Ecosystems and Human Well-being

Health Synthesis

A Report of the Millennium Ecosystem Assessment

Core Writing Team
Carlos Corvalan, Simon Hales, Anthony McMichael

Extended Writing Team
Colin Butler, Diarmid Campbell-Lendrum, Ulisses Confalonieri, Kerstin Leitner, Nancy Lewis, Jonathan Patz, Karen Polson, Joel Scheraga, Alistair Woodward, Maged Younes and many MA authors.

Review Editors
José Sarukhán and Anne Whyte (co-chairs); Philip Weinstein and other members of the MA Board of Review Editors.

WHO Library Cataloguing-in-Publication Data

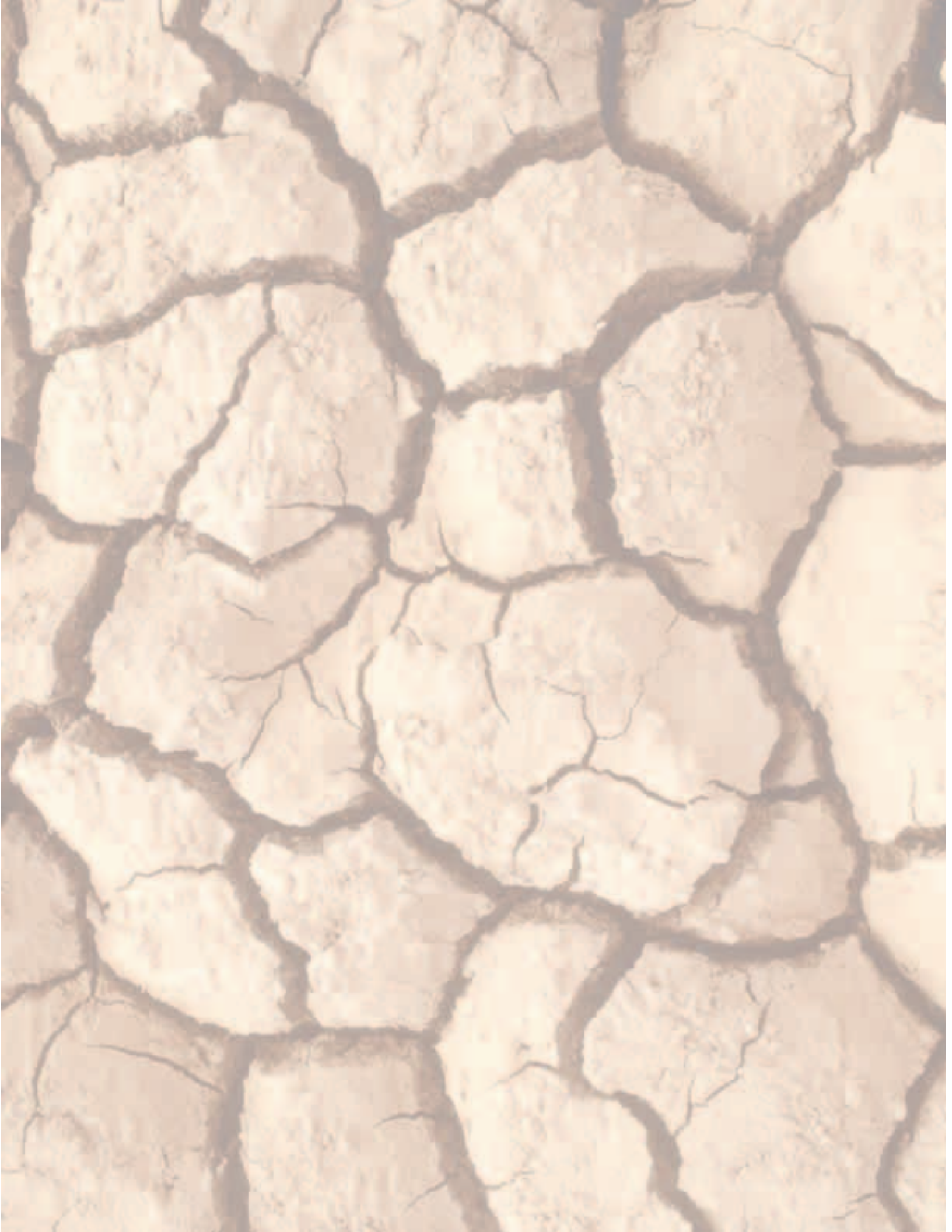
Ecosystems and human well-being : health synthesis : a report of the Millennium Ecosystem Assessment / Core writing team: Carlos Corvalan, Simon Hales, Anthony McMichael ; extended writing team: Colin Butler ... [et al.] ; review editors: José Sarukhán ... [et al.].

