

*Ecosystems and Human Well-being:  
A Framework for Assessment*

series page with MA blurb  
(including names of  
participating orgs)

Island Press blurb

# *Ecosystems and Human Well-being: A Framework for Assessment*

## **Authors**

---

Joseph Alcamo  
Neville J. Ash  
Colin D. Butler  
Baird Callicott  
Doris Capistrano  
Stephen R. Carpenter  
Juan Carlos Castilla  
Robert Chambers  
Kanchan Chopra  
Angela Cropper  
Gretchen Daily  
Partha Dasgupta  
Rudolf de Groot  
Thomas Dietz  
Anantha Duraiappah  
Madhav Gadgil  
Kirk Hamilton

Rashid Hassan  
Eric Lambin  
Louis Lebel  
Rik Leemans  
Liu Jiyuan  
Jean Paul Malingreau  
Robert May  
Alex McCalla  
Anthony J. McMichael  
Bedrich Moldan  
Harold Mooney  
Shahid Naem  
Gerald Nelson  
Niu Wenyuan  
Ian Noble  
Ouyang Zhiyun  
Stefano Pagiola

Daniel Pauly  
Steve Percy  
Prabhu Pingali  
Robert Prescott-Allen  
Walter V. Reid  
Taylor Ricketts  
Cristian Samper  
Bob Scholes  
Henk Simons  
Ferenc L. Toth  
Jane Turpie  
Robert Watson  
Tom Wilbanks  
Meryl Williams  
Stan Wood  
Zhao Shidong  
Monika Zurek

## **Contributing Authors**

Elena Bennett  
R. Oonsie Biggs  
Poh Sze Choo  
Jon Foley  
Pushpam Kumar  
Marcus Lee  
Richard H. Moss  
Gerhard Petschel-Held  
Sarah Porter  
Stephen H. Schneider

## **Assessment Panel Chairs**

Angela Cropper  
Harold A. Mooney

## **Editorial Board Chairs**

José Sarukhán  
Anne Whyte

## **Chapter Review Editors**

Gilberto Gallopin  
Roger Kasperson  
Mohan Munasinghe  
Léon Olivé  
Christine Padoch  
Jeffrey Romm  
Hebe Vessuri



copyright



# Table of Contents

page numbers to  
come in later  
proof

## Preface

## Acknowledgments

## Summary for Decision-makers

### Chapter 1. Introduction and Conceptual Framework

- 1.1 Introduction
- 1.2 Overview of Conceptual Framework
- 1.3 The Multiscale Approach
- 1.4 Types of Knowledge Assessed
- 1.5 Minimizing Structural Biases
- 1.6 Use in Decision-making

### Chapter 2. Ecosystems and their Services

- 2.1 Introduction
- 2.2 Ecosystems Boundaries and Categories
- 2.3 Ecosystem Services  
*Provisioning Services, Regulating Services, Cultural Services, Supporting Services, A Multisectoral Approach*
- 2.4 Biodiversity and Ecosystem Services
- 2.5 Ecosystem Condition and Sustainable Use  
*Flows of Provisioning Services, Condition of Regulating, Cultural, and Supporting Services, Variability, Resilience, and Thresholds in Services, Ecosystem Health and Other Related Concepts, Substitution of Services*

### Chapter 3. Ecosystems and Human Well-being

- 3.1 Introduction
- 3.2 Key Components of Human Well-being
- 3.3 Linkages Between Ecosystem Services and Human Well-being
- 3.4 Substitutability and Well-being
- 3.5 Balancing Priorities: Present Versus Future
- 3.6 Institutions and Freedoms
- 3.7 Conclusion

### Chapter 4. Drivers of Change in Ecosystems and their Services

- 4.1 Introduction
- 4.2 Previous Approaches on the Factors of Change
- 4.3 Drivers: An Overview
- 4.4 The Decision-maker Within the Ecosystem
- 4.5 Ecosystem Consequences of Decisions Outside an Ecosystem
- 4.6 Drivers of Ecosystem Change  
*Demographic Drivers, Economic Drivers, Sociopolitical Drivers, Scientific and Technological Drivers, Drivers Determined by Cultural and Religious Values, Physical, Biological, and Chemical Drivers*
- 4.7 Interactions Among Drivers

