"Coastal protection in the aftermath of the Indian Ocean tsunami: what role for forests and trees?"
28 – 31 August 2006, Khao Lak, Thailand

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Coastal forests and trees can, under certain conditions, act as bioshields to protect lives and valuable assets against coastal hazards, including: tsunamis, cyclones, wind and salt spray and coastal erosion.
2. The degree of protection offered by coastal bioshields depends on a number of variables, including: i) the characteristics of the hazard itself (e.g. type, force, frequency, etc.) ii) the features of the site (e.g. bathymetry, coastal geomorphology, etc.) and iii) the characteristics of the bioshield (e.g. type of forest/tree, width, height and density of the forest, etc.)
3. Care must be taken to avoid making generalizations about the protective role of forests and trees based on evidence from one or a few areas; the many factors that influence the protective role of the forests/trees must be understood and taken into consideration before lessons can be learned and applied elsewhere.
4. Coastal forests and trees are not able to provide effective protection against all hazards (e.g. extremely large tsunami waves, flooding from cyclones, and certain types of coastal erosion); provisions for other forms of protection and (in extreme events) for evacuation must be relied upon. Care must be taken not to create a false sense of protection against coastal hazards.
5. The importance of incorporating coastal protection as an integral part of coastal area planning and management is recognized.
6. The options for protection include: soft solutions, hard engineering solutions and a hybrid of the two. If none of these are appropriate and viable, it may be necessary to zone coastal land use to prevent (further) settlement and construction of valuable assets in the vulnerable zone.
7. It is important to match the species with the site in order to avoid high mortality and low performance of the planted trees. Some forest types and tree species cannot survive or thrive in areas exposed to specific coastal hazards, therefore will not be candidates for protective measures.
8. Development of bioshields is not possible in all situations due to biological limitations, space constraints, incompatibility with priority land uses, prohibitive costs, etc.
9. The level of knowledge and understanding of the functions of forests and trees in coastal protection is still insufficient and there is a lack of multidisciplinary research and cooperation in this field. Specific areas needing further attention include research in non-mangrove coastal forests and collection of data and development of models on interaction between the physical and ecological parameters.
10. There is a need to recognize that many years are required to establish and grow bioshields to a size and density that could offer protection against coastal hazards.

11. Considerable research and field initiatives related to forests and coastal protection have been carried out over the past several years; this provides a useful foundation for further work to improve understanding of forests' protective role.

Recommendations

Assessment and design of bioshields

12. The following process of analysis is recommended to assess the potential for protection:

a) identify the areas that are subject to coastal hazard(s) and the characteristics of the hazard(s);
b) identify and prioritize the assets that need protection;
c) identify the options for protection (hard, soft and hybrid measures);
d) consider the costs and benefits of the protective measure(s).

When a conclusion has been reached that forests and trees should be used for protection, the bioshield should be designed using best practice.

13. The following broad approaches are recommended:

a) protecting and managing existing coastal forests that provide protection of people and valuable assets against coastal hazards so to maximize their protective role;
b) rehabilitating existing degraded forests whose protective function has been impaired;
c) planting new forests and trees in sites where they have the potential to provide protection.

14. The design of protective measures using trees and forests must take into consideration not only physical and biological features, but also economic, social and cultural factors of the site.

15. Local people should be involved in the design and development of the bioshield so that they have a stake in protecting and maintaining it over the long term.

16. The multiple functions of coastal forests and trees (i.e. economic/livelihoods protection, wildlife habitat, aesthetics, etc.) need to be recognized and prioritized in establishing and managing coastal forests to enhance protection. It should be recognized that these functions and objectives may be compatible and mutually supportive, or they may be mutually exclusive.

Institutional and policy support and outreach

17. National governments should review existing coastal forest management policies and regulations to assess their practicality, e.g. regarding setback (no construction) zones, protected forests, etc.

18. National and local governments should develop/revise policies on coastal forest management and, as appropriate, integrated coastal zone management policies, regulations and guidelines so that they adequately reflect the role of coastal forests/vegetation in enhancing coastal protection and improving livelihoods.

19. National/local government should develop national/local coordination bodies for coastal area management and establish realistic integrated and participatory coastal management plans, incorporating bioshield development and management, as appropriate.

20. All sectors involved in the management of coastal forests and related natural resources should be involved in the development of disaster management policies and plans and be included in

national disaster management committees (where they exist) to ensure that the role of forests and trees is adequately addressed.

21. National disaster management committees should identify the link between disaster management and environmental management with special emphasis on the role of coastal forests and trees.

22. Additional research and multidisciplinary cooperation is needed to improve scientific knowledge and understanding of the protective functions of forests and trees against coastal hazards.

23. Efforts should be made to translate scientific knowledge into practical guidelines and technical information for use by coastal forest managers and other relevant coastal land managers.

24. Capacity in coastal forest management for protection should be strengthened through education, training, and extension.

25. Efforts should be made in raising awareness of the importance of forests and trees in coastal protection among disaster management decision makers, natural resource managers, NGOs, the private sector, local communities and the general public. (e.g. through demonstration sites, published materials and mass media such as videos, comic books, "pocket books", etc.)

National, Regional and international cooperation

26. National agencies, the private sector, and international donors should provide financial support for research, capacity strengthening and field implementation related to forest management for enhanced coastal protection.

27. FAO should support enhanced regional cooperation, including through workshops, working groups and technical networks.

28. A regional database should be developed on best practices, suitable species, and other relevant information for improved management of coastal forests for enhanced protection.

29. FAO should collect and publish information on local and indigenous knowledge, attitudes and practices related to the use of forests and trees in coastal protection.

30. Support should be provided to initiatives (e.g. Mangrove for the Future, Green Coast initiative, Asian Greenbelt initiative, etc) that provide a framework for national actions and regional cooperation to address the issue of coastal rehabilitation for protective purposes.