



Coastal protection in the aftermath of the Indian Ocean tsunami: What role for forests and trees?

**Proceedings of the Regional
Technical Workshop**

Khao Lak, Thailand
28–31 August 2006



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ISBN 978-974-7946-95-6

Cover design: Somchai Singasa

Cover photo: Jeremy Broadhead

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Foreword

The Indian Ocean tsunami of 26 December 2004 was one of the most devastating natural disasters in human history. The widespread wreckage and loss of life were hard to conceive and the subsequent outflow of national and international assistance was unprecedented. All around the Indian Ocean efforts were made to restore order and rebuild the lives and livelihoods of the millions affected. A proportion of the reconstruction and rehabilitation effort was focussed on environmental rehabilitation and a part of this again on the rehabilitation of coastal trees and forests. Many programmes were implemented during the post-tsunami period to restore coastal trees and forests, and in particular mangrove forests. Early information suggested that extensive areas of forest had been destroyed by the tsunami. It later became clear that the area of forest destroyed by the tsunami was small in relation to that removed by human activity over past decades. Other information from a range of sources strongly suggested that coastal forests had afforded some degree of protection from the devastation caused by the tsunami. These factors, and reductions in risk associated with increased distance of human habitations from the coastline, provided justification for tree planting programmes and led to calls to establish coastal buffer zones in a number of tsunami-affected countries. The effectiveness of trees and forests in shielding coastlines from tsunamis was later called into question, however, as was the practicality of planting trees to protect coasts in relation to other possible measures.

FAO has been deeply involved in these efforts through the Finnish-funded “Forestry programme for early rehabilitation in Asian tsunami-affected countries” [OSRO/GLO/502/FIN] and many other projects. Thanks to the generosity of the Finnish Government, FAO was able to organize the workshop on “Coastal protection in the aftermath of the Indian Ocean tsunami: What role for forests and trees?” to assess and synthesize information on the protective functions of coastal forests.

The workshop’s overall goal was to contribute to coastal area planning and forest management by increasing understanding of the roles that forests and trees may play in protecting coastal areas from tsunamis and other natural hazards and processes, namely cyclones, wind and salt spray and coastal erosion. Workshop participants represented a wide range of disciplines. They included physicists and coastal engineers, disaster management specialists, government representatives and policy makers, field-based practitioners, academics and international development workers. The technical papers included in these proceedings provide information on the processes and outcomes of interactions between trees and forests and each of the four coastal hazards. The outputs from the working group sessions and the recommendations reflect the intensity of debate that took place in the meeting and the wide range of opinions that were expressed.

Emerging from the workshop was the message that many variables are associated with the coastal protective functions that trees and forests can play and that broad conclusions are difficult to draw. It is clear, however, that for all the coastal hazards/processes discussed, trees and forests can provide protection under some circumstances. Further work is needed before definitive conclusions can be made, but FAO hopes that these proceedings will provide coastal planners with greater insights into the relevant factors, leading to more informed decisions related to the roles of trees and forests in protecting against coastal hazards.

He Changchui
Assistant Director-General and
Regional Representative for Asia and the Pacific
Food and Agriculture Organization of the United Nations

Acknowledgements

The organizing committee wishes to express its warmest thanks to the Government of Finland for its generous contribution to the FAO-supported project “Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries,” the framework of which supported the organization of this workshop.

Sincere thanks to all the authors of the thematic papers who enriched workshop preparation and discussions with their knowledge on coastal hazard mitigation measures. In particular to Mr P. Berg, who kindly agreed to provide information on the important role of trees in combating coastal erosion, wind and salt spray in New Zealand.

FAO is also grateful to the representatives from the governments of the eight tsunami-affected countries and to all the experts who attended the workshop and contributed significantly to its success.

The organizing committee would also like to thank the FAO forestry officers who provided important support for the preparation of the workshop and for reviewing technical papers: Mr J. Ball, Ms S. Braatz, Mr J. Broadhead, Mr C. Brown, Mr J. Carle, Mr F. Castañeda, Mr P. Durst, Ms S. Fortuna, Mr D. Renault and Ms M.L. Wilkie.

Grateful acknowledgements are also extended to all the national and international experts who contributed comments and suggestions to help with the organization of the workshop: Mr F. Danielsen, Prof L. Dengler, Mr R. Dubey, Ms K. Ewel, Dr E. Gilman, Mr C. Guard, Prof P. Grundy, Mr L.P. Jayatissa, Prof K. Kathiresan, Dr N.M. Tamin, Dr J.E. Ong, Dr M. Vannucci and Dr A. White, as well as all the other experts who helped with the preparation of the workshop.

