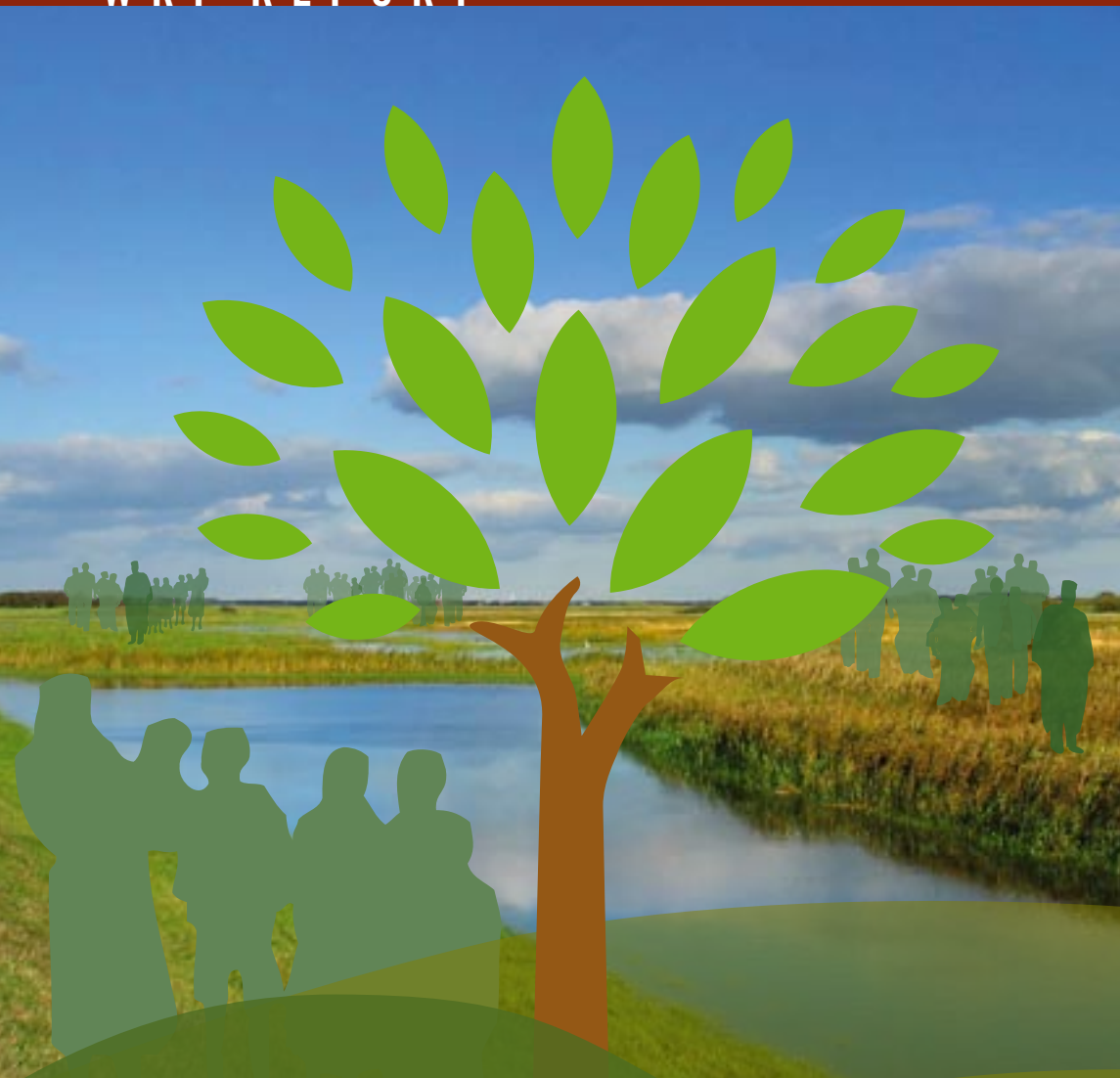




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FRANCES IRWIN

JANET RANGANATHAN

RESTORING NATURE'S CAPITAL

An Action Agenda to Sustain Ecosystem Services



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WITH

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ISBN 978-1-56973-641-8

Library of Congress Control Number: 2007927262

CONTENTS

| | |
|--|-----------|
| Foreword | v |
| Acknowledgments | ix |
| Chapter 1. Startling feedback from the earth | 1 |
| Drawing down nature's capital | 2 |
| Seeing two sides of the coin | 5 |
| Ecosystem services – the basics | 9 |
| The findings of the Millenium Ecosystem Assessment | 9 |
| This report | 12 |
| Chapter 2. Sustaining ecosystem services | 13 |
| A vision | 14 |
| An action agenda | 16 |
| Chapter 3. Advancing the action agenda in existing institutions | 19 |
| Develop and use information about ecosystem services | 20 |
| Strengthen the rights of local people to use and manage ecosystem services | 26 |
| Manage ecosystem services across multiple levels and timeframes | 31 |
| Improve accountability for decisions that affect ecosystem services | 36 |
| Align economic and financial incentives with ecosystem stewardship | 40 |
| Chapter 4. Advancing the action agenda through new institutions | 45 |
| Ecosystem service districts | 47 |
| Biome stewardship councils | 49 |
| Commission on macroeconomics and ecosystem services for poverty reduction | 53 |
| Leaders' forum | 57 |
| Chapter 5. Restoring nature's capital: Roles and responsibilities | 61 |
| References | 71 |
| Authors and papers contributing to this report | 81 |
| Acronyms | 86 |

LIST OF TABLES, FIGURES, AND BOXES

Tables

| | |
|--|----|
| Table 1. The Condition of Ecosystem Services | 2 |
| Table 2. Sustaining Ecosystem Services: Barriers, Actions, and Examples | 17 |
| Table 3. Social and Environmental Impacts of Globalization in Latin America Case Studies | 33 |
| Table 4. Ecosystem Service Districts: Advancing the Action Agenda..... | 49 |
| Table 5. Biome Stewardship Councils: Advancing the Action Agenda | 52 |
| Table 6. Commission on Macroeconomics and Ecosystem Services for Poverty Reduction: Advancing the Action Agenda..... | 56 |
| Table 7. Leaders' Forum: Advancing the Action Agenda..... | 59 |
| Table 8. Civil Society: Advancing the Action Agenda | 64 |
| Table 9. Business: Advancing the Action Agenda | 65 |
| Table 10. Research Communities: Advancing the Action Agenda | 66 |
| Table 11. Local Communities: Advancing the Action Agenda | 67 |
| Table 12. National Governments: Advancing the Action Agenda | 68 |
| Table 13. International Organizations: Advancing the Action Agenda | 69 |
| Table 14. Advancing New Institutions..... | 70 |

Figures

| | |
|---|----|
| Figure 1. Locations of the Sub-Global Assessments of the Millennium Ecosystem Assessment | 3 |
| Figure 2. Comparing the Economic and Social Value of Mangroves and Shrimp Farms | 6 |
| Figure 3. The Millennium Ecosystem Assessment Conceptual Framework | 8 |
| Figure 4. Fish Landings of Atlantic Cod off Newfoundland..... | 11 |
| Figure 5. Biomes Covered by the Millennium Ecosystem Assessment..... | 51 |
| Figure 6. Economic Benefits of Ecosystems Under Alternative Land Management Practices..... | 57 |

Boxes

| | |
|--|----|
| Box 1. What Was Unique About the Millennium Ecosystem Assessment? | 4 |
| Box 2. Shrimp Aquaculture—Profit or Loss?..... | 6 |
| Box 3. Four Major Findings of the Millennium Ecosystem Assessment | 10 |
| Box 4. Using Mobile Phones to Monitor Land Development Practices in Argentina..... | 21 |
| Box 5. Using the Action Impact Matrix in Sri Lanka..... | 23 |
| Box 6. Communal Management of Natural Resources | 28 |
| Box 7. The Access Initiative | 30 |
| Box 8. The Andean Traditional View of Water..... | 34 |
| Box 9. A Move to Consumption-Based Taxes | 41 |
| Box 10. Companies Pay for Reforestation to Keep the Panama Canal Open | 43 |
| Box 11. From Goods to Services—Imagining the Revenue Potential of Tomorrow's Forests..... | 44 |

FOREWORD

Nature provides the conditions for a healthy, secure, and fulfilling existence. Among the many benefits people receive from nature are fresh water, food, protection from floods, and spiritual enrichment. It is hard to think of a development or investment decision that doesn't in some way depend upon and affect nature.

The path-breaking Millennium Ecosystem Assessment has taken the first-ever comprehensive look at the condition of and trends in natural systems and the services they supply. It presents a stark account of the mismanagement of these services. Of the 24 assessed, only four have shown improvement over the past 50 years. A startling 15 are in serious decline. Five hang in the balance. But we don't have to continue down this path. Using the Assessment as its backdrop, *Restoring Nature's Capital* proposes an action agenda for business, governments, and civil society to reverse ecosystem degradation.

The authors, Frances Irwin and Janet Ranganathan, liken the Assessment to an audit—an audit of Planet Earth Ltd. In that light, ecosystems are less an array of elements—lands, waters, forests, reefs—that must be protected from harm, than they are huge capital assets, a trust fund perhaps. If properly managed using the action agenda suggested in this publication, this trust fund will provide benefits and income—economic and social—which will sustain generations to come.