1. Ecosystem 2. Environmental health 3. Health status 4. Development 5. Goals 6. Risk assessment I. Corvalán, Carlos F. II. Hales, Simon. III. McMichael, Anthony J. IV. Butler, Colin. V. Sarukhán, José.

ISBN 92 4 156309 5 (NLM classification: WA 30)

Printed in France.

Contents



Foreword

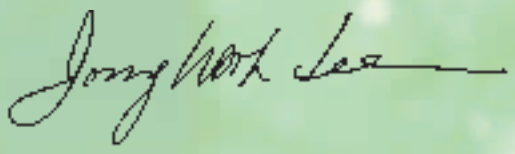
It is becoming increasingly clear that population growth and economic development are leading to rapid changes in our global ecosystems. In recognition of this, the United Nations' Secretary-General Kofi Annan, in a 2000 report to the General Assembly entitled: "*We the Peoples: The Role of the United Nations in the 21st Century,*" called for the Millennium Ecosystem Assessment to be undertaken. Since 2001, the Millennium Ecosystem Assessment has worked to assess the consequences of ecosystem change for human well-being, and establish the scientific basis for actions needed to enhance the conservation and sustainable use of those systems, so that they can continue to supply the services that underpin all aspects of human life.

The assessment exercise has involved more than 1 300 experts worldwide. The findings provide the strongest evidence so far of the impact of our actions on the natural world. They show, for example, that over the past 50 years, humans have changed natural ecosystems more rapidly and extensively than in any comparable period in human history. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process, and many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent. Approximately 60% of the ecosystem "services" examined, from regulation of air quality to purification of water, are being degraded or used unsustainably.

Nature's goods and services are the ultimate foundations of life and health, even though in modern societies this fundamental dependency may be indirect, displaced in space and time, and therefore poorly recognized. These more distant and complex links mean that we now need to look at environmental health through a broader lens. Health risks are no longer merely a result of localized exposures to "traditional" forms of pollution – although these still certainly exist. They are also a result of broader pressures on ecosystems, from depletion and degradation of freshwater resources, to the impacts of global climate change on natural disasters and agricultural production. Like more traditional risks, the harmful effects of the degradation of ecosystem services are being borne disproportionately by the poor. However, unlike these more traditional hazards, the potential for unpleasant surprises, such as emergence and spread of new infectious diseases, is much greater.

This report represents a call to the health sector, not only to cure the diseases that result from environmental degradation, but also to ensure that the benefits that the natural environment provides to human health and well-being are preserved for future generations.

LEE Jong-wook
Director-General
World Health Organization



Reader's Guide

This report synthesizes the findings from the Millennium Ecosystem Assessment's (MA) global and sub-global assessments of how ecosystem changes do, or could, affect human health and well-being. All the MA authors and review editors have contributed to this report through their contributions to the underlying assessment chapters on which this text is based.

Five additional MA synthesis reports were prepared to facilitate access to information by other audiences: general overview; UNCCD (desertification); CBD (biological diversity); Ramsar Convention (wetlands); and business. Each MA sub-global assessment also will produce additional reports to meet the needs of its own audience. The full technical assessment reports of the four MA working groups will be published in mid-2005 by Island Press.

