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978-1-107-68866-7 - Reshaping Environments: An Interdisciplinary Approach to Sustainability in a Complex World

Edited by Helena Bender

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Reshaping Environments

Reshaping Environments: An interdisciplinary approach to sustainability in a complex world draws together a team of specialist authors from disciplines including urban planning, geography, engineering and environmental science to examine the diverse influences humans have upon the natural environment. This interdisciplinary approach presents multifaceted solutions for complex environmental problems.

The book explores current environmental science theories to provide a solid foundation of theoretical knowledge. Drawing on a range of case studies, it develops core analytical skills for application to real-world environmental issues.

Reshaping Environments gives environmental science students the tools and insight to comprehend the range of influences society imposes on the natural environment. It is essential reading for those interested in creating a mutually beneficial future for human society and the natural environment.

Additional resources are available at www.cambridge.edu.au/academic/reshaping.

Helena Bender is in the Melbourne School of Land and Environment at the University of Melbourne.

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To the earthlings of the 21st century

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Foreword

We humans have always reshaped our environment. Throughout most of human history, our numbers were relatively small and our technologies primitive, so the impacts were localised. In the 21st century, there are now more than seven billion humans and our resource use has expanded dramatically, so we are now actively reshaping the environment at the global level. Nobel Laureate Paul Crutzen argues that we are in an epoch he calls the Anthropocene: a period distinguished by the impact of human activity. Most educated people now understand that we are changing the global climate by perturbing the carbon cycle, but we are also significantly altering the other great natural cycles of water, nitrogen, phosphorus, sulfur and so on. Humans now appropriate, directly or indirectly, about half of the total photosynthetic product of the Earth – as much as the other eight million species altogether. Species are being lost at a rate comparable with the five great extinction events in the Earth's history, but this loss of biodiversity has not been caused by a natural cataclysm. It is the direct result of our impact on the planet's natural systems. So we urgently need to become more aware of the consequences of our decisions and actions.

We also need to think routinely on much longer time scales. The decisions being made now about energy supply and use will continue to change the global climate for at least a hundred years, and will be increasing the sea level for several centuries. As well as changing the global climate, our decisions about urban planning, building construction and transport systems are literally setting in concrete structures that will last for most of this century. Those decisions are usually responding to the pressures of this year's balance sheet or next year's election; in other words, they are normally based on timescales that are irresponsible and totally inappropriate.

So those who are making decisions that reshape our environment need to be better informed at two levels. They need to understand the theoretical ideas and models that will help them to make wise choices. They also need guidance about turning those theories into practical environments that meet all our needs: physical, emotional, social, cultural and spiritual. This book is an excellent guide for those facing the need to make responsible choices, taking account of the range of factors involved. It has been wisely observed that we can never change only one thing in a complex system. Choices always entail consequences that cascade through the natural and social world. To make good decisions we need to understand and embrace that complexity. We also need to review past choices and respond actively as our knowledge increases of the many impacts of those decisions. The future is not somewhere we are going, but something we are creating. The contributions in this book will help you, the reader, to reshape environments sensitively.

The book contains several examples of the sorts of changes we need to be making as we reshape our environments to achieve the goal of a sustainable future. They

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demonstrate the crucial need for interdisciplinary or transdisciplinary thinking. As I learned in a decade working for the UK Open University, analysis of a complex problem inevitably requires the skills and knowledge of a range of traditional disciplines, while developing workable solutions. It demands systems thinking, understanding and appreciating the many linkages between the various different elements of the problem. Whether you are working on a very specific project like a straw-bale house or something as diverse as an entire region, the same principles apply. Farming, forestry and fire management demand a similar approach to school construction or Singaporean transport, irrigated agriculture or tropical grazing. The case studies in this book illustrate the general principles developed in the theory chapters. Together they comprise a wonderful resource that will help you, the reader, to make a difference.

Emeritus Professor Ian Lowe
Griffith University

15 November 2011

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Contributors

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Helena Bender is the senior tutor for the subject 'Reshaping Environments' and a former senior environmental science teacher. She was trained within the scientific disciplines of biology and zoology with a focus on behavioural ecology. She has become increasingly interdisciplinary in her thinking, learning and teaching, researching management strategies to be used where conflict is created during human–wildlife interactions, assessing student response to educational approaches, and interdisciplinary research practice.

