SUSTAINABLE DEVELOPMENT IN PRACTICE

Sustainomics Methodology and Applications

This book provides a comprehensive, rigorous and practical analysis of sustainable development prospects today by applying the innovative sustainomics framework. Developed over the past 18 years by the eminent environmental scientist and development expert, Mohan Munasinghe, sustainomics shows us the first practical steps in making the transition from the risky business-as-usual scenario to a safe and sustainable future. Its main message is optimistic: although the problems are serious, an effective response can be mounted to make development more sustainable if it is initiated immediately.

The book explains the key principles underlying sustainomics cogently, concisely and with a minimum of technical jargon, with mathematical and other details being provided in annexes. It illustrates the methodology with empirical case studies that are practical and policy-relevant over a wide range of time and geographic scales, countries, sectors, ecosystems and circumstances. The extensive bibliography is useful to researchers of specific issues within sustainable development. This book appeals to a wide audience, including students, researchers from many disciplines, policy analysts, public and private decision makers, and development practitioners.

PROFESSOR MOHAN MUNASINGHE is co-winner of the 2007 Nobel Prize for Peace, as Vice Chair of the UN Intergovernmental Panel on Climate Change (IPCC-AR4). He is the Chairman of the Munasinghe Institute of Development (MIND), Sri Lanka, Director General of the Sustainable Consumption Institute (SCI), University of Manchester, UK, and Honorary Senior Advisor to the Sri Lankan Government. During 35 years of distinguished public service, he has served as Senior Energy Advisor to the President of Sri Lanka, Advisor to the United States Presidents Council on Environmental Quality, and Senior Advisor/Director at the World Bank.

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MUNASINGHE INSTITUTE FOR DEVELOPMENT (MIND) SERIES ON GROWTH AND SUSTAINABLE DEVELOPMENT

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This series of volumes deals with the interaction between conventional economic growth and the more recent paradigm of sustainable development. A distinguished group of international experts drawn from a broad range of disciplines examine this nexus, and suggest ways for making development more sustainable in the future. The volumes cover both theory and practical applications at global, national and local levels:

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Sustainomics Methodology and Applications

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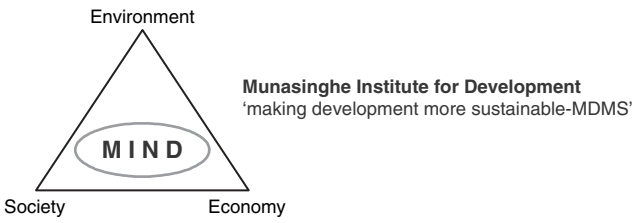

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org
Information on this title: www.cambridge.org/9780521895408

First published 2009

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data
Munasinghe, Mohan, 1945–
Sustainable development in practice : sustainomics methodology and applications /
Mohan Munasinghe ; foreword by James Gustave Speth.
p. cm. – (Munasinghe Institute for Development (MIND) Series
on growth and sustainable development ; 6)
ISBN 978-0-521-89540-8
1. Sustainable development – Economic aspects. 2. Sustainable development – Social aspects.
3. Sustainable development – Environmental aspects. I. Title.
HC79.E5M8675 2009
338.9′27–dc22
2009004021

ISBN 978-0-521-89540-8 hardback
ISBN 978-0-521-71972-8 paperback

To my granddaughter Linara (Lena) and her progeny – in the fond hope that they will inherit a world that is more sustainable than ours

Contents

Foreword

Sustainable development is the foremost challenge to humanity in the twenty-first century. It affects every human being on the planet, and therefore we are all stakeholders. Traditional development has focused on material-based economic growth to overcome problems such as poverty, hunger, sickness and inequality. However, despite impressive progress during the last century, especially in the OECD and middle-income countries, these issues have grown worse in most of the poorest countries, and even among poorer communities in the industrial world. New challenges, such as environmental degradation, violent conflicts, climate change and runaway globalization, could exacerbate problems and make them unmanageable.

At the global level, several thousand leading scientists in the United Nations Intergovernmental Panel on Climate Change (IPCC) have clearly confirmed that human activities that emit greenhouse gases are leading to potentially catastrophic global warming. Similarly, the recent Millennium Ecosystem Assessment, commissioned by UN Secretary General Kofi Annan and written by foremost ecologists, has chronicled the steady decline of ecosystem services, which support all life on the planet. They have urged early action to reverse this alarming trend. Yet, the alleviation of poverty among billions (who eke out their existence on less than one dollar a day) will require continued economic growth in those areas. Maintaining this balance among economic, social and environmental needs is the essence of sustainable development.