If it is helpful to consider our natural resource base as capital assets, it is fair to say that the Assessment demonstrates that humanity has been squandering these assets at a quickening pace. In fact, we have treated many of these assets as if they had no value. The people who clear forests for agriculture, build dams for water retention or power, or replace mangroves with coastal development and shrimp farms generally benefit from those changes, but society at large pays significant costs associated with the loss of nature's economic, cultural, or intrinsic values. No one in the private sector, or the public sector for that matter, would keep his or her job with a record of financial mismanagement and waste that the Assessment documents for our natural assets.

Unfortunately, national accounting systems have not done a good job of keeping track of natural assets. Economists have been preoccupied with a narrow set of economic indicators, such as gross domestic product, disposable income, and purchasing power parity. Many of nature's services are not included in the accounts. The recent failure of businesses such as Enron should serve as a painful reminder of the potential consequences of keeping key assets and liabilities off the balance sheet.

The Assessment offers public and private sector decisionmakers a new way of seeing and valuing ecosystems from the perspective of nature's services. In doing so, the Assessment confronts the status quo in uncomfortable but necessary ways. It forces us

to acknowledge what we should have known all along—that ecosystems are a source of extraordinary wealth and value.

- Ecosystems supply *provisioning* services: food, water, and the wealth of materials that underpin all life on this earth. These services are perhaps the ones most easily understood and currently valued the most.
- Ecosystems provide *regulating* services: water filtration and purification, storm protection (barrier islands, wetlands, and reefs, for example), pollination, erosion control, and carbon sequestration. Although we are learning about these services, our ignorance of them and of their enormous economic value remains profound.
- Ecosystems offer *cultural* services. Recreation is the most obvious; but as important are the spiritual and aesthetic values that many find in nature.
- Ecosystems also provide *supporting* services such as soil formation, photosynthesis, nutrient cycling, and water cycling. These underlie all of the other services.

In the past, the changes people have made to ecosystems have nearly always been driven by a desire to increase the supply of provisioning services—those with a value in the market place. But people have mostly been blind to the resulting tradeoffs. Forests have been cleared for timber and agriculture with the loss of critical services such as climate regulation and water quality protection. Dams have degraded wetlands and their water filtration and flood control services. Without this blind spot to the value of ecosystem services, we might be investing in wetland restoration rather than flood insurance, reforestation instead of expensive water filtration plants, or paying farmers for water quality in lieu of subsidizing production.

The natural reaction in situations like this is to ask the obvious. “Why have we been so cavalier with our ecosystems? And who is to blame?” Going through that drill may make us feel better...but little else. The “who and the why” blame game of how we got to where we are today is far less important than the “what we are going to do about it.” Rather than wringing our collective hands at the accumulating harm to the earth, we need to map a path for the future.

That’s what this publication is all about. Drawing on the recommendations of 17 contributing authors, WRI’s own series of World Resources Reports, and the good work of many others, it sets out to answer the thorny question of what changes must be made to ensure that ecosystems can meet the needs of today’s and future generations.

The authors contend that governance—who makes decisions, how they are made, and with what information—is at the heart of sustaining healthy ecosystems. With this as their fundamental tenet, the authors present an action agenda for reversing degradation of ecosystems and sustaining their capacity to provide vital services for generations to come. The action agenda identifies how decisions about development projects and investments can be made in ways that lead to healthy ecosystem services. These decisions, made by local and

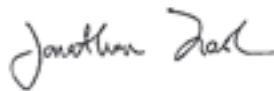
national governments, corporations, and international financial institutions, involve billions of dollars, affect huge swaths of land and water, and affect millions of people.

Let's be fair. No one has been making decisions with the goal of doing harm. Changes to ecosystems have fueled economic growth, and underpinned improvements in living conditions for many. But humanity now faces a vastly different set of challenges than it did 50 years ago—challenges that existing institutions and ways of making decisions are ill-prepared to handle. Farmers now cultivate most land that is suitable for agriculture. Human activities have more than doubled the amount of nitrogen and carbon released naturally into the environment. Reservoirs hold three to six times as much water as natural rivers. Fifty years ago, the costs of lost services from converting natural landscapes to production or development may not have exceeded the benefits. In this new century, the equation is likely to be reversed.

In addition, as public and private efforts accelerate to end the corrosive and destabilizing poverty that affects almost half the world's people, a challenge in which nature's services will play an ever larger role, it is irresponsible to continue to undermine the capacity of ecosystems to provide critical services now and over the long term.

This publication's action agenda calls for an increase in the availability of information on ecosystem services, and a redressing of the balance in favor of local rights to resources and local voices in decisionmaking. It also calls for managing decisions across levels—local, regional, national, and international—and increasing the use of accountability mechanisms and economic and financial incentives. Everyone has a role in implementing the agenda: civil society, business, the educational and research communities, local communities, national government, and international organizations.

The agenda proposed in *Restoring Nature's Capital* represents the results of the earliest concerted thinking about how to address both the stark realities and the enormous potential uncovered by the Assessment. Underlying the agenda is the realization that humanity needs a fundamentally new approach to managing the assets upon which all life depends, a paradigm shift that challenges past assumptions and practices. Implementing this agenda will be disruptive. Business as usual will not move beyond protecting nature *from* development to investing in nature *for* development.



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ACKNOWLEDGMENTS

This publication builds on the wealth of information contained in the reports of the Millennium Ecosystem Assessment. Without the Assessment there would have been no publication. We thank all the Assessment participants for their contributions to increasing knowledge on the linkages between ecosystems and human wellbeing and for changing the way we see and value ecosystems. Our work was also influenced by the 2002–04 and 2005 editions of the World Resources Reports, *Decisions for the Earth: Balance, Voice, and Power* and *The Wealth of the Poor: Managing Ecosystems to Fight Poverty*. We would like to thank all the contributors of these two important reports.

We are also grateful to the following colleagues and friends who provided critical review and other valuable contributions to this publication: Jon Anderson (USAID), Phil Angell (WRI), Steve Barker (WRI), Maria Berlekom (SwedBio), Lalanath De Silva (WRI), Navroz Dubash (National Institute of Public Finance and Policy), John Elkington (SustainAbility), Ann Florini (Brookings Institution), Norbert Henninger (WRI), Will Irwin (IUCN Commission on Environmental Law), David Jhirad (WRI), Jonathan Lash (WRI), Karl Morrison (WRI), Walt Reid (Packard Foundation), Jesse Ribot (WRI), Pernille Risgaard (PricewaterhouseCoopers), Kristin Snyder (WRI), Dan Tunstall (WRI), Peter Veit (WRI), Fred Wellington (WRI), and Simon Zadek (AccountAbility).

The publication process was helped along by WRI's wonderful publications team, particularly Hyacinth Billings and Jennie Hommel. Our special thanks go to Karen Bennett and Navid Ahdieh for their tireless research, editing, and other assistance during this project.

We are indebted to the Netherlands Ministry of Foreign Affairs, Swedbio, the Danish International Development Agency, and Irish Aid, Department of Foreign Affairs for their generous financial support for this undertaking.

FI
JR



CHAPTER 1

Startling Feedback from the Earth

Red lights are flashing on nature's indicator panel. If we had a panel with lights monitoring the status of ecosystem services, 15—nearly two thirds of 24 examined—would be flashing red (MA 2005e:41–5). Five would be yellow; only four would beam a steady green (Table 1). The most comprehensive audit ever undertaken of our natural systems and their capacity to support human wellbeing found that the crucial natural assets that all people, but especially the poor, depend upon are declining. These assets—or services—range from fresh water and pollination to storm protection and a source of spiritual values.

Table 1 | The Condition of Ecosystem Services

| Ecosystem Services | Degraded | Mixed | Enhanced |
|---------------------|--|---|-----------------------------------|
| Provisioning | Capture fisheries Wild foods Wood fuel Genetic resources Biochemicals Fresh water | Timber Fiber | Crops Livestock Aquaculture |
| Regulating | Air quality regulation Regional and local climate regulation Erosion regulation Water purification Pest regulation Pollination Natural hazard regulation | Water regulation (e.g., flood protection) Disease regulation | Carbon sequestration |
| Cultural | Spiritual and religious values Aesthetic values | Recreation and ecotourism | |

We have these warnings thanks to the Millennium Ecosystem Assessment. This scientific effort has provided an evaluation of the condition and trends of the world's ecosystems and their services on which people and all other living creatures rely. The Assessment took a century-long view—50 years back and 50 years forward. It separately assessed conditions and trends of ecosystem services at the global scale and at 33 places ranging from local to national and regional (see Figure 1).

