

# **Ecological Research Monographs**

Series Editor: Yoh Iwasa

For further volumes:  
<http://www.springer.com/series/8852>



Nobukazu Nakagoshi • Jhonamie A. Mabuhay  
Editors

# Designing Low Carbon Societies in Landscapes

 Springer

*Editors*

Nobukazu Nakagoshi  
IDEC  
Hiroshima University  
Higashi-Hiroshima, Japan

Jhonamie A. Mabuhay  
Biology Department  
College of Natural Sciences and Mathematics  
Mindanao State University  
Marawi, Philippines

ISSN 2191-0707

ISBN 978-4-431-54818-8

DOI 10.1007/978-4-431-54819-5

Springer Tokyo Heidelberg New York Dordrecht London

ISSN 2191-0715 (electronic)

ISBN 978-4-431-54819-5 (eBook)

Library of Congress Control Number: 2014932982

© Springer Japan 2014

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Preface

Violent tropical low-pressure airs or typhoons emerge from the Pacific Ocean and attack Eastern Asia regularly. However, the advent of “super typhoons,” which have caused unprecedented devastation in recent years, has increased fears among the people. Last year alone, several typhoons damaged many regions including Japan and other Asian countries. The Philippines, home country of co-editor Prof. Jhonamie A. Mabuhay, was not an exception. Destruction was enormous. Thousands of precious lives and properties were lost. In addition, huge tracts of farmland were ruined by flooding and high-tide phenomena. Crops almost ready for harvest, grown painstakingly by hardworking farmers, vanished, and their work was in vain. A few reliable scientific research outcomes support the hypothesis that super typhoons occur as a result of global warming. Accumulated meteorological data also appear to confirm that the current rise in seawater temperature is caused by the rise in air temperature. Aside from typhoons, abnormal weather patterns have also been observed more frequently compared to a decade, two decades, and even half a century ago.

The major cause of global warming is the high concentration of greenhouse gases present in the air. Greenhouse gases such as  $\text{CO}_2$  and  $\text{CH}_4$  are released through human activities. Among these harmful elements,  $\text{CO}_2$  is known as the main culprit. Its presence in the atmosphere is primarily the result of biotic respiration and burning of fossil fuels. The rapid increase of  $\text{CO}_2$ , however, is largely caused by the latter. Fossil fuels such as coal, petroleum, and natural gas were formed through photosynthetic organisms from prehistoric eras. When burned, their carbon content, which had been stored for millions of years, is released into the atmosphere. But the problem goes beyond this. At present, the total area of major  $\text{CO}_2$  absorbers such as forests, wetlands, and coral reefs has been shrinking. The ecological balance has deteriorated as a result of destructive human practices. If the reduction of  $\text{CO}_2$  absorbers accelerates the increase of  $\text{CO}_2$  in the atmosphere, it is common knowledge that controlling  $\text{CO}_2$  emissions and increasing the amount of  $\text{CO}_2$  absorbers are essential keys to total  $\text{CO}_2$  reduction. Ecological research groups have already developed several effective measures such as limitation and optimization of land use, recovery of ecological systems, and development of bio-energy, to name a few. Still, use of a single method alone cannot eradicate the problem.

Low carbon societies can be established by restoring the CO<sub>2</sub> balance through integration of multiple tools as well as simultaneous application of various fields such as physics and chemistry, physiology and humanities, and education. This goal can be realized based upon a universally accepted philosophical way of thinking that the global environment can be protected if people will make certain sacrifices—abandoning daily conveniences and giving up profit-gains, among others. Achieving this low carbon society is our top priority, and landscape conservation is regarded as the first step in this ecological research.

