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## **9.7 Rehabilitation of iron ore mine wasteland in Goa**

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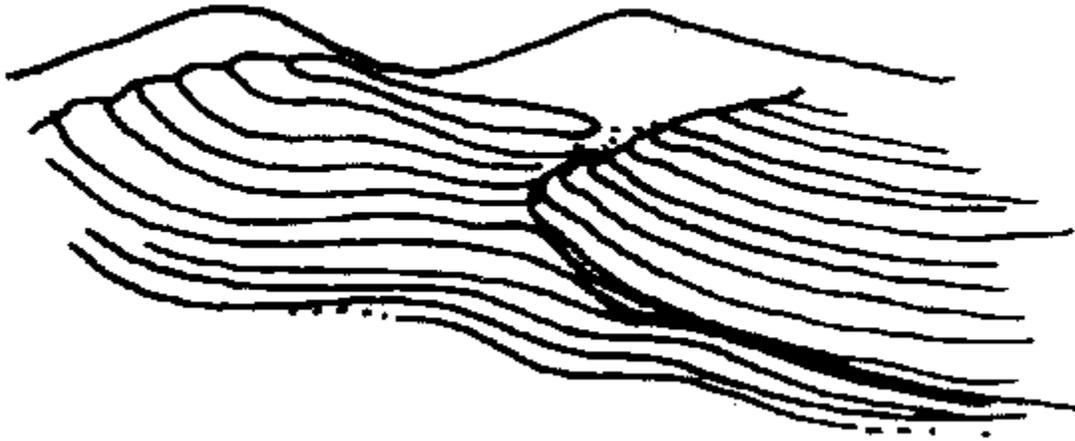
### **Ecosystems and plant succession**

Vegetation is closely related to the soil in which it has its roots, the associated fauna, and the surrounding environment. All these elements interact and support each other to form an ecosystem. Although ecosystems are sensitive to the outside influences, they are self-sustaining. Once properly established, they need no further support. This is because they cycle materials which maintain the vegetation and other organisms.

Ecosystems change over time. After a major disturbance such as a landslide or fire, vegetation will gradually develop naturally. Grasses are replaced by shrubs, which in turn give way to trees and their associated vegetation. This process is termed plant succession. Reaching the final, stable stage (called the climax vegetation) can take hundreds of years.

Mining produces a major disturbance in the ecosystem. The topsoil is removed, leaving bare rock, making it hard for vegetation to become reestablished. The reject materials may be contaminated with heavy metals. This means that natural succession will be even slower.

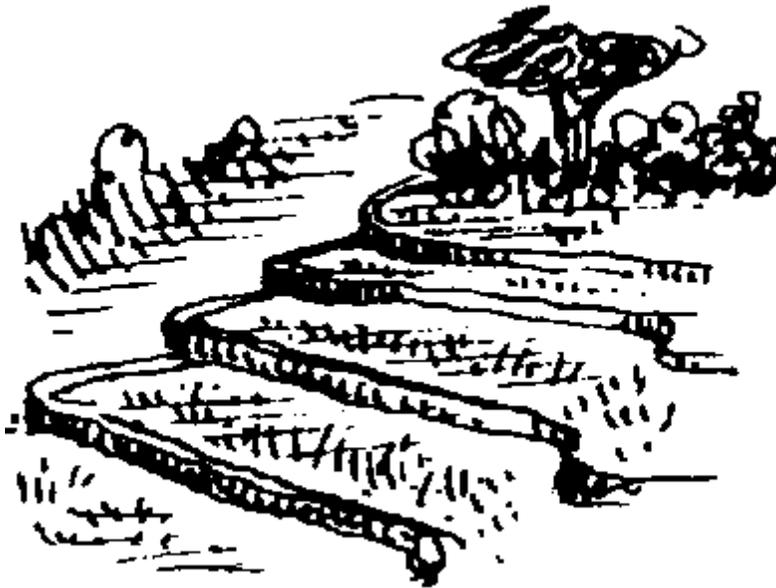
Normally, natural processes would gradually recolonize the mine sites and spoil heaps, building up the soil and reclothing the landscape in vegetation. However, this can take a long time. Meanwhile, the unprotected surface is subject to erosion, clogging rivers and lakes with silt.