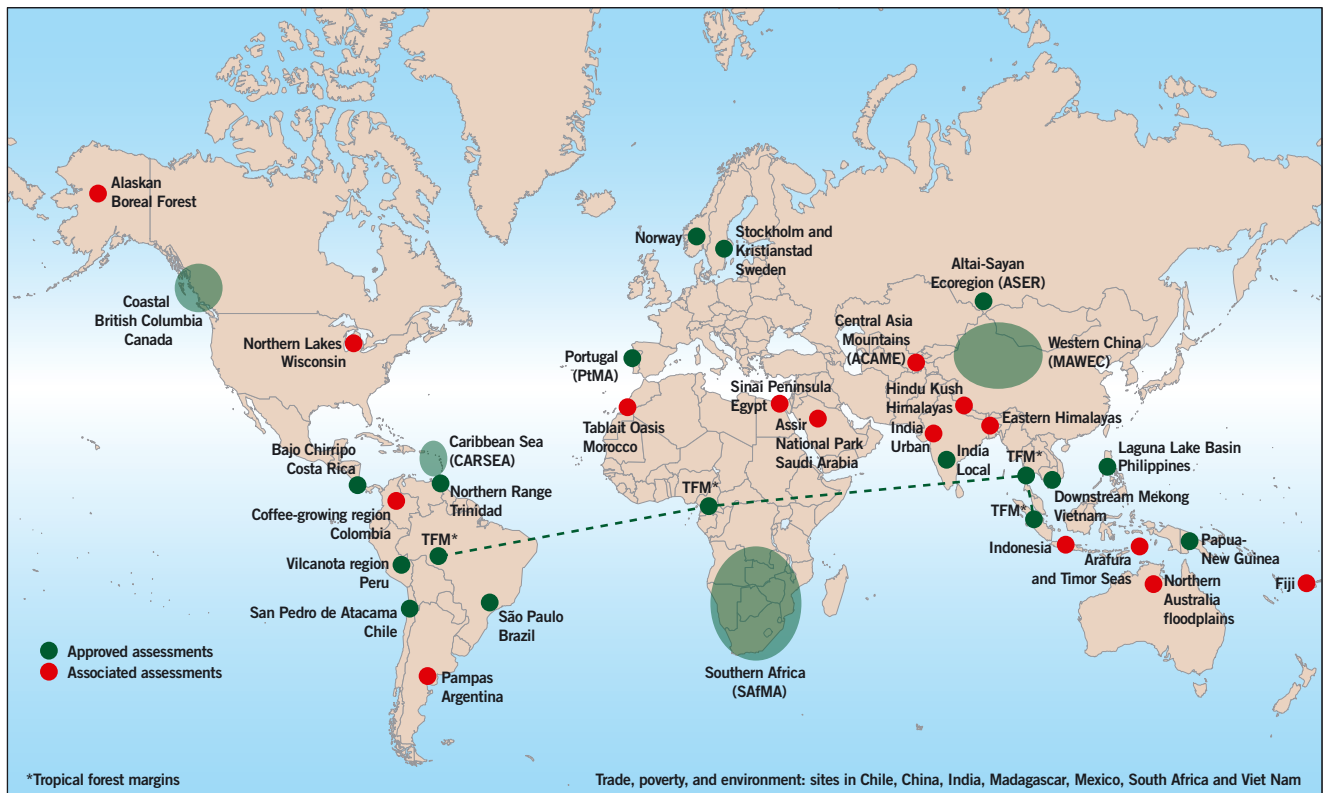
Released in March 2005, the Assessment was the culmination of a 4-year effort involving over 1,300 of the world's pre-eminent scientists from 96 countries (see Box 1). By design, the Assessment left proposing policy recommendations to others. The purpose of this report is to take up where the Assessment

left off and identify the seeds of an action agenda to turn the now flashing red lights to yellow and green, enabling both people and ecosystems to thrive.

DRAWING DOWN NATURE'S CAPITAL

The feedback from the Assessment is startling. Every natural system—forest, dryland, inland water, coastal, marine, island, mountain, and polar—is experiencing rapid increases in the impact of climate change and pollution. Temperate grasslands (a type of dryland), and inland and coastal water systems already exhibit very high impact from habitat change and pollution (MA 2005e:16). These changes have helped meet a

Figure 1 | **Locations of the Sub-Global Assessments of the Millennium Ecosystem Assessment**



Source: MA 2005e

growing population's need for food and water, reduced the proportion of malnourished people, and improved human health (MA 2005e:5–6). But these benefits have come at a growing cost to the health of ecosystems, challenging our ability to sustain improvements over time and jeopardizing efforts to improve the lives of the millions of people living in poverty. For the sake of short-term gain, we have undermined nature's capacity to provide the services that vibrant communities need—food, clean water and sanitation, natural hazard protection, and cultural landscapes.

The following are some illustrative findings of the Assessment that highlight the scale of human impacts on natural systems.

- **Twenty percent of coral reefs and 35 percent of mangroves have been lost since about 1980**, along with their capacity to buffer coastal communities from storms. Nearly half of the world's major cities are within 50 kilometers of a coast (MA 2005e:27). People are more vulnerable than ever to extreme events, as demonstrated by the high loss of life and accelerating economic losses from natural disasters such as the Asia tsunami in 2004 (MA 2005e:43).
- **More land was converted to crops between 1950 and 1980 than in the 150 years spanning 1700–1850.** Over two thirds of temperate grasslands and Mediterranean

Box 1

What was Unique about the Millennium Ecosystem Assessment?

- **It examined ecosystem services—the benefits people obtain from nature.** This approach focuses attention on the often overlooked reality that success in economic development must be underpinned by healthy ecosystems. Environmental assessment usually focuses on the effects of humans on ecosystems rather than the state of natural assets essential for human wellbeing.
- **It took a multiscale approach.** To understand the relationship among global, regional, and local drivers of ecosystem change and their effects on specific communities and landscapes, the Assessment examined services at a range of temporal and spatial scales. Cutting trees at the local scale may not change the flow of water in a nearby river, but changes at the scale of a river basin can affect the magnitude of downstream flooding. Soil erosion may not affect agricultural productivity over days or weeks, but will have major effects over years or decades.
- **It included a wide range of scientists.** The selection of scientists ensured geographical balance between developed and developing countries, and began to bridge gaps between natural and social scientists.
- **It involved civil society and business.** By including a range of stakeholders in addition to scientists in designing and carrying out the work, the Assessment sought to obtain a broader view of ecosystem services and increase the use of the results.
- **It was designed to provide information requested by national governments.** The Conferences of Parties (COPs) to four U.N. conventions asked for the assessment. The formal request came from resolutions passed by the COPs.

forests and over one half of tropical dry forests, temperate broadleaf forests, tropical grasslands, and flooded grasslands have been converted. Most land suitable for intensive agriculture is already under cultivation (MA

2005e:32–3); further increases in agricultural output will likely result from more intensive management of existing cultivated areas. The economic value of converted land is often far less than sustainably managed natural systems that provide a greater variety of services than intensively cultivated systems.

- **Over half of the synthetic nitrogen fertilizer ever used on the planet has been applied to crops in the past two decades** (MA 2005e:2). As much as 50 percent of this is lost, contributing to rapidly rising nitrate concentrations in rivers, lakes, and coastal areas (MA 2005e:43,69). This can lead to “dead zones”, which are areas where marine life cannot survive because of low oxygen levels. Dead zones can be found around the globe, including in the Kattegat at the mouth of the Baltic Sea and in the Gulf of Mexico, and can reach up to 70,000 square kilometers in size (Diaz 2001; MA 2005a:346).
- **The amount of water impounded by dams has quadrupled since 1960.** Three to six times as much water is now held in reservoirs as in natural rivers (MA 2005e:2). As a result of large-scale dam construction during the last half of the 20th century, tens of millions of people have been displaced and more have suffered a loss of the resources on which their livelihoods depend. Ecosystems have also been adversely affected—freshwater biodiversity is threatened, wetlands are increasingly lost, and the capacity of surrounding ecosystems to provide the services on which society depends is quickly disappearing (World Commission on Dams 2000).
- **Marine fish harvests have declined dramatically since the late 1980s** as supply has diminished. World-wide fish landings peaked in the 1980s and are now declining, even though demand has never been greater (MA 2005f:16). Aquaculture (fish farming) has mitigated some of this shortfall, contributing 27 percent of total fish production in 2000, but sometimes at the expense of extensive mangrove destruction, increasing the vulnerability of coastal communities to natural hazards (MA 2005e:43) (see Box 2).



More land was converted to crops from 1950 to 1980 than in the 150 years spanning 1700–1850.

SEEING TWO SIDES OF THE COIN

We tend to take nature's services for granted. Gretchen Daily, an early writer on ecosystem services, says that "the disparity between actual and perceived value is probably nowhere greater than in the case of ecosystem services" (Daily 1997:6). We seldom think about the many different ways we gain from the natural capital provided by living and nonliving resources. As a result we often overlook the fact that healthy ecosystems underpin long-term economic success. The economy impacts the environment but it also depends on natural assets. Our individual and national security also depends upon services that are provided by nature, though we often take this for granted as well. In our ever more globalized world, threats arising from ecosystem change can easily cross borders. When ecosystem

services such as freshwater provision and disease regulation are compromised, the problems that result, such as political instability or refugee migration, can affect people around the world.

The Assessment provides a conceptual framework that allows us to see these two sides of the coin, by capturing the relationship between the wellbeing of people and the services that ecosystems offer on one side, and the impacts of human activities on ecosystems on the other side. This approach goes beyond the familiar process of assessing and mitigating the environmental impact of a decision to build a highway or a mine. It encompasses human impact through both direct drivers such as decisions about what technology to use, and

Box 2 | Shrimp Aquaculture—Profit or Loss?

Adapted from Sathirathai and Barbier (2001)

Next time you enjoy a shrimp dinner consider for a moment that it may have started its life in a South Asian pond, built in place of a mangrove swamp, and been fed with wild fish from local fisheries. Two likely consequences of this process are degraded fish nurseries and a weakened natural barrier to the sea for adjacent communities.