The powerful technologies and forces we have unleashed may have increasingly unforeseeable and unmanageable consequences. We need to act with the prudence and wisdom suggested in Antoine de Saint Exupery's *The Little Prince*:

> The fox said to the little prince: Men have forgotten this truth, but you must not forget it. You remain responsible, forever, for what you have tamed.

Therefore, Professor Munasinghe should be commended for writing a comprehensive, concise and clear volume that offers an immediate and practical path for making current development more sustainable, by applying the sustainomics framework. He demystifies the complexities of sustainable development with a critical and probing analysis. This book is unique in not only presenting an easily understandable and rigorous conceptual framework, but also in illustrating its practical applications using a wide range of empirical case studies.

Professor Mohan Munasinghe first set out the basic principles of sustainomics at the 1992 Earth Summit in Rio de Janeiro. This volume expands on that base, and describes the careful analysis and rigorous testing of the framework during the past 15 years. Key elements of

sustainomics include the fundamental approach of 'making development more sustainable' (MDMS); the balanced applications of Mohan's widely recognized sustainable development triangle (with social, economic and environmental dimensions); better integration by transcending conventional boundaries (imposed by discipline, space, time, stakeholder viewpoints and operational needs); and practical application of innovative methods and tools throughout the full cycle (from data gathering to policy implementation and feedback). The methodology is elucidated with a number of practical case studies that are relevant over a wide range of geographic and time scales, countries, sectors, ecosystems and circumstances.

In this book, Mohan brings together a wide range of skills. As a respected and award winning researcher, his analysis is rigorous and well documented. As a senior decision maker and manager with over 35 years of experience in the development arena, his advice is eminently practical. Finally, as a veteran university professor with an enviable record of publications, he presents his arguments lucidly and convincingly.

To conclude, this text, written by a leading world authority on sustainable development, is an invaluable resource for students, researchers, development practitioners, policy analysts, public and private sector decision makers and, indeed, all concerned citizens.

Professor James Gustave Speth
Dean, School of Forestry and Environmental Studies,
Yale University, and former Administrator,
United Nations Development Program

Preface

This book is the sixth major volume in the Munasinghe Institute of Development (MIND) series on growth and sustainable development. Earlier volumes are listed at the front of this publication.

A range of ideas about addressing the complex problems of sustainable development and poverty are set out in this text. Therefore, the reader may find some relevant background information helpful in understanding and interpreting my viewpoint. Physics and engineering were my first loves, and they sustained me all the way through a Ph.D. However, the lure of development was hard to resist, and this led me to pursue concurrently a post-graduate degree in development economics. This focus on the issues of poverty and development has continued ever since, and I have had no cause to regret the choice.

Early work in the development area, during the early 1970s, helped me to concentrate on development planning and natural-resource management (especially energy and water) – amidst the 'limits to growth' debate and the first oil crisis. Although the concept of sustainable development was not known at the time, much of this initial work on marginal cost pricing, integrated resource planning and macroeconomic modelling was not only based on sound economic principles, but also included important social and environmental considerations, including poverty, equity and externalities. From the mid 1980s, my efforts shifted more towards environmental and natural-resource issues and their links with macroeconomic policies and poverty. With the publication of the Bruntland report in 1987, I began to focus on forming a better understanding of the new concept of sustainable development.

The core framework of sustainomics was developed from around 1990, and now draws on more than 15 years of direct applications. Thus, the bulk of this book relies on work carried out since 1990. At the same time, sustainomics also makes use of previous research, where the issues, principles and policy options involved are still relevant. Some of the broader development insights, concepts and case studies in this volume are based on over 35 years of professional work. During this period, hands-on involvement in designing and implementing projects and policies in a variety of countries helped to build up practical experience in development activities. Meanwhile, continuing research and teaching sharpened my analytical insights. The basic foundation for intellectual growth was, of course, the preceding two decades of formal education, as well as the subconscious absorption of knowledge whilst growing up amidst the problems of development in Sri Lanka. To summarize, I have learned about development whilst playing many roles – be it as a student or teacher, researcher or field practitioner, policy analyst or decision maker.

Two major international events (i.e. the 1992 UN Earth Summit in Rio de Janeiro and the 2002 UN World Summit on Sustainable Development (WSSD), in Johannesburg) provided major impetus for two seminal publications (Munasinghe, 1992a, 2002a). The first paper set out the conceptual framework for sustainomics, based on the results of a major World Bank research programme that I led. At this time, the Vice Presidency for Environmentally and Socially Sustainable Development was established in the Bank, with the sustainable development triangle as its official logo. Shortly afterwards, some senior colleagues and I presented an important policy paper on Economy-wide Policies and the Environment to the Bank's Board of Executive Directors, proposing policy remedies to address the adverse environmental and social impacts of structural adjustment programmes. The findings were then presented to the world's finance ministers at a special seminar during the World Bank–International Monetary Fund 50th anniversary celebrations in Madrid, in 1994. Subsequently, my 2002 paper at WSSD elaborated on the initial sustainomics framework – based on a range of practical applications and lessons learned during the intervening decade.