**Chapter 5. Dealing with Scale**

- 5.1 Introduction
- 5.2 Why Scale Matters
- 5.3 Changing Scales
- 5.4 Space and Time Domains
- 5.5 Inertia in Human and Ecological Systems
- 5.6 Viewing a Particular Scale in Context
- 5.7 Scales in Ecological and Human Systems
- 5.8 Scale and Policy  
*Politics of Scale, Institutional Fit and Interplay*
- 5.9 Guidance for Multiscale Assessments  
*Choosing the Appropriate Scales, Resolutions, and Boundaries, Integration Across Scales*

**Chapter 6. Concepts of Ecosystem Value and Valuation Approaches**

- 6.1 Introduction
- 6.2 The Utilitarian Approach and Economic Valuation Methods  
*Motivations for Economic Valuation, Total Economic Value, Economic Valuation Methods, Putting Economic Valuation into Practice*
- 6.3 Non-utilitarian Value  
*Sociocultural Values, The Intrinsic Value Paradigm, The Interactions of Political and Market Metrics*
- 6.4 Conclusion

**Chapter 7. Analytical Approaches**

- 7.1 Introduction
- 7.2 Data  
*Challenges in Using Data, Data Quality Assurance, Indicator Selection*
- 7.3 Units of Analysis and Reporting  
*Ecosystem Boundaries, Relating Ecological and Human-centered Units, Reporting Units*
- 7.4 Modelling Issues  
*Environmental System Models, Human System Models, Integrated Models*
- 7.5 Scenario Analysis  
*Scenarios for Ecological Services, Review of Scenario Types and Approaches, The MA Approach to Scenario Analysis, Models to Support Scenario Analysis*
- 7.6 Overarching Issues  
*Matters of Scale, Review and Validation Procedures, Analysis of Uncertainty*
- 7.7 Conclusions

**Chapter 8. Strategic Interventions, Response Options, and Decision-making**

- 8.1 Introduction
- 8.2 Decision-making Processes
- 8.3 Response Options and Strategic Interventions
- 8.4 Usable Knowledge
- 8.5 Dealing with Risk and Uncertainty
- 8.6 Decision Analytical Frameworks and Tools

**Appendix 1. Chapter Responsibilities**

**Appendix 2. Reviewers**

**Appendix 3. List of Acronyms**

**Appendix 4. Glossary**

**Sources**

## Preface

*Ecosystems and Human Well-being: A Framework for Assessment* is the first product of the Millennium Ecosystem Assessment (MA), a four-year international work program designed to meet the needs of decision-makers for scientific information on the links between ecosystem change and human well-being. It was launched by United Nations Secretary-General Kofi Annan in June 2001, and the principal assessment reports will be released in 2005. The MA focuses on how changes in ecosystem services have affected human well-being, how ecosystem changes may affect people in future decades, and what types of responses can be adopted at local, national, or global scales to improve ecosystem management and thereby contribute to human well-being and poverty alleviation.

Parties to the Convention on Biological Diversity, the Convention to Combat Desertification, and the Ramsar Convention on Wetlands have asked the MA to provide scientific information to assist in the implementation of these treaties. The MA will also address the needs of other stakeholders, including the private sector, civil society, and indigenous peoples organizations. The MA is closely coordinated with other international assessments that focus in greater depth on particular sectors or drivers of change, such as the Intergovernmental Panel on Climate Change and the Global International Waters Assessment. Scientific evaluations such as these help underpin various regular annual and biennial international reporting mechanisms, such as the *Global Environmental Outlook*, the *World Resources Report*, the *Human Development Report*, and the *World Development Report*.

Leading scientists from more than 100 nations are conducting the MA under the direction of a Board that includes representatives of four international conventions, five United Nations agencies, international scientific organizations, and leaders from the private sector, nongovernmental organizations, and indigenous groups. If the MA proves to be useful to its stakeholders, it is anticipated that an integrated ecosystem assessment process modeled on this process will be repeated at a global scale every 5–10 years and that ecosystem assessments will be regularly conducted at national or sub-national scales.

An ecosystem assessment can aid any country, region, or company by:

- deepening understanding of the relationship and linkages between ecosystems and human well-being;
- demonstrating the potential of ecosystems to contribute to poverty reduction and enhanced well-being;
- evaluating the compatibility of policies established by institutions at different scales;

- integrating economic, environmental, social, and cultural aspirations;
- integrating information from both natural and social science;
- identifying and evaluating policy and management options for sustaining ecosystem services and harmonizing them with human needs; and
- facilitating integrated ecosystem management.

