

## **FOREWORD**

# A Vital Information Tool for Managers and Decision-makers Working to Safeguard Our Mangrove Ecosystems

Being a scientific society with a vested interest in the protection and restoration of mangroves and other coastal environments, it is with great pride that The International Society for Mangrove Ecosystems (ISME) provides the foreword to this important new work. In recognising the economic and ecological importance of mangrove forests and ecosystems, we have a responsibility to provide the means to sustainably manage and protect this vital coastal resource for future generations.

Edited by three outstanding mangrove experts—Prof. Y. Mazda, Dr. E. Wolanski and Dr. P.V. Ridd—this book targets members of the scientific community who are interested in the preservation and sustainable utilisation of mangrove forests. The book has set itself five principal objectives:

- 1) To instruct mangrove researchers and engineers in developing countries on the physical processes taking place in the mangrove environment;
- 2) To encourage students to undertake studies of physical processes in mangrove areas;
- 3) To make coastal physical researchers recognise the peculiarity of mangrove physics;
- 4) To show the physical mechanisms that have been solved and need to be solved; and
- 5) To save research time by providing ready access to scientific articles and papers that appear in diverse media in different countries.

As reliable information is fundamental to the long-term health of mangrove ecosystems, ISME believes that this book will provide and contribute to the strengthening of scientific understanding, as well as the development and exchange of essential data and information required for the conservation, restoration and management of mangrove forests. The information developed and provided in the book constitutes a vital new resource for effective decision-making and policy formulation in the sustainable management of all mangrove ecosystems.

The first part of the book provides an outline of the physical processes within mangrove systems through sections on: the state of mangrove studies from a physical viewpoint; physical factors that shape mangrove environments; hydrodynamics and physics supporting the mangrove environment; feedback processes that maintain the mangrove environment; research technology and the modeling of mangrove systems; and current and future studies on the preservation and utilisation of mangroves. The second part compiles global case studies on mangrove physics in various areas, including: relationships between tidal flow, mangrove vegetation and landforms; the action of sea waves on mangrove swamps; groundwater flow; physical mechanisms affecting water properties; sediment dynamics; the role of the atmosphere; material exchanges between mangrove areas and the open sea; and the interrelation between physical, chemical and biological processes in the mangrove environment.

It is our belief that this publication will provide a vital information tool for managers and decision-makers, as well as an invaluable resource for scientists and researchers working to safeguard our mangrove ecosystems.

Nairobi, 15 December 2006

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President,  
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# An Up-to Date Systematic Study on the Physical Processes in Mangroves

Living in tropical areas, every year the coastal communities in many Asian countries have to suffer from various natural calamities such as storms, typhoons or tsunamis. Other threats to coastal zones have emerged in recent years, including global warming and sea level rise. Coastal dwellers in some countries have for a long time known that protected natural mangrove forests or planted mangrove belts can help mitigate the consequences.

Due to the pressures of population overgrowth and economic development, however, mangrove forests have been severely destroyed or converted to other economic uses. It is obvious that mangroves the world over are in great danger.

Strong typhoons and tsunamis have recently caused very serious damage to human beings and their properties in South Asian and South East Asian. However, where natural mangroves are well conserved or there are wide belts of planted mangroves, the damage was substantially reduced.

There have been numerous studies on the socio-economic aspects as well as management of mangrove ecosystems. Nevertheless, there have not been many which focus on the physical processes and mechanisms in mangroves. In the years ending the 20th century and beginning the 21st century, a number of scientists such as Y. Mazda, E. Wolanski, B. Kjerfve, P.V. Ridd, etc. have published part of their works on these fields in scientific journals. These articles have actively contributed to the database of mangrove related research papers, and also helped to raise awareness and understanding of the role of mangroves in the protection of the coastal life and environment. Some articles on the relation between the tidal flow and mangrove vegetation, action of sea waves intruding mangrove swamps and sediment dynamics in the Vietnam coastal areas with mangroves of Professor Mazda, Dr. Wolanski and their associates have been translated into Vietnamese. Through scientific analysis of empirical data, these articles have been very successful in proving the importance of mangrove forests to local authorities.

In addition to those articles, I have found in the draft of this book useful and up-to-date systematic on the hydro-dynamics and physical processes in mangroves. I believe that researchers, local authorities in mangrove areas, forestry engineers, lecturers and especially students in developing countries with mangrove forests will be grateful to receive this book as a manual for the preservation and sustainable use of the mangrove ecosystem which focus on physical processes.

I hope that the publication of *The Role of Physical Processes in Mangrove Environments* will stimulate a wide range of studies on Mangrove Ecosystems and will result in many publications. I am pleased to recommend this book to the readers.

Hanoi, 11 December 2006

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# Physics Helps Elucidate the Mechanisms of Mangrove Environments

Mangroves construct unique ecosystems along the coasts and estuary areas of tropical and sub-tropical regions in the world. Mangrove ecosystems consist of a limited number of tree species and some animals, and they are regulated by a number of environmental factors.

In Japan, several scientists have studied mangroves from the standpoint of taxonomy and vegetation ecology from the 1950s to the 1970s. . Then from about 1978 Professor Jiro Sugi developed research of mangrove ecosystem with new and challenging in cooperation with Thai mangrove scientists. In 1978, he organized four mangrove research projects. The first focused on vegetation ecology and physiology; the second on fishery and marine biology; the third on meteorology and soil science; the fourth on marine science and physics.

The third and fourth projects were very innovative and important as new research fields of mangrove ecosystems. They helped measurably elucidate the mechanisms controlling mangrove environments and ecosystems.

Dr. Y. Mazda, the lead author of this book, has investigated the tidal and sea wave behavior in mangrove areas for 25 years, as the leader of the fourth group within our mangrove research projects. He has gathered important knowledge of how physics control mangrove ecosystems. This methodology and knowledge that he developed establish useful methods for the conservation of mangrove forests and sustainable utilization of the mangroves.

As a botanist, I have also researched and surveyed mangrove forests in South East Asia in practice and I found that this knowledge of mangrove oceanography contribute significantly to the advancement of research of mangrove ecosystems.

This book is a fruitful result of Mazda's research and surveys, including the results of two other authors, Dr. E. Wolanski and Dr. P.V. Ridd, who are prominent mangrove physicists for a long time for mangrove forests worldwide.

I hope that this book is used as a set text, particularly for young mangrove scientists and students.

Tokyo, 20 December 2006

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