In the last 5 years global shrimp production has grown at a rate of 10–20 percent per annum. Shrimp farms have multiplied along coastal systems in South, East, and Southeast Asia, often replacing mangroves (MA 2005e:41). Thailand alone accounts for 25 percent of the world

shrimp market, with the number of shrimp farms increasing from 19,700 in 1995 to 35,000 by 2003 (MA 2005a:358).

Mangroves are coastal wetlands that are flooded with brackish water, making them ideally suited for aquaculture. From the perspective of a shrimp farmer, converting mangroves to aquaculture makes financial sense, as illustrated by one study in southern Thailand which found that aquacultures had a net present economic value (using a 10 percent discount rate) of US\$8,340 per hectare compared with only US\$823 per hectare in economic value for an intact mangrove.

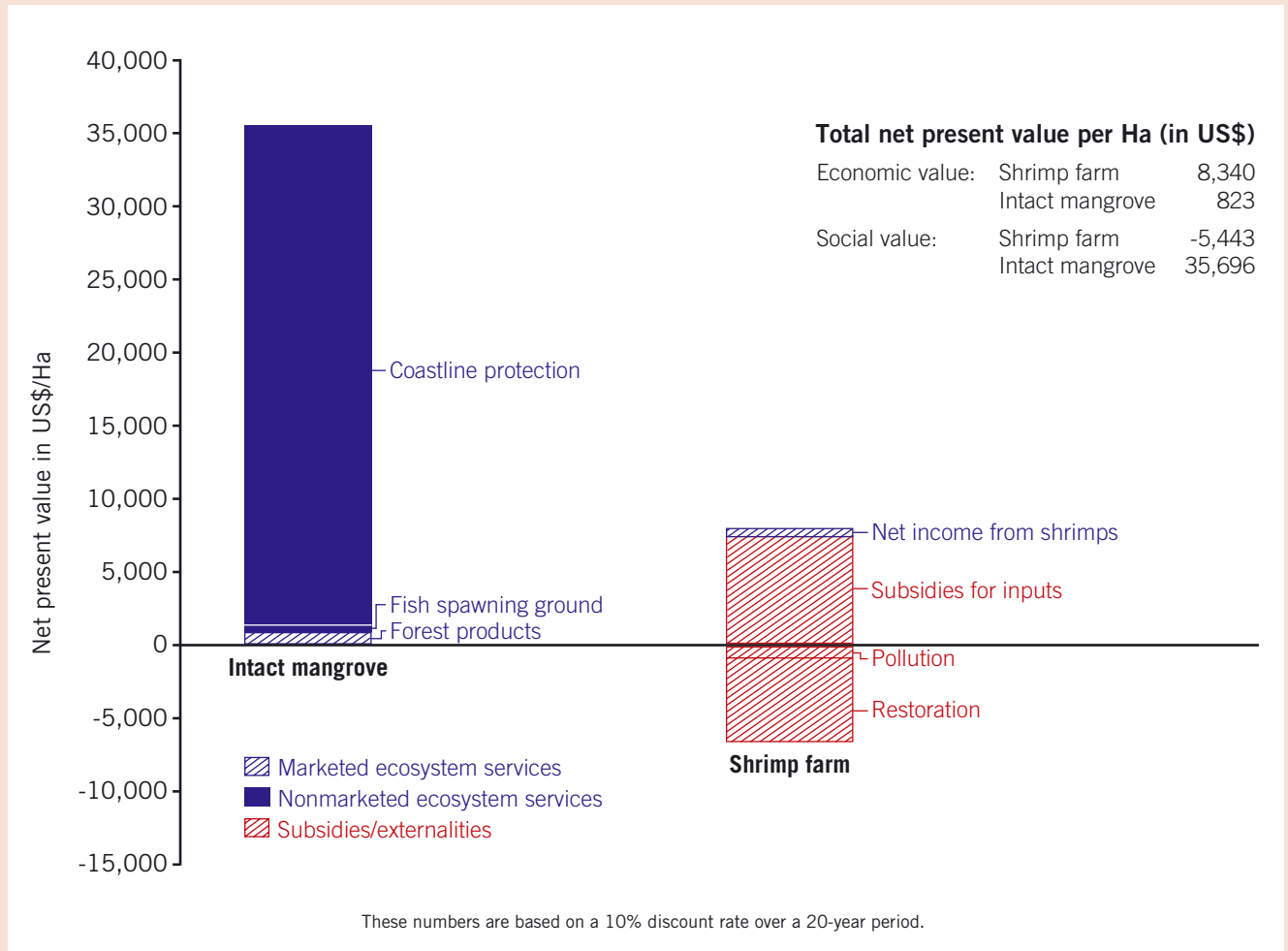


Figure 2. Comparing the Economic and Social Value of Mangroves and Shrimp Farms



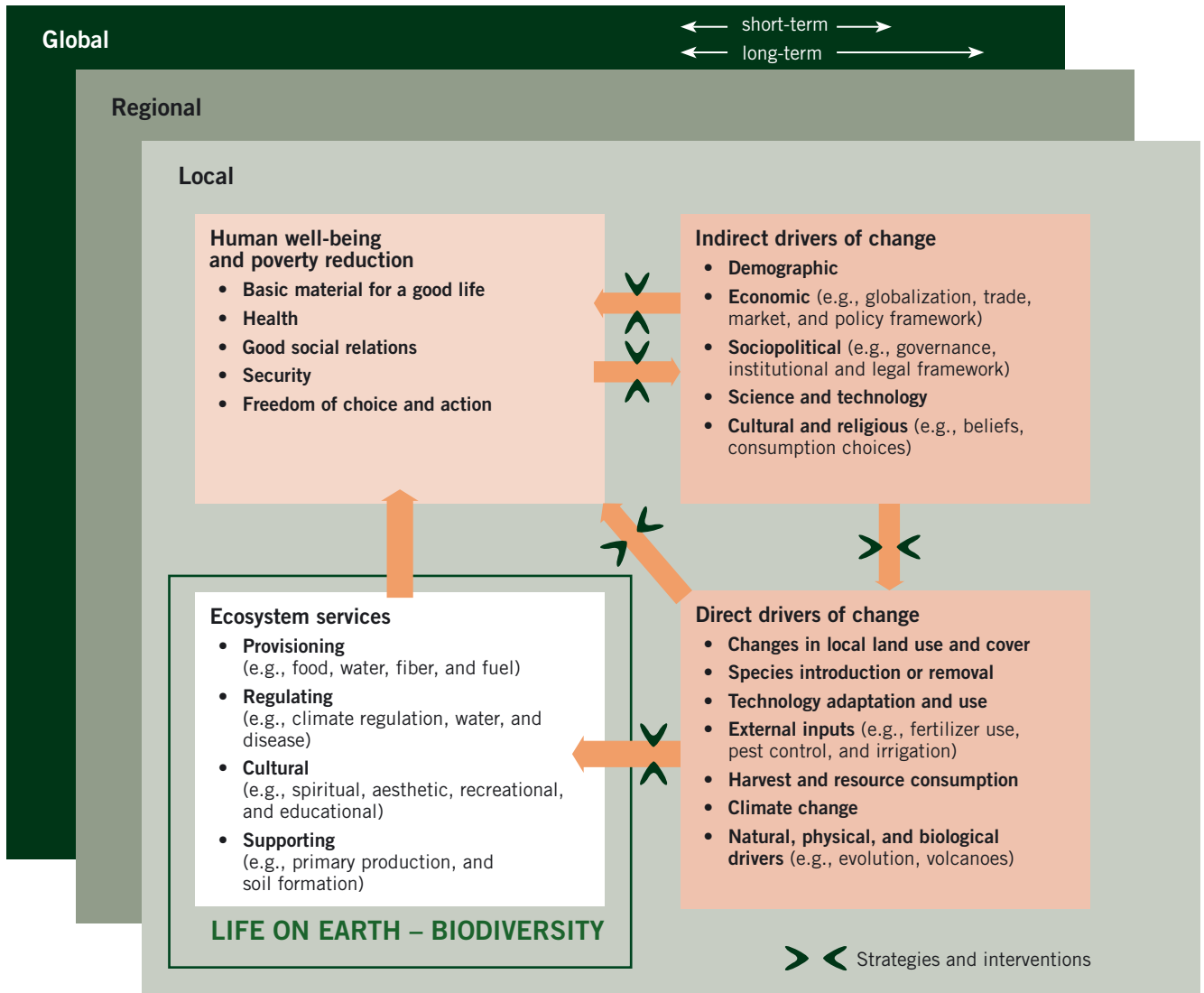
From a fuller cost accounting perspective – the social value – the economics of shrimp aquacultures are not so rosy. Intact mangroves provide a number of important services that are not captured in the marketplace. These include supporting offshore fisheries through the provision of nursery habitat for marine life, as well as storm protection for coastal communities. At the same time shrimp aquaculture has a number of environmental and societal costs not typically borne by the farmer, including water pollution and land degradation. The productive life of a typical commercial shrimp farm in Thailand is only 5 years, after which yields dramatically decline and disease increases. The site is then often abandoned for another location, leaving behind a wasteland that is unfit for further productive use. Aquaculture also enjoys a number of input subsidies including nominal land rent and taxes. Taking these additional factors into account, a fuller comparison of the social values of intact mangroves and shrimp farms reveals the net present value of intact mangroves to be in the region of US\$35,696 per hectare versus minus US\$5,443 per hectare for shrimp

aquaculture. Even if the mangrove restoration costs are excluded, the mangrove benefits are still greater than aquaculture.