The research introduced in this book focuses on three elements: conservation of ecosystem complexes, changes of arrangement, and creation as a means to achieve a low carbon society. A landscape is a collection of various ecosystems. Specifically, landscapes are classified into three categories: urban, agricultural, and natural, in relationship to humans. The landscape in urban areas is intensively influenced by citizens, whereas the agricultural landscape symbolizes the coexistence between farmers and the ecosystem. Further, the CO<sub>2</sub> balance in a natural vegetation landscape differs greatly from that in urban and agricultural landscapes. There are specific countermeasures for carbon absorption among these three types of landscapes because they have their respective carbon balances. Urban landscapes in East Asia, for example, which have been affected by heat island phenomena, are subject to fierce temperature fluctuation. School biotope projects in Japan, although still small in scale at the moment, are considered a promising solution because young people are encouraged to join environmental protection activities. Similar endeavors aim to rebuild damaged biodiversity in urban areas. Agricultural landscapes, on the other hand, have evolved moderately and thus have created biodiversity through long periods of years. Such landscapes have adjusted themselves to human activities. This book contains several research cases on tropical regions that had not been actively explored in the past. Studies on natural landscapes conducted in wildlife conservation areas consist of those held in nature reserves where local people live, as well as in their surrounding areas. In developed countries, natural areas have been regarded as conserved nature protection areas since early times. By contrast, abundant nature had remained in developing countries such as Indonesia and Malaysia. Later, nature protection areas were designated along with development. Now, developmental pressures have penetrated the nature protection areas. Under these circumstances, landscape ecological projects are needed. Therefore, research outcomes focused on tropical regions became the key in selecting the contents for this book.

Readers may freely choose their favorite chapters according to their individual interests in landscapes. Nineteen chapters chosen for the book were revised papers presented at the 8th World Congress of International Association for Landscape Ecology, Beijing 2011. All the papers were evaluated for technical and scientific quality by experts and accepted by Springer for publication. In fact, there were more than 19 candidates at the time of the proposal; but in the final phase, only those that qualified through peer review have been presented here.

I compiled this book as the main editor, but nothing would have been possible without the frequent discussions with my co-editor, Prof. Jhonamie A. Mabuhay.

My consultations with her were indeed relevant and valuable. Completing the book would have been impossible without the cooperation of many people from various sectors. The following professors and researchers generously and critically peer-reviewed all articles submitted for this publication: Saiful Arif Abdullah (Universiti Kebangsaan Malaysia), Hadi Susilo Arifin (Bogor Agricultural University), Jürgen Breuste (University of Salzburg), Inocencio E. Buot, Jr. (University of the Philippines), Sun-Kee Hong and Jae-Eun Kim (Mokpo National University), Jhonamie A. Mabuhay (Mindanao State University), and Yun Pan (Capital Normal University, Beijing). Dr. R. L. Kaswanto of Bogor Agricultural University and two Ph.D. candidates, Rachmad Firdaus and Beni Raharjo of Hiroshima University, worked hard, and I am grateful for their assistance in editing this book. From at least 27 supporting agencies, there were eight large fund donors: the GELs Program of Hiroshima University; a Grant-in Aid for Scientific Research of JSPS; UNESCO; MAB Korea and Jeollanam-do Province; the Ministry of Science, Technology and Innovation Malaysia; the Ministry of Forestry Indonesia; BAPPENAS Indonesia; the UNREDD Program Indonesia; and the Joint Japan World Bank Graduate Scholarship Program.

Last, I thank my wife, Naomi Nakagoshi of JICA, because she has provided worthwhile advice to the young scholars studying at Hiroshima University and to the visiting professors working in the same university. Through her support, our team was able to discuss successfully the environmental and local situations in the developing countries involved in our studies. I believe many contributors to this book are thankful to her as well.

Higashi-Hiroshima, Japan

Nobukazu Nakagoshi





# Contents

## Part I Introduction

- 1 Landscape Ecological Approaches to a Low Carbon Society . . . . . 3**  
Nobukazu Nakagoshi and Jhonamie A. Mabuhay

## Part II Urban Landscape Ecology

- 2 Cooling Potential of Urban Green Spaces in Summer . . . . . 15**  
Kochi Tonosaki, Shiro Kawai, and Koji Tokoro
- 3 A Study on the Restoration of Urban Ecology: Focus on the Concept of Home Place in Callenbach's *Ecotopia*—A Park Conservation and Community Networks . . . . . 35**  
Masami Kato
- 4 Transpiration Characteristics of Chinese Pines (*Pinus tabulaeformis*) in an Urban Environment . . . . . 57**  
Hua Wang, Zhiyun Ouyang, Weiping Chen, Xiaoke Wang, and Hua Zheng
- 5 Landscape Design for Urban Biodiversity and Ecological Education in Japan: Approach from Process Planning and Multifunctional Landscape Planning . . . . . 73**  
Keitaro Ito, Ingunn Fjørtoft, Tohru Manabe, and Mahito Kamada