Clearly, sustainomics is not the creation of one person. Isaac Newton's classic remark about 'seeing further by standing on the shoulders of giants', is most appropriate.[1] Thus, sustainomics is a practical transdisciplinary framework (or 'transdiscipline') that makes use of my own ideas as well as many existing concepts, methods and tools developed by others – gladly acknowledged in the text. Such an eclectic approach is necessary because sustainable development is so broadly defined and vast in scope that it cannot possibly be dealt with by any single traditional discipline. Furthermore, there is no need to 're-invent the wheel', when practical techniques and solutions are already at hand. Chapter 1 describes the main current rationale for writing this book. However, the original motivation that led to the neologism 'sustainomics' was more basic – simply the lack of a discipline or practical framework that focused explicitly on sustainable development problems in a policy-relevant manner.

The first basic principle of sustainomics – making development more sustainable – was a practical reaction to the endless (and ongoing) theoretical debate on the ultimate definition of sustainable development. It motivates and validates those who wish to address urgent issues such as poverty and hunger immediately. The second core element – balanced treatment of the sustainable development triangle – was prompted by the lively discussions that took place in the run-up to Rio 1992, about how the 'three pillars' (environment, economy and society) might be integrated within development policy. It emphasizes that the sides and interior of the triangle (representing interaction among the three pillars) are as important as the three vertices. The third basic idea of transcending traditional boundaries (of discipline, space, time, etc.) has been around for many years, and proved quite appropriate for sustainomics. Finally, the kitbag of sustainomics methods and models includes some key policy-focused tools, such as the Action Impact Matrix (AIM), Issues-Policy Transformation Mapping (ITM) and Policy Tunnelling, which were developed specifically in the context of sustainomics. Others, such as sustainable development assessment (including cost–benefit analysis and environmental and social assessment), environmental valuation, green accounting, various macroeconomic

[1] Lohne, J. (1965). 'Isaac Newton: the rise of a scientist', *Notes and Records of the Royal Society London*, **20**, 125–39.

and sectoral models, etc., were borrowed from other disciplines, or adapted from existing material. The empirical case studies are designed to be not only rigorous applications of the theory, but also practical and policy-focused. The extensive reference list should be useful to those who wish to research specific topics further.

A brief word is appropriate here about the creation of the Munasinghe Institute for Development (MIND) in the year 2000. Working many years abroad within the UN system provided me with unique opportunities and insights. Nevertheless, I felt that I could improve my understanding of development problems and contribute more by taking early retirement and returning to live and work in Sri Lanka. This is a key decision I do not regret, because the view from Colombo is refreshingly different from the 'Washington Consensus' perspective. The outcome was MIND, a small non-profit research centre based in Sri Lanka, whose official logo is the sustainable development triangle, and whose motto is 'making development more sustainable'. A balanced South–North partnership, built on mutual respect and cooperation, is essential to save the planet. To facilitate this process, MIND is building capacity in the South, and fostering both South–South and South–North collaboration to address sustainable development issues.

During the course of this intellectual journey, I have benefited from my association with a wide range of people, each of whom has contributed generously to my understanding of development issues in his (or her) own way. While the core framework presented in the first few chapters of this book are based mainly on my own papers, the case studies have benefited greatly from ideas in selected co-authored publications.

The list of names of the many erudite colleagues I have collaborated with over the years is far too numerous to set out here, but among them special thanks are owed to those with whom I have had the privilege of co-authoring journal articles and books that are the sources of material on which parts of this volume are based. They range from young students and researchers to eminent experts and Nobel prize winners. Working with them has enriched my professional growth and deepened my insights into the problems of development. Their valuable contributions are explicitly acknowledged in the relevant chapters. The honour list includes: Kenneth Arrow, Caroline Clarke, Matthew Clarke, William Cline, Wilfrido Cruz, Carlos de Miguel, Chitrupa Fernando, Claudio Ferraz, Sardar Islam, Susan Hanna, Paul Kleindorfer, Randall Kramer, Karl-Goran Maler, Jeffrey McNeely, Peter Meier, Robert Mendelsohn, Sebastian Miller, Risako Morimoto, Raul O'Ryan, Annika Persson, Walter Reid, Niggol Seo, Ronaldo Seroa da Motta, Narendra Sharma, Walter Shearer, Joseph Stiglitz, Osvaldo Sunkel, Rob Swart, Jeremy Warford and Carlos Young.