This example also raises fairness questions in regard to the distribution of costs and benefits from mangrove conversion. The shrimp farmers who gained in this example are mainly people from outside the community who could afford the high initial investment needed. The losers are the poor who depend on mangrove services for their livelihoods and wellbeing.

This example is not unique, but pervasive throughout Southeast Asia and many other coastal tropical regions. In the five Asian countries most affected by the 2004 tsunami, for example, human activities had reduced the area of mangroves by 26 percent between 1980 and 2000. After the tsunami hit, some areas buffered by coastal forests, like mangroves, were found to be less damaged than areas without tree vegetation, highlighting the protective services of mangroves (Danielsen et al. 2005:643).

Figure 3 | The Millennium Ecosystem Assessment Conceptual Framework



Source: MA 2005e

indirect drivers such as patterns of consumption. But it goes beyond this. It extends the focus to how the changes we make to natural systems alter the supply of their services, and how these changes in turn affect our lives. These services are

fundamental to the food we eat, the air we breathe, the landscapes we enjoy, the protection we have against storms and disease, and, more broadly, our freedom of choice and action (see Figure 3).

ECOSYSTEM SERVICES—THE BASICS

The term “ecosystem” emerged in the 1930s. It means a “dynamic complex of plant, animal and micro-organism communities and their nonliving environment interacting as a functional unit” (CBD 1992). The term “ecosystem services” as the benefits ecosystems provide was first used in the 1960s.

In the last decade, research on ecosystem services has grown dramatically and the concept has been refined. The Millennium Ecosystem Assessment uses a definition by Costanza and colleagues that includes both natural and human-modified ecosystems as sources of ecosystem services. It follows Daily in using the term “services” to cover both goods and services (MA 2005b:56). Because ecosystem goods and services can be difficult to distinguish, the Assessment defined services to include both the tangible (i.e., food) and intangible (i.e., aesthetic) benefits that humans obtain from ecosystems. The Assessment categorized nature’s services—which we use interchangeably with ecosystem services—in four groups:

- **Provisioning services** such as food, fresh water, fiber, and fuel;
- **Regulating services** such as biophysical processes that control climate, floods, diseases, air and water quality, pollination, and erosion;
- **Cultural services** such as places that provide recreational, aesthetic, or spiritual values; and
- **Supporting services**, the underlying processes such as formation of soil, photosynthesis, and nutrient cycling.

We are still at an early stage of understanding and evaluating the health of ecosystem services and how human alterations to natural systems affect their supply and distribution over time. However, several decades of debate about achieving sustainable development have begun to clarify how to integrate the environment with social and economic goals. In 1969, the IUCN (now the World Conservation Union) adopted a mandate that recognized “the perpetuation and enhancement of the living world—man’s natural environment—and the natural resources on which all living things depend” and referred to managing “air,

water, soils, minerals and living species including man, so as to achieve the highest sustainable quality of life” (Adams 2006). In 1987, the Brundtland Commission defined sustainable development as “development which meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their own needs”.

Increasingly, scientists think about sustainability in terms of the ability of social and ecological systems to adapt to and benefit from change, rather than as a static balance between people and nature. Societies and the ecosystems on which they depend are said to be resilient if they are able to absorb change while maintaining their basic structure, identity, and function. Societies are adaptable if people can manage the links between society and ecosystems to maintain resilience. Information on ecosystem services can help decisionmakers distinguish between options that are likely to enhance ecological and social resilience (and thus sustainability) and those that may undermine it.

THE FINDINGS OF THE MILLENNIUM ECOSYSTEM ASSESSMENT

The Millennium Ecosystem Assessment found that people have radically changed the earth in the last half century. While humans have benefited from ecosystem change, these gains come at high costs to natural assets. Further degradation will increase the risk of ecosystem collapse and will threaten our ability to reach development goals. Assessment scenarios show that reversing the trends in degradation and at the same time reducing poverty will require significant changes in how we make decisions (Box 3).

The Assessment looked in detail at 29 of the many services that ecosystems provide people. These services were selected both because they have been significantly affected by recent ecosystem change and because human wellbeing is likely to be greatly affected as a result. The availability of information and data was also a factor in choosing which services to assess. The 29 ultimately chosen include five supporting services. Since, by definition, supporting services are not directly used by people, these five services were not given a rating of enhanced or degraded. Alterations in these services do, however, greatly affect the other three categories of services and therefore may indirectly be used by people and be enhanced or degraded. (MA 2005e:45).

Box 3 | Four Major Findings of the Millennium Ecosystem Assessment

The collective findings of the Millennium Ecosystem Assessment document unprecedented ecosystem change in the last 50 years, and a weakened capacity to provide essential services in the future. The findings challenge the soundness of basic premises that underlie the valuation of ecosystems and their services in economies. They also cast doubts on the way we now make decisions to safeguard ecosystems and maintain their services for future generations. The Assessment lays out four main findings.

- **Humans have radically altered ecosystems in just 50 years**

In the last half of the 20th century, humans changed ecosystems more rapidly and extensively than in any comparable period of history, primarily to meet growing needs for food, fresh water, timber, fiber, and fuel. This has resulted in a substantial and largely irreversible loss in the variety of life on earth (MA 2005e:2). The distribution of remaining species is becoming more similar across regions, mainly as a result of species moving from one region to another, following the increasing movement of people around the world. Almost one third of land is now under cultivation for the purpose of producing provisioning services for people (MA 2005e:32). An increase in atmospheric carbon dioxide concentration by one third since 1750, two thirds of which occurred since 1959, has the greatest potential to alter natural systems through changes in global weather systems. Nature's capacity to adapt to such climatic changes is limited by the anticipated speed of climate change and by the changes humans have made to the landscape. Many species are now stranded in small islands of nature, surrounded by urban or intensively farmed land, making it difficult or impossible for them to adapt or move to more suitable areas (MA 2005f:13–4).

- **Ecosystem change has brought gains in human well-being, but at high costs to “natural” capital**

Taken together, ecosystem changes have resulted in significant benefits to humans, including improvements in health and a reduction in the proportion of malnourished people. However, these gains have come at an increasing cost. The Assessment's findings indicate that increases in the provisioning services that have a market price have inadvertently caused the degradation of other ecosystem services. The degraded services are often “regulating” services such as those provided by mangroves that limit flooding and provide nurseries for fish. These regulating services are mostly public goods that have no value in the marketplace until they are lost. As the experience of the tsunami demonstrates, the loss of the flood protection services of mangroves becomes strikingly apparent after disaster hits.

The Assessment highlights the growing body of evidence that human-induced ecosystem changes increases the likelihood of abrupt and potentially irreversible ecosystem change. The increased likelihood of abrupt changes stems from a combination of biodiversity loss and growing pressure from overharvesting, climate change, invasive species, and nutrient loading, weakening the resilience of ecosystems (MA 2005e:12). These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems. Of particular concern are disruptions to the supply of ecosystem services, such as the 1990s collapse of the Atlantic cod stocks off Newfoundland, Canada (see Figure 4). This fishery had supported small-scale, inshore fisheries for centuries. In the late 1950s, offshore bottom trawlers began exploiting the deeper part of the stock, increasing the size of the catch but depleting stocks. After the stocks collapsed in the early 1990s, a commercial fishing moratorium was instigated, but more than a decade later there are few signs of the fish returning (MA 2005e:58).

- **Further unsustainable practices will threaten development goals**

Ecosystem degradation, greater risk of ecosystem collapse, and exacerbation of poverty, particularly among the resource-dependent poor, all have their roots in the choice of development paths. If they continue unchecked, these problems will undermine the gains in human wellbeing. The Assessment concluded that degradation of ecosystems presents a significant barrier to achieving the U.N. Millennium Development Goals agreed to by world leaders at the United Nations in 2000 to reduce poverty and improve human wellbeing for 2015. Poverty and ecosystem degradation often go hand in hand. Half of the urban population of Africa, Asia, Latin America, and the Caribbean suffers from diseases associated with inadequate water and sanitation. Declining fisheries reduce the availability of an inexpensive source of protein in developing countries. Development prospects for drylands, which cover approximately 40 percent of the Earth's land surface and are home for 2 billion people, were singled out by the Assessment as being especially dependent on actions that reduce or reverse ecosystem degradation. Freshwater availability in drylands is already below the minimum level considered necessary for human wellbeing and is projected to decrease further. Approximately 10–20 percent of drylands are already degraded (MA 2005e:29).

The Assessment developed four scenarios over a 50-year timeline to explore plausible futures for ecosystems and human wellbeing (MA 2005e:71). The scenarios explored two global development paths,

one in which the world becomes more globalized and another in which it becomes more regionalized. In addition, two approaches to ecosystem management were explored, one in which actions are reactive with problems only addressed when they become obvious, and another in which management is more proactive with policies designed to manage ecosystem services over the longer term. Under all four scenarios there is significant growth in consumption of ecosystem services, continued loss of biodiversity, and further ecosystem degradation (MA 2005e:17). Land conversion remains an important driver of biodiversity loss, although in some regions other factors become increasingly important. Nitrogen build-up in rivers and coastal waters in developing countries, especially in Asia, damages human health, fisheries, and habitats such as coral reefs (MA 2005f:21).