Ian Bishop is a professorial fellow in the department of Infrastructure Engineering at the University of Melbourne. He has made extensive use of spatial information technologies including geographic information systems and visualisation to develop systems for better communication of environmental change and associated decision-making. He has also used visualisation techniques in the exploration of landscape perception especially in relation to development of energy related infrastructure.

Rebecca Ford is a lecturer in environmental studies in the Department of Resource Management and Geography, University of Melbourne. Her research focuses on the psychological basis for public acceptance of forest management, for example in people's values and beliefs. Previously Rebecca worked in forest policy with the Victorian and federal governments which sparked broad interests in the ways people value and perceive forests, and the ways social research can inform forest management.

Clinton Golding is a member of the Higher Education Development Centre at the University of Otago, New Zealand, and an honorary senior fellow of the Centre for the Study of Higher Education, University of Melbourne. He is an interdisciplinary researcher, working primarily in the fields of philosophy, education, philosophy of education, ethics and interdisciplinarity, with a special focus on thinking, inquiry and problem solving across the disciplines.

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Dominique Hes received a science degree from the University of Melbourne and followed this with a graduate diploma in cleaner production and a doctorate in 2005 at RMIT University, Melbourne. She has carried out research on Victorian residential projects such as the Commonwealth Games Village and Aurora, commercial projects such as Melbourne City Council's Council House 2, and local government projects such as Reservoir Civic Centre.

Kate Judith is the senior tutor for the subject 'Natural Environments' at the University of Melbourne. She has taught in a wide range of contexts, both within the humanities and sciences. Her research and publications have involved text analysis or discourse analysis to explore ideas about landscape and identity.

Edward Maltby is emeritus professor of wetland science, water and ecosystem management at the University of Liverpool, where he was previously director of the Institute for Sustainable Water, Integrated Management and Ecosystem Research (SWIMMER). He is now an adviser to the Secretary of State for Environment on the UK National Ecosystem Assessment. He was a former chair on the IUCN Commission on Ecosystem Management and of the IUCN Wetlands and Water Programme.

Blythe McLennan is a research fellow in emergency management with the Bushfire Cooperative Research Centre at RMIT University, Melbourne. She completed an interdisciplinary Master of Environment at the University of Melbourne, and followed this with a PhD at the University of Alberta in Canada, which she completed in 2009.

Graham Moore has a long history of teaching and research in environmental engineering at the University of Melbourne. He is also chairman of the board of NGO Partners in Aid and on the Register of Engineers for Disaster Relief.

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Eric Smith is an engineer with over 20 years' experience in hardware, software and technical systems design in industry. Building on his background in electronic and communication engineering, he completed a PhD in geomatics at the University of Melbourne where his research developed methods and technology to represent and assess the effects of environmental change at a landscape scale.

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Kathryn Williams is a senior lecturer in the Department of Resource Management and Geography at the University of Melbourne. She is an environmental psychologist whose research is primarily concerned with understanding the different ways people value, understand and use vegetated environments.

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Associate Professor Ruth Beilin provided the seed and much water to help this project bear fruit. The academics who have been part of the 'Reshaping Environments' teaching team since its inception – Ms Anna Bailey, Associate Professor Ruth Beilin, Dr Helena Bender, Associate Professor Peter Christoff, Dr Scott Drake, Mr Blair Gardiner, Dr Clinton Golding, Associate Professor Ray Green, Associate Professor Roger Hadgraft, Dr Blythe McLennan, Dr Graham Moore, Associate Professor Darko Radovic, Dr Mike Stewardson, and Dr Kathryn Williams – have helped to make us all more interdisciplinary in our approach. Dr Dominique Hes and Associate Professor Sun Sheng Han may have joined the team later than others, but have had no less input to the ideas or content. Each has laboured to bring the passions they have for their research areas together in an interdisciplinary way to form this book. Each semester there are approximately 10 tutors in the subject. These PhD students and graduates of the University of Melbourne have offered their perspectives on the depth and breadth of content they believed first year students could absorb, as well as the skill development that would help students excel. Over the last three years of teaching the subject 'Reshaping Environments' about 2000 students have engaged in learning and critiquing the ideas we have included in the book. We wish to thank them all for their contributions. During the process of writing, the international and local reviewers' constructive suggestions made each chapter better.

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