I am equally grateful for the kind courtesies and good wishes extended by the following international journals in which relevant papers have appeared: *Ambio*, *Conservation Ecology*, *Ecological Economics*, *Ecological Economics Encyclopedia*, *Encyclopedia of Earth*, *Environment and Development Economics*, *International Journal of Ambient Energy*, *International Journal of Environment and Pollution*, *International Journal of Global Energy Issues*, *International Journal of Global Environmental Issues*, *Land Use Policy*, *Natural Resources Forum*, *Natural Resources Journal*, *Proceedings of the IEEE*, *The Energy Journal*, *World Bank Economic Review* and *World Development*.

Thanks are also due to the following institutions who have published books and monographs I have authored, from which material is drawn: Asian Development Bank (ADB), Asian Pacific Economic Cooperation (APEC), Beijer International Institute of Ecological Economics, Cambridge University Press, Butterworths-Heinemann Press, Edward Elgar Publishing, Intergovernmental Panel on Climate Change (IPCC), International Decade for Natural Disaster Reduction (IDNDR), International Society of Ecological Economics (ISEE), Johns Hopkins University Press, Organization for Economic Cooperation and Development (OECD), Sri Lanka Association for the Advancement of Science (SLAAS), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), United Nations University (UNU), Westview Press, World Bank (WB) and International Union for Conservation of Nature (IUCN).

Generations of students have helped to sharpen my concepts and logical thinking over the years. I would like to express my gratitude for the valuable feedback provided by students and faculty from the following academic and research institutions where I have given courses or lectures on various aspects of sustainable development in recent years: American University, USA; Asian Institute of Technology, Thailand; Boston University, USA; Cambridge University, UK; China Meteorological Administration, China: Colombo University, Sri Lanka; Concordia University, Canada; Federal University of Rio de Janeiro, Brazil; Gotenberg University, Sweden; Groningen University, Netherlands; Harvard University, USA; Indian Institute of Management (Calcutta), India; Indira Gandhi Institute of Development Research, India; Institute of Economic Growth, India; Institute of Social and Economic Research, India; Japan Development Bank, Japan; Massachusetts Institute of Technology, USA; Moratuwa University, Sri Lanka; Oxford University, UK; Peking University, China; University of Pennsylvania, USA; Peradeniya University, Sri Lanka; Ritsumeikan Asia Pacific University, Japan; Sorbonne University, France; State University of New York, USA; Tellus Institute, USA; TERI University, India; Tsinghua University, China; United Nations University, Japan; Wuppertal Institute, Germany; Yale University, USA.

I am deeply indebted to the following, who provided detailed and insightful comments and helpful material: Johannes Opschoor, Rob Swart and Harald Winkler.

I also thank the following for useful suggestions and advice: Michael Chadwick, Nazli Choucri, Cutler Cleveland, Shelton Davis, Surendra Devkota, Sytze Dijkstra, Chitru Fernando, Prasanthi Gunawardene, Anders Hansen, Jochen Jesinghaus, Steven Lovink, Risako Morimoto, Eric Neumayer, John O'Connor, Paul Raskin, Terry Rolfe, Fereidoon Sioshansi, Nimal Siripala, Jeremy Warford and Robin White.

The MIND team who helped to prepare this manuscript provided invaluable assistance, for which I am most grateful. They include: Nishanthi De Silva, Yvani Deraniyagala, Irusha Dharmaratna, Priyangi Jayasinghe and Sudarshana Perera.

Last, but not least, my wife Sria deserves special praise for her advice and steadfast support, and for putting up with the many impositions and pressures arising from the preparation of this book. Support provided by my children Anusha and Ranjiva and my mother Flower Munasinghe were also much appreciated.

All my generous benefactors deserve full credit for their valuable contributions to the ideas expressed in this book. Any errors, omissions, shortcomings and misinterpretations are my own responsibility. I hope that the book will appeal to a wide audience, including students, researchers, teachers, policy analysts, development practitioners, public- and private-sector decision makers, concerned citizens and all stakeholders.

To conclude, sustainomics is a preliminary framework and is, as yet, incomplete. It is like a giant jigsaw puzzle, with some gaps and pieces that do not quite fit. Nevertheless, it does seem to provide a promising and practical start, which is allowing the bigger picture to emerge. My earnest hope is that other practicing and potential 'sustainomists' will step forward to correct any errors, reconcile inconsistencies and fill in the empty spaces in the framework, in the process of moving towards the ultimate goal of sustainable development. The final take-home message is optimistic: although the problems are serious, an effective response can be mounted, provided we begin immediately. Sustainomics can help to show us the first practical steps in making the transition from the risky business-as-usual scenario to a safer, and more sustainable, future.