- **Workable solutions require major governance changes**

It will be a significant challenge to reverse ecosystem degradation while meeting the demands of a growing population, but options do exist. Three of the four scenarios indicate that major changes in policies, institutions, and practices on a scale well beyond anything under way at present can reduce some of the negative effects of rising consumption of ecosystem services. The same three scenarios also show improvements in human wellbeing in both developing and industrial countries. Promising interventions identified in the scenarios include investments in environmentally sound technology, active adaptive management, proactive approaches to addressing ecosystem problems, extensive investment in public goods such as education and health, and an emphasis on eliminating socioeconomic disparities (MA 2005e:92).

The scenarios diverge in regard to the overall state of services, with the most significant decline in “futures” where governments favor their own national or regional security over global cooperation and where conservation is given low priority (MA 2005f:21). In contrast, in “futures” where regional ecosystems such as watersheds are the focus of political and economic activity and emphasis is given to proactive local ecosystem management strategies, improvements occurred across all ecosystem service categories. In a globally connected “future” with emphasis on the use of environmentally sound technology and a proactive approach to ecosystem management, improvements occurred in both provisioning and regulating services. In a globally connected “future” characterized by global trade and economic liberalization, strong emphasis on poverty reduction and investment in public goods such as education, but a reactive approach to problems, improvements only occurred to provisioning services. In all scenarios biodiversity continued to be lost, raising questions about the long-term sustainability of improvements in both services and human wellbeing (MA 2005e:92).

The Assessment stopped short of making recommendations to achieve the significant changes in the ways we make decisions that its report identifies as needed. At the same time, it voices optimism that society has the ability “to ease the strains people are putting on natural services of the planet, while continuing to use them to bring better living standards to all” (MA 2005f:23).

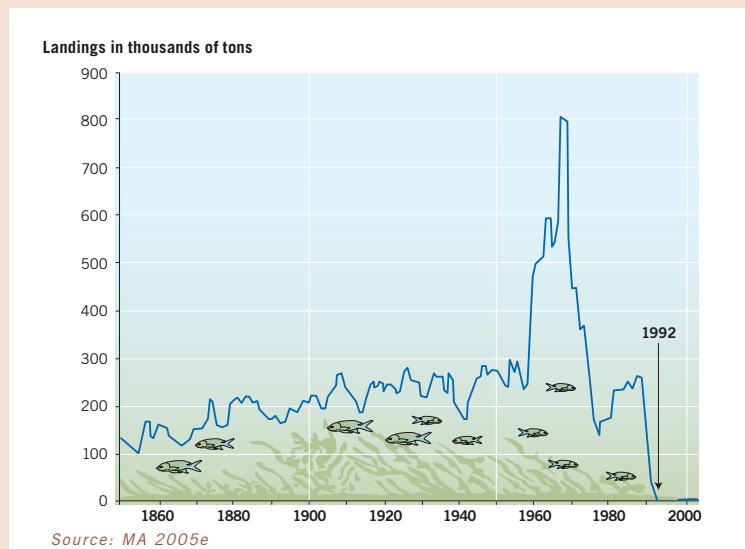


Figure 4. Fish Landings of Atlantic Cod off Newfoundland

Table 1 summarizes how human use has enhanced or degraded the ecosystem services that the Assessment evaluated, namely the provisioning, regulating, and cultural services. Only four of the 24 services rated were enhanced, three of which are provisioning services (crops, livestock, and aquaculture), reflecting society's focus on managing ecosystems to produce food for a growing population. In contrast, 15 services were found to be in decline worldwide—six of 11 provisioning services, seven of ten regulating services, and two of three cultural services examined. By using up provisioning services such as timber, groundwater, and capture fisheries faster than they can be replenished, we are depleting the assets available to future generations. Actions to increase provisioning services often lead to the degradation of regulating and cultural services.

By converting natural systems into production factories for a handful of provisioning services—crops, livestock, and aquaculture—we lose a myriad of other often more valuable services, not captured in the marketplace, but nonetheless critical to our wellbeing. The costs of these lost services are already being borne by parts of society. The first to suffer are often the poor who depend upon the lost services for their livelihoods, while the beneficiaries are often wealthier and live in places far away from the degraded services.

THIS REPORT

This publication takes up the challenge of distilling the implications of the Assessment for how we make decisions. What

policies, governance measures, and organizational changes will foster ecosystem health? To focus a debate on how to put society on a course that ensures healthy ecosystem services, the World Resources Institute (WRI) invited 17 experts from diverse backgrounds to review the Assessment's findings (see page 81). It asked them to propose ideas for an action agenda to turn the now flashing red lights to yellow and green. Their only instructions were that all options should be on the table. The resulting papers are compiled in a separate book published by Edward Elgar (Ranganathan et al., 2007). This report builds on the fruits of their reviews. It also draws extensively on the work of WRI.

In the spirit of provoking further analysis and debate, the remainder of this publication proposes and makes the case for an action agenda. Chapter 2 outlines five barriers to governing for healthy ecosystems and five corresponding actions for overcoming them. These five actions form the backbone of the action agenda. Chapter 3 describes examples of ways that company boardrooms, conservation groups, government ministries, and others are already weaving these actions into their work. Chapter 4 takes an institutional view and discusses four new ways of working that could help meet the challenge of sustaining ecosystem services. Chapter 5 outlines actions that civil society, business, researchers, local communities, national governments, and international organizations can take to restore natural capital.

Turning the flashing red lights to yellow and green will require imaginative and persistent efforts by all these groups working with the public.



CHAPTER 2

Sustaining Ecosystem Services

The Assessment makes clear that current approaches to managing our natural assets have not kept ecosystems healthy. Nor are they likely to be adequate for the challenges that lie ahead. Over the next 50 years, an expanding global population and economy will place growing demands on ecosystems at a time when their capacity to provide services has never been lower.

This rising demand for ecosystem services, coupled with dwindling supply, will lead to growing vulnerability and conflicts over who gets the benefits and who pays the costs of disrupted ecosystems in an already highly inequitable world. Eighty percent of the world's gross domestic product belongs to the one billion people living in the developed world; five billion people in developing countries share the remaining 20 percent (RWSS 2005). The regions facing the largest development challenges (south of the Sahara in Africa, Central Asia, parts of South and Southeast Asia, and Latin America) will also confront the largest problems from ecosystem degradation. Overlaid on this fragile world will be the effects of growing pressures such as the build-up of nitrogen in rivers and coastal waters, species extinction, and increased incidence of droughts and flood from climate change.

A VISION

The challenges, while enormous, are not insurmountable. We believe that the seeds of change needed to put us on a path to sustaining ecosystem services are already emerging, assembled from existing pockets of best practice around the globe. What might the world of decisionmaking look like in 2030 if these seeds germinate and transform the way we see and value our ecosystem services? Will it become second nature for people to safeguard the capacity of ecosystems to provide the mosaic of services necessary for human wellbeing? Will ecosystem health and development aspirations be viewed as mutually reinforcing sides of the same coin, instead of a zero sum game?

*The seeds of change
needed to put us on
a path to sustaining
ecosystem services are
already emerging.*

Imagine for a moment that the movement to ensure the sustainability of our natural assets and long-term wellbeing that is already underway in parts of the world grows across economic sectors and political boundaries. Led by participants in the Millennium Ecosystem Assessment, global business leaders with progressive ecosystem policies such as members of the World Business Council for Sustainable Development, coalitions of governments such as the Poverty Environment Partnership, and multidisciplinary applied scientific groups such as the Resilience Alliance, the movement unleashes a new generation of information and governance approaches.

Civil society performs the role of watchdog, solution provider, and trailblazer. It makes information on ecosystem services and the performance of the public and private sector available, enabling the public to hold business and government accountable. It is an effective advocate at all levels for strengthening the rights of local people, especially the poor, in development decisions. Multilevel partnerships, convened by civil society, that bring together formal and informal actors for the purposes of developing collective solutions provide model governance structures for government and business to emulate. Civil society is at the vanguard of calls for fiscal and policy reform that aligns economic and financial incentives with ecosystem stewardship.

Business views ecosystem stewardship as a source of new markets and competitive advantage. Companies adopt policies on ecosystem services and routinely report to the public on how they are implementing them. Companies in the natural resource sectors operate at the behest of local communities. Local voices are influential in shaping business operations in their locality. Managers routinely have ecosystem stewardship goals incorporated into their performance reviews. New businesses emerge to take advantage of new and growing markets for technologies and products that reduce ecosystem impacts and of payments for ecosystem services.