Ecosystems

### **Rehabilitation measures**

- Reducing the angle of slope of the spoil dumps is essential. Terracing helps reduce erosion, hold water and improve the local microclimate.



Rehabilitation measures

- Removing and storing topsoil for reuse would make it easier to reestablish vegetation. Topsoil contains organic matter, plant nutrients, seeds and useful microbes.



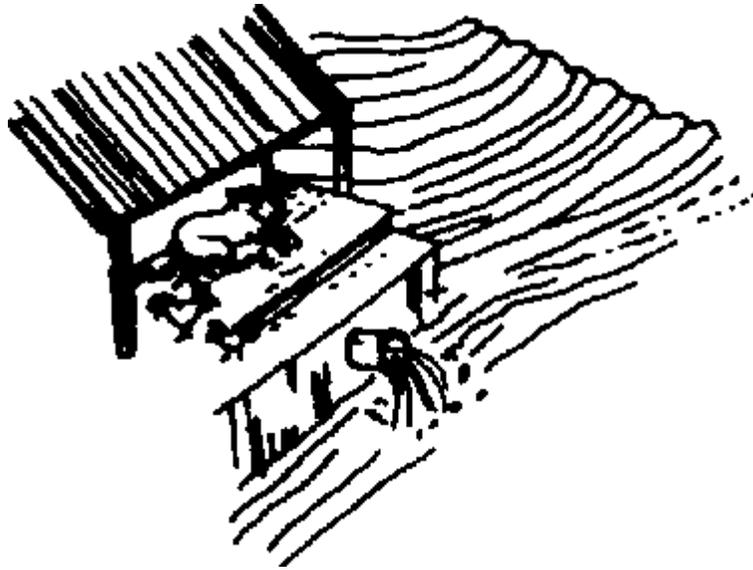
#### Rehabilitation measures

- The soil becomes compacted because it has a high clay content and mining uses heavy machinery. Compaction tends to reduce moisture infiltration and results in poor plant growth. This problem can be overcome by ripping the surface with deep lines drawn by a crawler tractor, followed by cultivation. Ripping improves aeration, water retention, root penetration and erosion control.



#### Rehabilitation measures

- Rejects and tailings are deficient in organic materials. Adding organic materials like sewage sludge, seaweed, green manure and farmyard manure improves the soil status and helps plants become established. These organic materials contain enzymes responsible for mobilization of nutrients to plants. They also help in the development of beneficial microflora (algae, fungi and bacteria) and microfauna.



### Rehabilitation measures

- Mine rejects and tailings are deficient in macro and micronutrients. This severely limits plant growth. Adding normal agricultural fertilizers considerably improves plant growth. The amounts to be applied can be calculated from a soil chemical analysis.



