

Planting operations

The coastal area available between sea and the adjacent road (upto a maximum of 20 m width) will be taken leaving about 10 m from the sea for planting *C. equisetifolia*. Spacing between plants and between rows was 1 x 1 m and the pit size was 30 x 30 x 30 cm.

Mixed bio-shield: Mixed species planting against the natural calamities will give the good result.

Steps to establish / conserve bioshield In Andaman and Nicobar Island

- Coastal vulnerability mapping and identification of most vulnerable areas
- Identification of suitable sites, species selection and planting method
- Establishment of bioshield with multipurpose trees and other plants
- The natural protection (bioshield) should be identified and protected from human disturbances

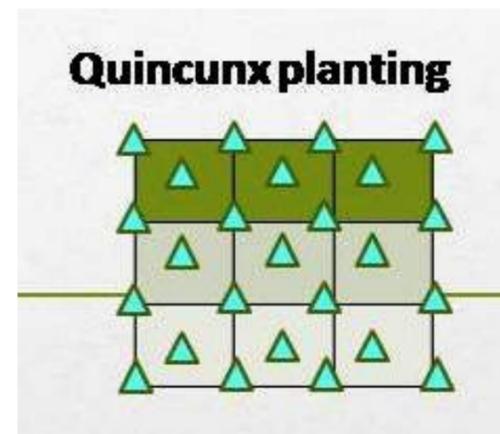
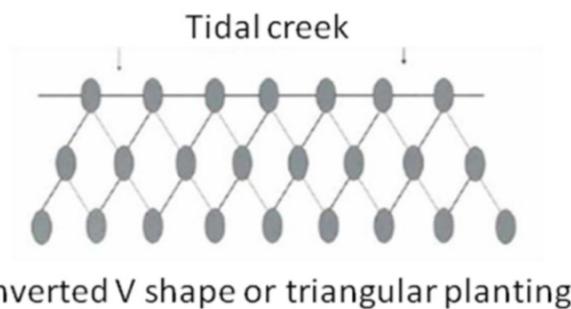
Bioshield

Establishment and conservation of multipurpose coastal vegetations



(Natural defence against the sea surges and tsunami)
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What is bioshield?

Coastal vegetation has been widely recognized as a natural method to reduce the energy of storm surges and tsunami waves. However, a vegetation barrier cannot completely stop a tsunami or storm surge and its effectiveness depends on the magnitude of the storm surge as well as the structure of the vegetation. The effectiveness of vegetation also changes with the age and structure of the forest. This highlights the fact that proper planning and management of vegetation are required to maintain the buffering function of coastal forests.

In common parlance “Bio shield” refers to the vegetation between sea and living habitat. Coastal vegetation is mainly of two types – mangroves and non-mangroves. Bioshield usually consist of mangroves in the sea front and other species such as Casuarinas, Laucaena, Atriplex, Palms, Bamboo, Manilkara, Sterculia, Pandanus, Terminalia, halophytes and other shrub species that inhabit lower tidal zones. The concept of bioshield is learnt from the nature, the way it protects the islands against the action of sea waves.



Importance

Properly established / natural bioshield can block or buffer wave action with their stems, which can measure up to 30 meter high and several meters circumference. They trap sediment in their roots; thereby maintain a shallow slope on the seabed that absorbs the energy of tidal surges. They also break the high velocity of winds and thus protect agricultural crops besides providing shelter and grazing lands for the livestock and farms. They reduce evaporation from the soil, transpiration from the plants and moderate extreme temperatures. They also protect fertile coastal agricultural land from erosion. Systematic regeneration of the bio-shields in the coastal belts wherever feasible is the most natural and cost effective method of protecting these areas from storm surges and erosion. In addition, bioshield provide habitat for large variety of flora and fauna to thrive. It is one of the unique biodiversity with saline tolerant and other useful genes, which are in its natural habitat.

Relevance / significance to Islands

Observations of damage during the December 2004 Indian Ocean tsunami in coastal areas indicated that mangrove wetlands and shelter belt plantations such as Casuarinas, Palm trees and other thick coastal vegetation had a positive effect in reducing loss of lives and properties in the settlements located behind these areas. This may be due to the friction / obstruction created by these trees in rows reduced the force of sea / tsunami waves.

Some of the multipurpose species for Island condition

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|---|------------------------------------|------------------------------------|
| <i>Casuarina equisetifolia</i> Forst. | <i>Pongamia pinnata</i> L. | <i>Avicennia spp.</i> |
| <i>Manilkara littoralis</i> | <i>Azadirachta indica</i> A. Juss. | <i>Sonneratia spp.</i> |
| <i>Ficus spp</i> | <i>Morinda citrifolia</i> | <i>Rhizophora spp.</i> |
| <i>Thespesia populneoides</i> (Roxb.) Kostel. | <i>Cassia fistula</i> L. | |
| <i>Hibiscus tiliaceus</i> L. | <i>Cocos nucifera</i> L. | <i>Ipomoea spp</i> |
| <i>Barringtonia spp.</i> | <i>Anacardium occidentale</i> L. | <i>Nypa fruticans</i> |
| | <i>Syzygium spp</i> | <i>Bixa orellina</i> L. |
| | <i>Pandanus tectorius</i> | <i>Bambusa arundinacea</i> (Retz.) |

Shelterbelts in the coastal areas

Non-mangrove bio-shield along the coastal zone is popularly known as shelterbelts which are strips of vegetation composed of trees and shrubs grown along the coasts to protect coastal areas from high velocity of winds, salt sprays and natural hazards like cyclones and tsunami. Shelter belts have positive effect on animals, crops and physical structures.

Suitable species

1. *Anacardium occidentale*,
2. *Azadirachta indica*,
3. *Bambusa bambos*,
4. *Bixa orellina*,
5. *Manilkara littoralis*
6. *Cassia ostula*,
7. *Casuarina equisetifolia*,
8. *Clerodendron serratum*,
9. *Cocos nucifera*,
10. *Hibiscus tiliaceus*,

11. *Pongamia pinnata*,
12. *Sterculia spp.*
13. *Sapindus emarginatus*,
14. *Thespesia populneoides*
15. *Vitex negundo*
16. *Pandanus spp.*
17. *Terminalia catappa*,
18. *Gyrocarpus americanus*,
19. *Guettarda speciosa*
20. *Bombax insigne*