FAO gratefully acknowledges Ms S. Fortuna for the organization and smooth functioning of the workshop, as well as for the preparation of this report.

Executive summary

The regional technical workshop on *Coastal protection in the aftermath of the Indian Ocean tsunami: What role for forests and trees?* was organized by the Food and Agriculture Organization of the United Nations (FAO) under the auspices of the FAO Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries, funded by the Government of Finland. The workshop was held from 28 to 31 August 2006, in Khao Lak, Thailand.

The main objective of the workshop was to contribute to improved coastal area planning, coastal forest management and disaster mitigation by increasing the knowledge and understanding of the role of trees and forests in protecting populations and assets from the most common and destructive natural hazards affecting coastal areas of Asia, namely cyclones, erosion, tsunamis and wind and salt spray.

The specific objectives of the workshop were:

- To assess the effectiveness of coastal forests and trees in protecting populations and resources from the aforementioned natural hazards in Asia.
- To increase understanding of the effectiveness and value of coastal forests and trees relative to other forms of coastal protection, for example “hard” (engineering) structures, sand dunes and other coastal vegetation in the region.
- To identify the variables that will determine the potential effectiveness of forests and trees for providing coastal protection.

Sixty-three participants, including government representatives from the eight tsunami-affected countries (Bangladesh, India, Indonesia, Malaysia, the Maldives, Myanmar, Sri Lanka and Thailand), experts from 15 other countries and delegates from national, regional and international organizations attended the workshop. All the participants agreed that the workshop provided a rare opportunity for multidisciplinary analysis of the coastal protection issue. Coastal engineers and oceanographers, forest ecologists and managers, disaster management specialists, coastal planners and social scientists had the opportunity to share their combined experience; the event was considered to be an important beginning or strengthening of collaborations between the different — but highly related — disciplines.

The experts concluded that forests and trees can act as bioshields for the protection of people and assets against tsunamis and other coastal hazards — but whether they are effective, and the degree of their effectiveness, depends on many variables. It is important to understand, however, that they do not provide effective protection against all hazards (for example extremely large tsunami waves, flooding from cyclones and certain types of coastal erosion). The degree of protection they offer depends on a number of variables, including the characteristics of the hazard itself (type, force, frequency), the features of the site and the characteristics of the bioshield (*inter alia* type of forest or tree species, density and height).

Care must be taken to avoid making generalizations and creating a false sense of security. In cases where bioshields are not a feasible option or sufficiently effective, provisions must be made for other forms of protection, including hard solutions and a hybrid of hard and “soft” solutions; evacuation may also be necessary. It has also been noted that the development of bioshields is not possible in all situations because of biological limitations, space constraints, incompatibility with priority land uses, prohibitive costs and so forth. It should be recognized that many years are required to establish and grow bioshields to a size and density that offers protection against coastal hazards. Once it has been decided that forests and trees should be used as mitigation measures for an area, during bioshield development planning, species for planting should be scientifically

identified as some forest types and tree species cannot survive or thrive in areas exposed to specific coastal hazards — decreasing, or even reversing, the effectiveness of the protection.

In order to save as many lives as possible, the use of bioshields should be considered within the framework of disaster management strategies, which also include effective early warning systems and evacuation plans.

The participants highlighted the need to translate scientific knowledge into policy-relevant information for decision-makers and into technical guidelines and information for coastal resource managers. They also recommended that 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. The experts and government representatives also observed that regional cooperation, juxtaposed by the use and publication of indigenous knowledge, are key elements for the success of the implementation of field projects related to coastal protection.

After a welcoming speech from Mr He Changchui, Assistant Director-General and Regional Representative of the FAO Regional Office for Asia and the Pacific, invited experts elaborated on scientific knowledge related to the role of mangroves and other coastal forests as protection against tsunamis, cyclones, wind and salt spray, as well as coastal erosion. A session on coastal planning and a synthesis of the current knowledge of the use of coastal forests and trees as mitigation measures against natural hazards provided an important contribution to the discussions. Case studies from eight countries in the region were also presented by national experts and representatives, highlighting the role of coastal forests in protecting lives and resources from different natural hazards in their own countries. (These are abstracted as “field study presentations” in this publication.)