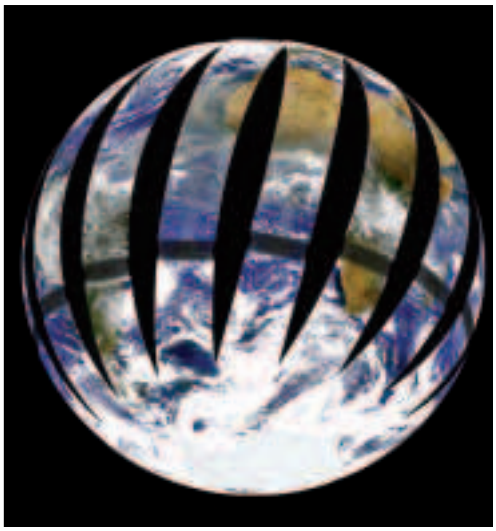
All of the assessment's printed materials, together with core data and a glossary of terminology used in the technical reports, will be available on the Internet at www.maweb.org. Appendix A lists the acronyms and abbreviations used in this report. References for the underlying chapters in the full technical assessment reports of each working group appear in parentheses in the body of this synthesis report. A list of the assessment report chapters is provided in Appendix B.

The following set of words has been used, where appropriate, to indicate estimated levels of certainty about the observations or conclusions: very certain (98% or greater probability), high certainty (85-98% probability), medium certainty (65-85% probability), low certainty (52-65% probability) and very uncertain (50-52% probability). These estimates are based on the collective judgment of the authors, using the observational evidence, modelling results and relevant theory. Elsewhere the following qualitative scale is used to gauge the level of scientific understanding: well-established, established but incomplete, competing explanations and speculative. These terms appear in italics.

Throughout this report, dollars ($) indicate U.S. dollars, and tonne means metric tonne. The term billion is used in accordance with the WHO definition – of one thousand millions.

Summary for Decision-makers

SeaWiFS / NASA / Goddard Space Flight Center and ORBIMAGE/ http://visibleearth.nasa.gov

