an on-going programme designed to restore physical, chemical and biological quality of environment disturbed as a result of mining to a level acceptable to all concerned. Mutual respect and realistic expectation from both sides i.e. mining companies and the local communities will help building image of mining companies as well as winning confidence of people. Mining industry has Social responsibilities and obligations towards all people living in the region. Rehabilitation of degraded mining lands will help restoring the ecological services for the people and environment. Rehabilitated land should aim at a self-sustaining eco-system and as a social assets and sustainable livelihood source for the local

<p>1. SELECTION OF SITE</p> <p>SELECT MINING DEGRADED AREA</p> <p>OBTAIN DATA ON PHYSICAL CHARACTER OF THE AREA</p> <p>CARRY OUT THE PHYTOSOCIOLOGY OF NEARES NATURAL FOREST</p> <p>FIND OUT THE POTENTIAL NATURAL NATIVE SPECIES</p> <p>TAKE ACTION TO RAISE SEEDLINGS</p>	<p>2. INVOLVE COMMUNITY GROUPS AND STUDENTS</p> <p>ARRANGE WORKSHOPS FOR THE STAKEHOLDER GROUPS</p> <p>PROVIDE PROPER TRAINING ON REHABILITAION METHOD AND EXTENT OF THEIR INVOLVEMENT</p> <p>OFFER INCENTIVES TO COMMUNITY FOR COLLECTING SEEDS AND RAISING SEEDLINGS</p> <p>PROVIDE KNOWHOW FOR RAISING NURSERY SEEDLINGS INCLUDING MATERIALS</p>
<p>3. ENSURE SITE REQUIREMENTS</p> <p>DESIGNATE THE AREA FOR REHABILITATION</p> <p>ARRANGE MATERIALS FOR TREATMENT OF SOIL EROSION</p> <p>ARRANGE BAMBOO FOR SLOPE TREATMENT</p> <p>ARRANGE TOP SOIL</p> <p>ARRANGE MULTCHING MATERIAL</p> <p>WATER AND SANITATION FACILITY</p>	<p>4. SITE REHABILITATION</p> <p>SOIL WORKING AND PREPARATION OF DESIGNATED AREA</p> <p>USE ONLY ALL ORGANIC NUTIRENTS</p> <p>PLANTING THE AREA BY MIYAWAKI/MODIFIED MIYAWAKI METHOD</p> <p>MULTCHING SPREAD AND TIE WITH ROPES DIAGONALLY</p> <p>LABELLING OF PLANTS</p> <p>INITIAL MEASUREMENT FOR HEIGHT AND DBH</p>

community. The Miyawaki method seems to be difficult to be implemented on country basis because we lack database of earlier rehabilitation experiments to show that the programmes are ecologically stronger and economically encouraging. We need a strong data base of results of long term study which clearly establishes that it is economically as well as ecologically viable to convince the policy makers. The mining projects could adopt some country examples like Japan etc. where the method has already been adopted and is working well. We

need to develop a database across regions (where such rehabilitation programmes can be undertaken) to improve ecological values and bring positive changes in environmental quality. Rehabilitation programmes will help the degraded sites in course of time to regain natural character after planting and to the extent help restoration of ecological services. Donor institutions can also contribute to the success of the rehabilitation programme by funding large scale regional programmes as funding and economic consideration are big factors in large-scale programme of environmental restoration.