Based on the presentations and discussions, the participants were then divided into break-out groups to discuss two topics:

1. In the first session, the participants were divided into four break-out groups to discuss and develop a diagnostic tool for identifying the variables needed to assess the protective potential of forests and trees against tsunamis and other common natural hazards affecting the coasts of Asia.
2. In the second session, the participants were divided into three break-out groups to clarify the current state-of-the art of the topic addressed by the workshop at the international level and in the Asian tsunami-affected countries, and to identify actions to improve the situation and generate recommendations for action.

The results of the diagnostic tool working groups are found in Part 2, while formulated conclusions and recommendations are reported in Part 3.

Welcome address

Mr He Changchui, Assistant Director-General and Regional Representative for Asia and the Pacific

Distinguished participants,
Colleagues,
Ladies and gentlemen,

It is my great pleasure to welcome you, on behalf of the Regional Office of the Food and Agriculture Organization of the United Nations, to this important regional technical workshop on *Coastal protection in the aftermath of the Indian Ocean tsunami: What role for forests and trees?*

The Indian Ocean tsunami of 26 December 2004 highlighted the need for protection and sound management of coastal environments. Following the tsunami, the role of mangroves and other forests and trees as protective barriers received considerable attention in the press and in academic circles. Observations and anecdotal reports indicated that intact and extensive areas of coastal forests reduced the loss of life and assets from the tsunami. However, the picture is not that simple. The effectiveness of forests and trees in coastal protection against different hazards depends on several factors, including the nature of the hazard and the characteristics of the vegetation. These factors must be well-understood if efforts to improve coastal protection through forest management are to be successful.

The need for synthesis of existing information and for more scientific studies and rigorous assessments of the protective roles of coastal forests and trees has been highlighted in several meetings, including the FAO-supported “Regional Coordination Workshop on Rehabilitation of Tsunami-affected Forest Ecosystems: Strategies and New Directions,” held 7 to 8 March 2005, in Bangkok.

The tsunami has cast much needed light on coastal forests. I believe it is safe to say that the benefits of these resources have been undervalued by many, if not most decision-makers and planners, and even natural resource managers. This has contributed to neglect of these resources. FAO’s *Forest resources assessment 2005* reports that the area of mangroves worldwide decreased by about 20 percent between 1980 and 2005. Although the rate of loss appears to have decelerated — from about one percent per year in the 1980s, to about 0.7 percent per year in the 2000 to 2005 period — the continued decrease in mangrove area represents a loss of important goods and environmental services. There are no global figures — and in most cases no country figures — on other types of coastal forests and trees. These resources have been overlooked even more glaringly than mangroves. The attention the tsunami has drawn to coastal forests offers a unique opportunity to increase awareness of their value and the consequences of their loss.

Thanks to the generous contribution of the Government of Finland, the FAO-executed project “Forestry Programme for Early Rehabilitation in Asian Tsunami Affected Countries,”¹ has been operational since mid-2005, under the dynamic leadership of Ms Susan Braatz, Programme Coordinator, in cooperation with a wide range of partners to support coastal forest rehabilitation in tsunami-affected areas of Indonesia, Sri Lanka and the Maldives. This project has also allowed FAO to promote information sharing within the region on coastal forests and to organize this workshop. Next month, the project will support two more workshops related to rehabilitation in Asian tsunami-affected countries. The first, which will take place on 26 September, will focus on

¹ OSRO/GLO/502/FIN.

coastal forest rehabilitation and management. The second, from 27 to 29 September, targets coastal area planning and management. Both will be held in Bangkok.

FAO supports an active programme for tsunami rehabilitation in the forestry, agricultural and fisheries sectors through 75 projects, ongoing or completed, with a combined total value of US\$65 million. We are working hard to foster coordination across these sectors and to address cross-sectoral issues in tsunami rehabilitation efforts in the affected countries.

The goal of the workshop is to increase knowledge and understanding of the role of forests and trees in protecting coastal populations and assets from natural hazards threatening Asian coastal areas.

As tsunami-affected countries move from emergency response into long-term rehabilitation, it is important that the role of coastal forests and trees in protecting lives and assets in coastal areas, as well as in providing other environmental services and various products, is fully taken into account. We hope that the workshop findings will contribute to improved rehabilitation efforts in the tsunami-affected countries. Further, we anticipate that lessons learned will be brought to bear on improved coastal area management in other areas.

I wish you a fruitful exchange of ideas and information this week and successful workshop outcomes.

I hereby declare the workshop open.
Thank you.