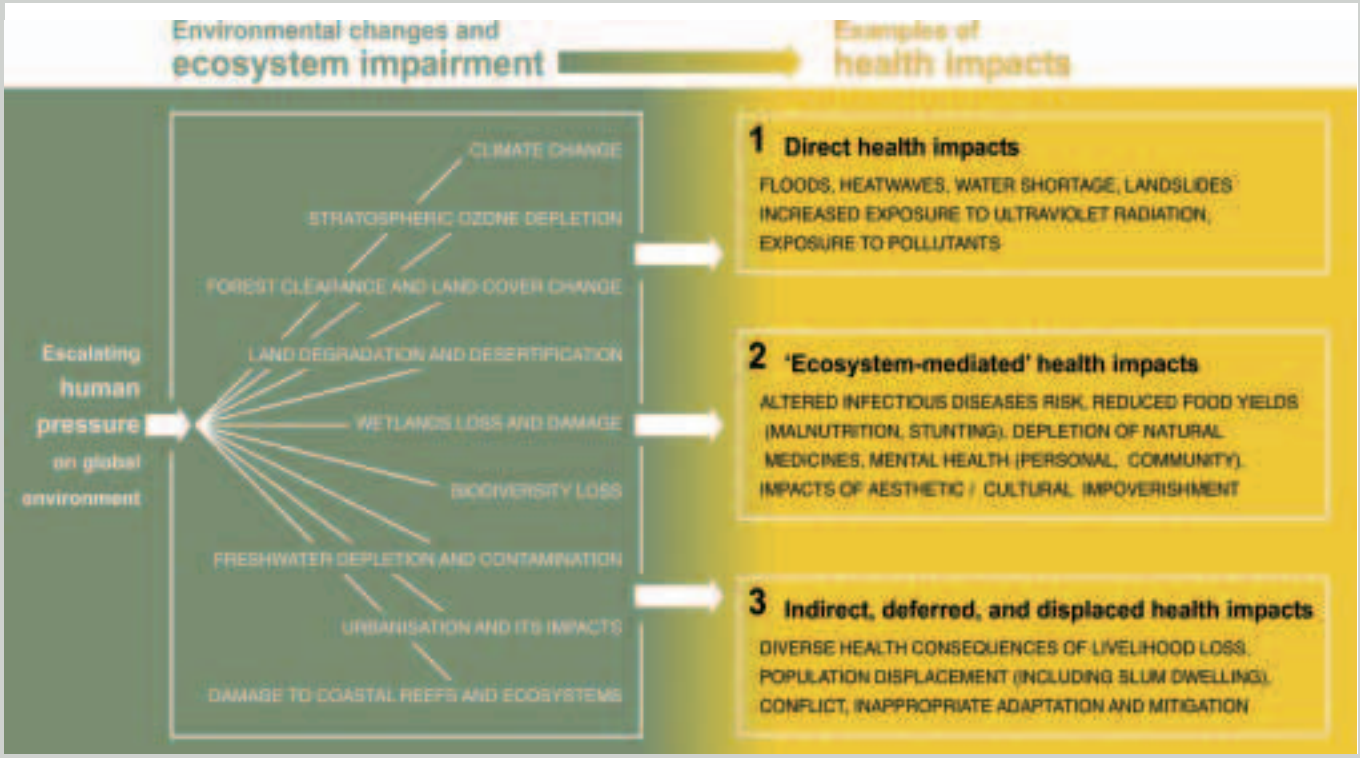


The health impacts of ecosystem change are global as well as local; here dust from north Africa is distributed widely across the continent, with potential impacts on health. Degradation of drylands, as well as biomass burning, exacerbates problems associated with dust storms.

Why do ecosystems matter to human health?

Ecosystems are the planet's life-support systems - for the human species and all other forms of life. Human biology has a fundamental need for food, water, clean air, shelter and relative climatic constancy. Other health benefits include those derived from having a full complement of species, intact watersheds, climate regulation and genetic diversity. Stresses on freshwater sources, food-producing systems and climate regulation could cause major adverse health impacts *(high certainty)* (see Figure SDM1).

Figure SDM1. Harmful effects of ecosystem change on human health



This figure describes the causal pathway from escalating human pressures on the environment through to ecosystem changes resulting in diverse health consequences. Not all ecosystem changes are included. Some changes can have positive effects (e.g. food production).

Ecosystem services are indispensable to the well-being and health of people everywhere. In addition to providing life's basic (above-mentioned) needs, changes in their flow affect livelihoods, income, local migration and, on occasion, political conflict. The resultant impacts on economic and physical security, freedom, choice and social relations have wide-ranging impacts on well-being and health.

The causal links between environmental change and human health are complex because often they are indirect, displaced in space and time, and dependent on a number of modifying forces. For example, climate changes can place stresses on agricultural production or the integrity of coral reefs and coastal fisheries. This can lead to malnutrition, stunted childhood growth, susceptibility to infectious diseases and other ailments. Deforestation may alter infectious disease patterns, for example by affecting vector (e.g. mosquito) distributions over time. The MA identified key ecosystem services and their links to human health. These are described in more detail below.

Anopheles stephensi *mosquito, a known malaria vector, with a distribution from Egypt to China, obtaining a blood meal from a human host. In the wild, mosquito larvae are found in sites such as stream pools and margins, puddles, irrigation channels and springs. In urban areas the larvae are found in a wide variety of artificial containers including cisterns, wells, tubs and fountains.*

Fresh water is essential for human health. It is used for growing food, drinking, personal hygiene, washing, cooking and the dilution and recycling of wastes. Water scarcity jeopardizes food production, human health, economic development and geopolitical stability. Globally, the availability of water per person has declined markedly in recent decades. One third of the world's population now lives in countries experiencing moderate to high water stress. This fraction will continue to increase as both population size and per capita water demand grow - reflecting the escalating use of fresh water for irrigated agriculture, livestock production, industry and the requirements of wealthier urban residents.
Over 1 billion people lack access to safe water supplies; 2.6 billion people lack adequate sanitation. This has led to widespread microbial contamination of drinking water. Water-associated infectious diseases claim up to 3.2 million lives each year, approximately 6% of all deaths globally. The burden of disease from inadequate water, sanitation and hygiene totals 1.7 million deaths and the loss of more than 54 million healthy life years. Investments in safe drinking-water and improved sanitation show a close correspondence with improvements in human health and economic productivity. Every day each person needs 20-50 litres of water free from harmful chemical and microbial contaminants, for drinking, cooking and hygiene. The growing challenge of providing this basic service to large segments of the human population is highlighted by one of the United Nations Millennium Development Goals, MDG-7, which calls for halving by 2015 the proportion of people without sustainable access to safe drinking-water and basic sanitation.

Food

Productive terrestrial and marine ecosystems, both wild and managed, are the source of our food - a prerequisite for