### Rehabilitation measures

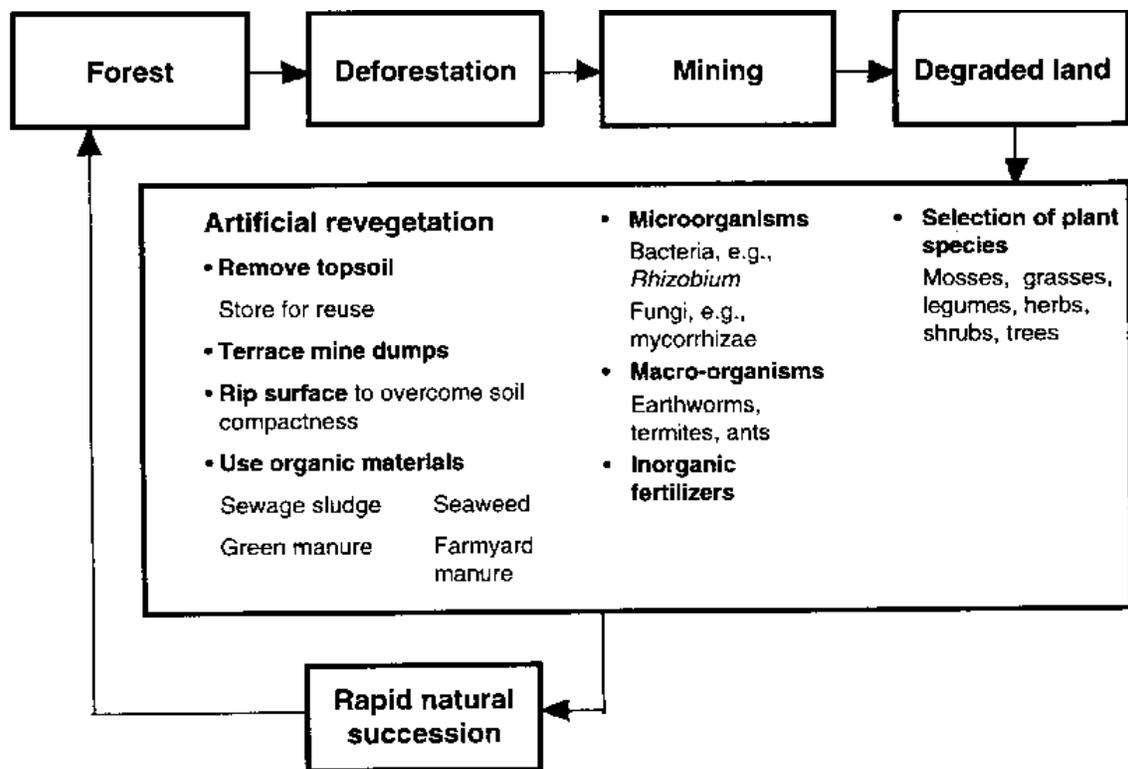
#### **Accelerated succession**

Rehabilitating mining sites is a way to speed up and control the vegetative succession. It aims to achieve vegetation cover within a few years, so that the later succession will be quick. The ecosystem should be self-sustaining, increasing the area's biodiversity.

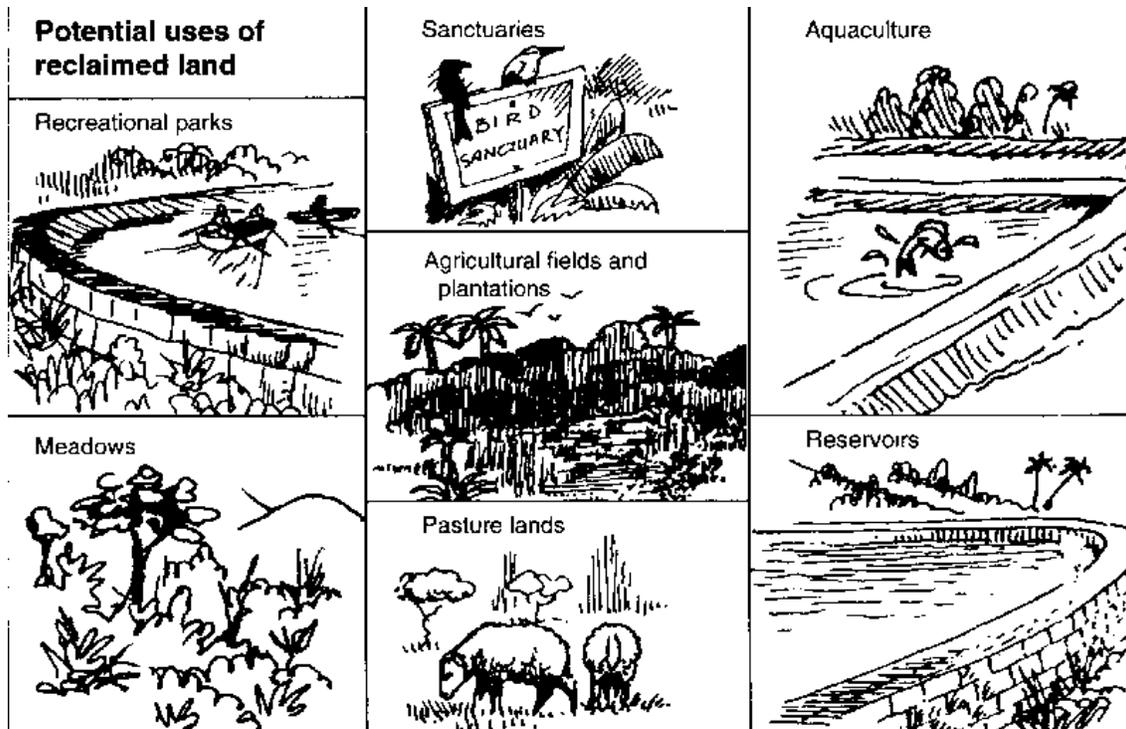


### Accelerated succession

Achieving a self-sustaining ecosystem in degraded areas requires careful planning before mining starts. The mining industry need not degrade the environment if imagination, care and scientific skill are applied.