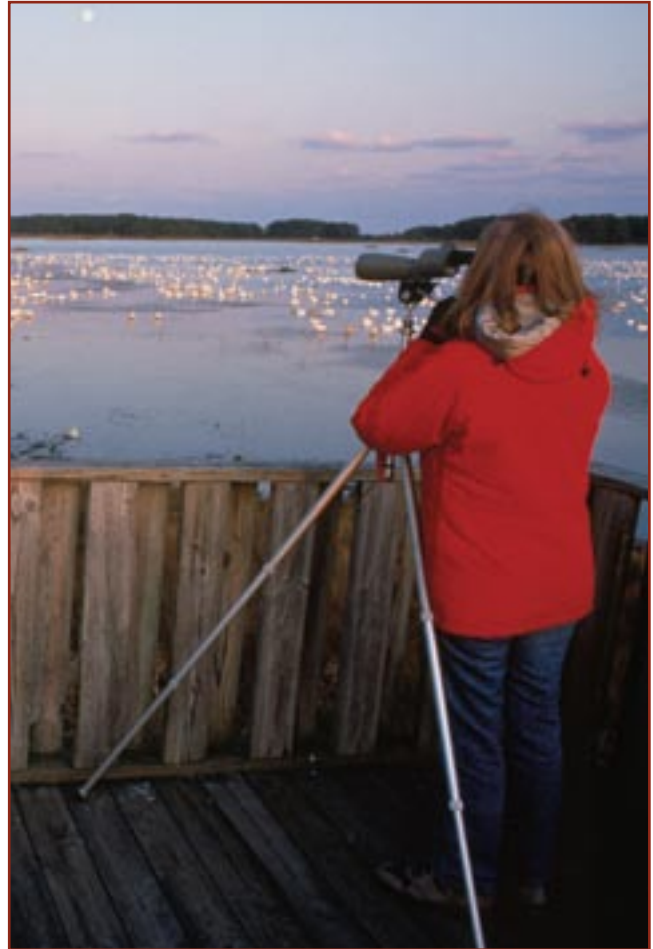
Research communities embrace ecosystem services as a major research theme. Information from monitoring systems for ecosystem condition and trends is analyzed and broadly disseminated, informing economic and development policies and election priorities. The Assessment conceptual framework becomes the organizing locus for a ballooning interdisciplinary research agenda that builds bridges across the traditionally fragmented natural, social, and economic research disciplines.

Empirical research validates the contribution of participatory governance to successful development strategies and decisions.

Local communities have clear rights to resources in their communities and a significant voice in decisions about how they will be used and how the resulting costs and benefits will be distributed. Those in particular who have a major stake in the health of the ecosystem services, such as the vast majority of the world's poor who are concentrated in rural areas, have appropriate opportunities to influence development decisions that affect the services they depend upon. They also have ready access to information on the state and trends of ecosystem services. Locally elected officials keep a close eye on the health of services—whether water, timber, sacred sites, or others—because they know they will have to answer to voters at the ballot box otherwise. Ecosystem Service Districts are commonplace. They collect information and use it to clarify tradeoffs among services. They use tools such as zoning and taxation to protect and restore natural capital.

National governments routinely monitor the health of ecosystem services and include indicators in national accounts, enabling the public to track progress and hold decisionmakers accountable. They provide the public with access to information, participation, and judicial review on decisions affecting ecosystem services. Policies routinely set minimum environmental standards, but respect the rights of individuals and communities over the natural resources where they live and promote fairness in the distribution of costs and benefits associated with ecosystem change, both at home and abroad. Tax and subsidy policies reinforce ecosystem stewardship. Budget systems are in place to identify investment opportunities for restoring ecosystem services, estimate the costs and benefits, and incorporate them into agency budgets. Government officials work regularly with networks at all levels, particularly regional ones, to encourage action at the level most likely to be effective.

International organizations play a lead role in establishing the conditions for institutional cooperation on ecosystem stewardship across political levels and geographic scales. They facilitate dialogue among national parties involved in disputes over ecosystem degradation and diminishing services, such as fresh water and fisheries, helping parties to focus on the root causes of ecosystem degradation. They also support national development processes to implement the Millennium



A vision: the relationship between ecosystem health and development goals is second nature to people.

Development Goals through investments that restore ecosystem services that the poor in rural areas depend upon for their livelihoods. Local communities and indigenous groups have a voice in the negotiations of international agreements. Information from regional and national monitoring systems and Biome Stewardship Councils informs convention priorities and goal setting and enables the public to track progress by national governments in implementing their commitments under environmental conventions.

Is this vision achievable? Overly optimistic? We believe that it is possible to achieve and that it is imperative that we do so. In the next section we lay out an action agenda for reaching this vision.

AN ACTION AGENDA

What would an action agenda that could achieve this vision look like? Despite the immensity of the challenge, we do know where the path to sustaining ecosystem services starts. Table 2 outlines the barriers we face and corresponding actions, including illustrative examples, to address them.

*Will we look back
and wonder how
people could have
failed to recognize
the importance of
natural assets?*

In a generation or two, will we look back and wonder how people could have failed to recognize the importance of natural assets? Why wasn't the health of ecosystems a higher priority? Why was it so difficult to move beyond outmoded ways of making decisions? Most basically, we take the availability of nature's services for granted. As Table 2 lays out, five reasons for this stand out. First, we lack relevant information on the connection between ecosystem services and human wellbeing, and often do not use what we have. Second, local people, especially the poor, frequently lack the rights to use services they depend on for their livelihoods and to play a significant role in managing them. Third, our institutions focus narrowly on their mandates and find it difficult to work across boundaries whether of professional specialties, geographic scale, or at a political level. Fourth, the measures to hold government and business accountable for decisions affecting natural assets are weak or absent. Fifth, the needed incentives to align economic and financial decisions with ecosystem health are not in place.

While much remains to be learned, burgeoning research and experience with a variety of approaches among government,

business, and civil society groups in the last several decades point the way to making decisions that will sustain ecosystem services.

The primary authors draw in particular from three sources to identify the areas for action:

- Seventeen expert reviews of the Assessment findings commissioned by WRI;
- Technical and synthesis volumes of the Millennium Ecosystem Assessment; and
- Relevant WRI work, much of it reported in the 2002–04 and 2005 editions of the World Resources Report (WRI et al. 2003, 2005).

The five proposed actions grow out of experience with initiatives undertaken in the last several decades, as conservation, community, business, and development leaders, seeing the limits to achieving their goals within narrow focuses, began to explore ways of connecting their work. For example, conservationists have long used protected areas as their primary tool. They have been successful in setting aside more than 10 percent of the planet's land surface to preserve threatened habitats and species. There is growing recognition, however, of the rights of local people living in or adjacent to such protected areas. As a result, conservation groups have begun to work much more closely with local people. Initial efforts sought to integrate development and conservation goals in projects around protected areas and then moved to community-based natural resource management projects. At the same time, business and development leaders also began to explore more effective ways of achieving their business and economic goals, while minimizing environmental impacts. Business faces resistance from communities in using forest, water, and other resources. Civil society is calling for more effective ways to reduce poverty than waiting for the benefits of economic growth to trickle down to the poor.

The projects that emerged out of this ferment tested ways to answer fundamental questions about how to make decisions about natural assets. How can we develop and use information about ecosystem services in everyday individual and institutional decisions, and bring attention to and weigh the

Table 2 | Sustaining Ecosystem Services: Barriers, Actions, and Examples

| Barriers | Actions | Examples |
|--|--|--|
| <p>People fail to make the connection between healthy ecosystems and the attainment of social and economic goals. Individuals, business, government, and civil society lack—or don't use—information on how their decisions and goals affect or depend on the availability and quality of food, water, cultural, and other services of nature.</p> | <p>Develop and use information about ecosystem services</p> | <ul style="list-style-type: none"> • Perform regular monitoring and assessment • Identify and manage tradeoffs • Frame messages that resonate with the public • Tailor information for citizens, producers, and purchasers |
| <p>Local people often lack clear rights to use and make decisions about the ecosystem services they depend on for their livelihoods and wellbeing. People in local communities—particularly indigenous people, women, and the poor—lack secure tenure to land and resources they use and have little or no influence in decisions about how they are used.</p> | <p>Strengthen the rights of local people to use and manage ecosystem services</p> | <ul style="list-style-type: none"> • Ensure that individuals and communities have secure rights to ecosystem services • Decentralize decisions about ecosystem services • Bring local voices to the table to influence development projects and policies |
| <p>The management of ecosystem services is fragmented among many different agencies and bodies that often work at cross-purposes and fail to coordinate across levels. The complexity and integrated nature of ecosystems necessitates a coordinated management approach. However, decisionmaking and research bodies often lack the mandate and capacity to work across geographical and temporal scales and political levels.</p> | <p>Manage ecosystem services across multiple levels and timeframes</p> | <ul style="list-style-type: none"> • Establish the conditions for cooperation with communities • Form bridging organizations • Use comanagement practices • Raise priority of working across levels in national institutions |
| <p>Government and business accountability mechanisms for decisions about ecosystem services are frequently absent or weak. Corruption flourishes when decisions are not transparent and sanctions are unavailable.</p> | <p>Improve accountability for decisions that affect ecosystem services</p> | <ul style="list-style-type: none"> • Hold elected officials accountable • Use public process to track ecosystem investments in meeting development goals • Increase corporate transparency |
| <p>Responsible management of ecosystem services does not always pay. Many ecosystem services have no value until they are lost. The economic and business case for maintaining ecosystem services is weak, obscured, or nonexistent. The costs of ecosystem degradation are not borne by those responsible.</p> | <p>Align economic and financial incentives with ecosystem stewardship</p> | <ul style="list-style-type: none"> • Eliminate perverse subsidies and reform taxation policies • Include ecosystem risk in financial evaluations • Support markets and payments for ecosystem services • Incorporate ecosystem stewardship goals in managers' performance objectives |



A vision: children learn how people depend on nature.

tradeoffs among immediate ecosystem services of food and the longer term ones such as flood control and clean water? How can we strengthen the rights of local people to use and manage ecosystem services? What kind of governance structures will facilitate the management of ecosystem services across geographic, political, and temporal boundaries? What mechanisms are needed to improve accountability for decisions that affect ecosystem services, and how do we better align economic and financial incentives with ecosystem stewardship? The learnings from these early initiatives inform the actions recommended in Table 2.