## Part III Ecologies in Cultural Landscapes

- 6 Can Satoyama Offer a Realistic Solution for a Low Carbon Society? Public Perception and Challenges Arising . . . . . 89**  
Yuuki Iwata, Takakazu Yumoto, and Yukihiro Morimoto

<b>7</b>	<b>Effects of Sustainable Energy Facilities on Landscape: A Case Study of Slovakia . . . . .</b>	<b>109</b>
	Katarina Pavlickova, Anna Miklosovicova, and Monika Vyskupova	
<b>8</b>	<b>Low Carbon Society Through <i>Pekarangan</i>, Traditional Agroforestry Practices in Java, Indonesia . . . . .</b>	<b>129</b>
	Hadi Susilo Arifin, Regan Leonardus Kaswanto, and Nobukazu Nakagoshi	
<b>9</b>	<b>Challenges and Goal of the Sustainable Island: Case Study in UNESCO Shinan Dadohae Biosphere Reserve, Korea . . . . .</b>	<b>145</b>
	Sun-Kee Hong, Heon-Jong Lee, Bong-Ryong Kang, Jae-Eun Kim, Kyoung-Ah Lee, Kyoung-Wan Kim, and Dae-Hoon Jang	
<b>10</b>	<b>The Neglect of Traditional Ecological Knowledge on Wild Elephant-Related Problems in Xishuangbanna, SW China . . . . .</b>	<b>163</b>
	Zhao-lu Wu, Qing-cheng He, and Qiu-jun Wu	
<b>11</b>	<b>Effects of Tropical Successional Forests on Bird Feeding Guilds . . . . .</b>	<b>177</b>
	Eurídice Leyequién, José Luis Hernández-Stefanoni, Waldemar Santamaría-Rivero, Juan Manuel Dupuy-Rada, and Juan Bautista Chable-Santos	
<b>Part IV Ecologies in Protected Areas</b>		
<b>12</b>	<b>Understanding Development Trends and Landscape Changes of Protected Areas in Peninsular Malaysia: A Much Needed Component of Sustainable Conservation Planning . . . . .</b>	<b>205</b>
	Saiful Arif Abdullah, Shukor Md. Nor, and Abdul Malek Mohd Yusof	
<b>13</b>	<b>Land Use Trends Analysis Using SPOT 5 Images and Its Effect on the Landscape of Cameron Highlands, Malaysia . . . . .</b>	<b>223</b>
	Mohd Hasmadi Ismail, Che Ku Akmar Che Ku Othman, Ismail Adnan Abd Malek, and Saiful Arif Abdullah	
<b>14</b>	<b>The Relationship Between Land Use/Land Cover Change and Land Degradation of a Natural Protected Area in Batang Merao Watershed, Indonesia . . . . .</b>	<b>239</b>
	Rachmad Firdaus, Nobukazu Nakagoshi, Aswandi Idris, and Beni Raharjo	
<b>15</b>	<b>Ecotourism Activities for Sustainability and Management of Forest Protected Areas: A Case of Camili Biosphere Reserve Area, Turkey . . . . .</b>	<b>253</b>
	Mustafa Fehmi Türker, İnci Zeynep Aydın, and Türkan Aydın	

**16 Community Aspects of Forest Ecosystems in the Gunung Gede Pangrango National Park UNESCO Biosphere Reserve, Indonesia . . . . .** 271  
Nobukazu Nakagoshi, Heri Suheri, and Rizki Amelgia

**17 Landscape Ecology-Based Approach for Assessing Pekarangan Condition to Preserve Protected Area in West Java . . . . .** 289  
Regan Leonardus Kaswanto and Nobukazu Nakagoshi

**18 Integrating the Aerial Photos and DTM to Estimate the Area and Niche of *Arundo formosana* in Jiou-Jiou Peaks Natural Reserve of Taiwan . . . . .** 313  
Jeng-I Tsai and Fong-Long Feng

**19 REDD+ Readiness Through Selected Project Activities, Financial Mechanisms, and Provincial Perspectives in Indonesia . . . . .** 327  
Ima Yudin Rayaningtyas and Nobukazu Nakagoshi

**Index . . . . .** 349