Rehabilitating iron ore mine lands in Goa



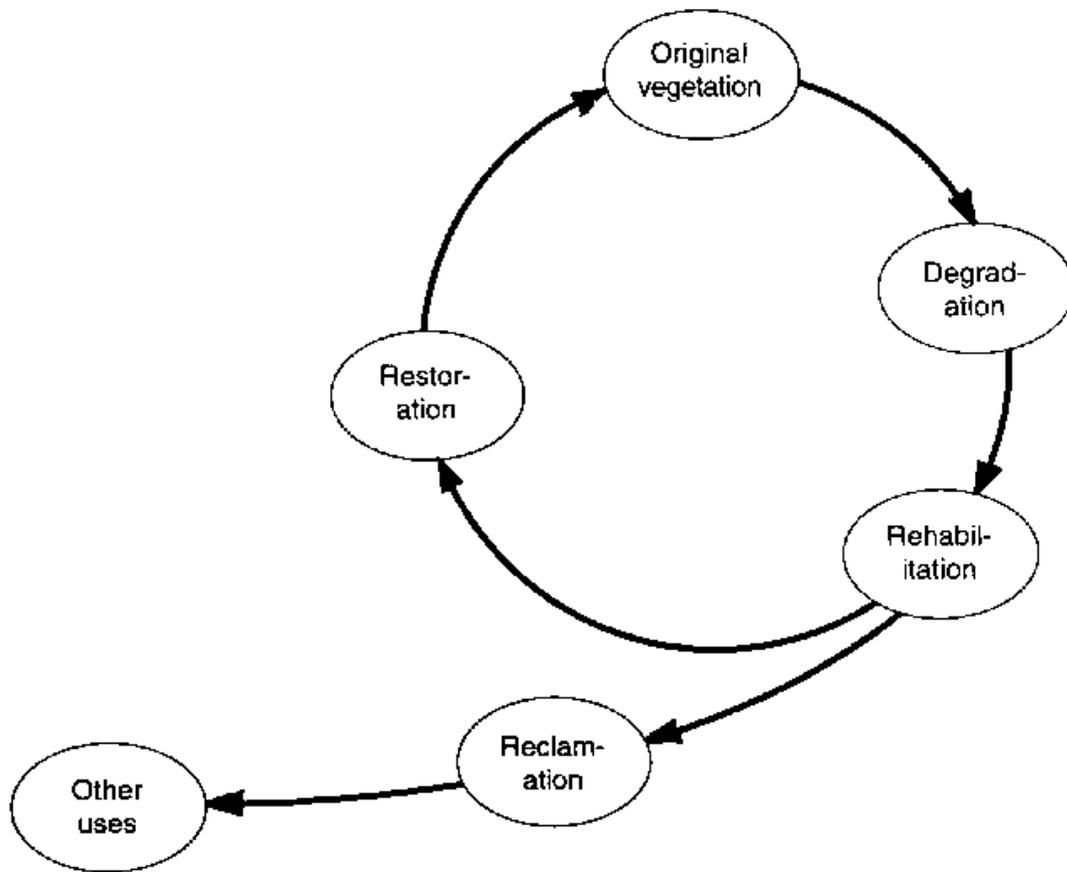
Potential uses of reclaimed land

Rehabilitation strategies

"Rehabilitation" is a broad term which may include restoration or reclamation. It means resuming a site to a stable condition-such as forest or pasture. A rehabilitated site does not necessarily have the same land use as before mining.

"Reclamation" means rehabilitating an area for productive use such as farming or fisheries.

"Restoration" means returning the land to its previous state before mining-such as restoring the original forest cover.



Rehabilitation strategies

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