The MA will help both in choosing among existing options and in identifying new approaches to carrying out the Plan of Implementation adopted at the World Summit on Sustainable Development (WSSD) and achieving the United Nations Millennium Development Goals. The WSSD Plan reiterates those goals and states that in order to “reverse the current trend in natural resource degradation as soon as possible, it is necessary to implement strategies which should include targets adopted at the national and, where appropriate, regional levels to protect ecosystems and to achieve integrated management of land, water and living resources, while strengthening regional, national and local capacities.”

The MA will contribute directly to this goal and can respond to the WSSD call to

improve policy and decision-making at all levels through, *inter alia*, improved collaboration between natural and social scientists, and between scientists and policy makers, including through urgent actions at all levels to: (a) Increase the use of scientific knowledge and technology, and increase the beneficial use of local and indigenous knowledge in a manner respectful of the holders of that knowledge and consistent with national law; (b) Make greater use of integrated scientific assessments, risk assessments and interdisciplinary and intersectoral approaches;...

The MA also seeks to help build individual and institutional capacity to undertake integrated ecosystem assessments and to act on their findings. In the final analysis, societies need to be enabled to manage their biological resources and their ecosystems better with the resources at hand. The human capacity to do so is vital. Wherever the MA activities unfold, they will leave a corps of more aware and motivated collaborators to continue the effort to achieve more enlightened and effective management.

This first report of the Millennium Ecosystem Assessment describes the conceptual framework that is being used in the MA. It is not a formal assessment of the literature, but rather a scientifically informed presentation of the choices made by the assessment team in structuring the analysis and framing the issues. The conceptual framework elaborated in this report describes the approach and assumptions that will underlie the analysis conducted in the Millennium Ecosystem Assessment. The framework was developed through interactions among the experts involved in the MA as well as stakeholders who will use its findings. It represents one means of examining the linkages between ecosystems and human well-being that is both scientifically credible and relevant to decision-makers. This



framework for analysis and decision-making should be of use to a wide array of individuals and institutions in government, the private sector, and civil society that seek to incorporate considerations of ecosystem services in their assessments, plans, and actions.

Five overarching questions, along with the detailed lists of user needs provided by convention secretariats and the private sector, guide the issues being assessed:

- What are the current conditions and trends of ecosystems and their associated human well-being?
- What are the plausible future changes in ecosystems and in the supply of and demand for ecosystem services and the consequent changes in health, livelihood, security, and other constituents of well-being?
- What can we do to enhance well-being and conserve ecosystems? What are the strengths and weaknesses of response options, actions, and processes that can be considered to realize or avoid specific futures?
- What are the most robust findings and key uncertainties that affect provision of ecosystem services (including the consequent changes in health, livelihood, and security) and other management decisions and policy formulations?
- What tools and methodologies developed and used in the MA can strengthen capacity to assess ecosystems, the services they provide, their impacts on human well-being, and the implications of response options?

The MA was launched in June 2001, and the final global assessment reports will be released in 2005. In addition, a series of short synthesis reports will be prepared, targeted at the needs of specific audiences, including the international conventions and the private sector. Up to 15 sub-global assessments may be carried out at local, national, and regional scales using this same conceptual framework and designed to contribute to decision-making at those scales. These sub-global assessments have already begun to release initial findings and will continue through 2006. During the course of the assessments, an ongoing dialogue is under way with the users at global and sub-global scales in order to ensure that the assessment is responsive to the needs of the users and that the users are informed regarding the potential utility of the findings.

This report has undergone two rounds of peer-review, first by experts involved in other parts of the MA process and then by both experts and governments (through the national focal points of the Convention on Biological Diversity, Convention to Combat Desertification, and the Ramsar Convention on Wetlands and through participating National Academies of Science).

*The Board of the Millennium Ecosystem Assessment dedicates this report to the memory of Angela Cropper's husband, mother, and sister: John Cropper, Maggie Lee, and Lynette Lithgow-Pearson. Through their lives and work they embodied the spirit and intent of the Millennium Assessment by their love of the natural world and their concern to improve the lives of people.*



# *Acknowledgments*