On their own, none of the five actions is sufficient to address the enormity of the challenge. But when collectively applied they represent a powerful force for change. Better information can provide political and economic incentives to take ecosystem services into account. Ensuring that individuals and communities have secure access to the ecosystem services they depend on for their livelihoods gives them a financial incentive to invest in the long-term health of those natural assets.

Of course not everything on the action agenda will be implemented at once. Powerful obstacles stand in the way. Elite groups who control land and resources will not want to relinquish control. Corrupt regimes will fight efforts to increase

transparency and accountability. Empowered rural communities may be unable to secure the needed investment to restore healthy ecosystems capable of supporting their livelihoods. But the democratization of natural resources has begun, and the winds of change will ultimately disperse today's germinating seeds far and wide.

***The democratization
of natural resources
has begun.***

The next two chapters lay out how this vision can be achieved, first by describing examples of how the action agenda is already being implemented in existing institutions around the globe, that is, by civil society, business, research communities, local communities, national governments, and international organizations; and then by proposing four new approaches that could address current institutional gaps.



CHAPTER 3

Advancing the Action Agenda in Existing Institutions

What steps can existing institutions take to implement the action agenda? This section puts meat on the bones of the agenda outlined in Chapter 2. It explores the five actions listed in Table 2 in more depth by providing promising examples of how civil society groups, business, research communities, local communities, national governmental agencies, and international organizations are already putting them into practice.

The examples are not exhaustive. They are intended to introduce the direction and range of opportunities for carrying out the five actions. They encompass the very specific—such as an effort to make a particular kind of information available about legislative performance—and the much broader—efforts to decentralize governmental decisions about ecosystem services. The actions and examples illustrate how we can bring the health of nature into our everyday decisions by developing and using information, strengthening the rights of local people, managing across multiple levels, improving accountability, and aligning economic and financial incentives. With each example, we note the types of organizations that could scale up these approaches and activities elsewhere.

DEVELOP AND USE INFORMATION ABOUT ECOSYSTEM SERVICES

It is difficult to think of a decision that does not in some way depend on the benefits that nature provides and that in turn does not influence the health of nature's services. Every day, investors, finance and development ministries, companies, local governments, and individuals at home and at work take actions that drive decisions about how resources are used. These decisions in turn drive ecosystem change. Effective decisionmaking requires relevant and accurate information, but when it comes to ecosystems this information is often unavailable or not used.

Responsibility and power lie with individual organizations and people, yet without sufficient information even the best intentions fail. To make everyday choices in a way that incorporates an understanding of the inevitable tradeoffs in utilizing ecosystem services requires regular monitoring and periodic assessment of ecosystem services. It also requires developing and using tools to identify these tradeoffs, framing the message of ecosystems' importance in ways that resonate, and tailoring the information so that citizens, producers, and purchasers are able to use it. Developing and using information about ecosystem services as illustrated by these four actions will enable individuals and organizations to make more informed decisions about how best to manage and use the services nature provides.

Perform Regular Monitoring and Assessment Civil Society, research communities, local communities, national governments, and international organizations

Regular collection and analysis of data on ecosystem services is fundamental to making informed decisions on issues that affect or are affected by ecosystem health. These data need to become as easily available and commonly used as economic data. The Millennium Ecosystem Assessment provides a framework for tracking the status and trends of ecosystem services.

While our knowledge of ecosystems has increased dramatically, it simply has not kept pace with our ability to alter them, the Assessment says. Even valid baselines are lacking in many instances, with deforestation estimates, for example, accurate only to within plus or minus 50 percent. Sometimes the information is available, but the financial resources are not available to process it. For instance, the Assessment points out that this is the case for global monitoring of land cover change using remote sensing. Some types of information are missing almost entirely. The Assessment found little information on the economic consequences of changes in ecosystem services or on the links between ecosystem services and human wellbeing, except for food and water (MA 2005e:101–2). The challenge is to establish regular monitoring and assessment of services at all scales and to fill in the gaps identified in the Assessment.

Several groups are working to spur the process of collecting, interpreting, and using data on ecosystem services. To encourage widespread use of the Assessment's methodologies, a consortium of organizations led by the United Nations Environment Programme (UNEP)'s World Conservation Monitoring Centre is preparing an ecosystem assessment technical handbook. WRI is collaborating with the World Business Council for Sustainable Development and Meridian Institute to develop an "Ecosystem Services Review" methodology to help businesses assess the risks and opportunities associated with their use of and impact on ecosystem services. Another coalition led by WRI is writing a guide to help policymakers and others mainstream ecosystem services in socioeconomic decisions. Development agencies may be appropriate sponsors for regular sub-global assessments of ecosystem services in the future (La Viña 2007).

The experience of the Assessment supports investment in cross-disciplinary and cross-scale learning that involves the

policy community and the public as well as scientists (Norgaard 2007). A group called Locally Managed Marine Areas in the Pacific, for example, demonstrates one way to include resource user communities in monitoring an ecosystem service that they depend on for their livelihoods. Finding that their fisheries were deteriorating, in the 1990s coastal communities in Fiji brought back traditional management practices such as closing some zones to fishing or limiting the amount that could be harvested. Twenty percent of the inshore fisheries involving 125 communities are now locally managed in this way. To test the effectiveness of these approaches, experts from the University of the Pacific taught local people to monitor their fisheries. Using these skills, the Fiji community of Ucunivanua found that the number and size of clams in the area closed to fishing and adjacent areas increased dramatically (WRI et al. 2005:144–51).

A new generation of information and communication technology offers opportunities to improve ecosystem monitoring significantly at low cost. In Malaysia, conservationists count elephants by satellite (WWF 2005). WRI and the University of South Dakota are partnering to develop and apply remote sensing forest monitoring tools to monitor tree cover change on a regular basis using a globally consistent methodology. Civil society groups can encourage local participation in monitoring by distributing cell phones and offering a free connection service in return for regular reports on environmental conditions (see Box 4).

Future ecosystem monitoring and assessment needs to occur at multiple scales and levels, draw on both traditional and scientific knowledge, and emphasize the links between

Box 4 | Using Mobile Phones to Monitor Land Development Practices in Argentina

An important advantage of mobile phone technology is that little infrastructure is required for its operation. In addition, new advances in text messaging and Internet access capabilities mean that mobile phones are now a viable and affordable communication platform for the collection of real-time, on-the-ground monitoring data by a variety of groups including nongovernmental organizations (NGOs) and local communities (Bateman 2007).

The value of mobile phone technology is well understood by the indigenous Wichi people on the Pizarro Reserve in northwest Argentina. There are no land lines in this remote area, so residents were previously unable to communicate environmental conditions or call for help when developers destroyed land and homes. When the state government threatened to auction off the Pizarro reserve to agribusiness, Greenpeace Argentina distributed mobile phones to various community leaders and taught them how to send text messages to activists for help (Oberman 2005).

ecosystems and people. New technologies, such as web-based interfaces that display spatially referenced information on a virtual globe like Google Earth, provide ways to share, analyze, and disseminate information across different levels. Once more experience has been gained in monitoring and assessing ecosystem services, standards will be needed for factors such as data quality, measurement units, and labeling. Such standards can help ensure that the resulting data can be aggregated and compared and that the results are appropriately used.

Identify and Manage Tradeoffs

Civil society, research communities, local communities, national governments, and international organizations

Local and national development planners, project developers, natural resource managers, and a myriad of other public and private decisionmakers regularly make choices that trade one ecosystem service for another and determine who bears the costs and who benefits. However, tools to identify and pro-



Using new tools to monitor ecosystem health.



UNEP (2005)

Decision-makers in the Soviet Union weighed the economic benefits of a cubic foot of river water for irrigating cotton against feeding the Aral Sea. They chose irrigation. Withdrawals from two major rivers almost doubled between 1960 and 2000. By 2005, the Sea had lost 90 percent of its volume and nearly three-quarters of its area. As a result, 60,000 jobs in fishing and canneries were lost, and thousands of people left as delta became desert. Salt and pesticide-laden winds threaten the health of remaining residents and damage crops as far as 1000 km away.

Projects are underway to rehabilitate parts of the Sea and its deltas. A major challenge is building cooperation among the seven countries (including local communities) on the fair sharing of water. This includes collecting and sharing monitoring data, aligning economic incentives to increase efficiency in using water, and shifting to less water-intensive crops (Mickin 1998; Roll et al. 2006).

vide information on these tradeoffs are often unavailable or unused (Goodland 2007; La Viña 2007). Examples of tools that offer promise include the Action Impact Matrix, several types of mapping, and scenarios.

The Action Impact Matrix is a fully participative, multi-stakeholder method which can be used at any scale or level to understand the two-way interactions between development policies and ecosystems (Munasinghe 2007). Environmental impact assessments are often narrowly focused on the effects of development on ecosystems and not vice versa. The Action Impact Matrix could be used to integrate ecosystem management comprehensively into national sustainable development planning (Li 2007; Munasinghe 2007). Box 5 illustrates the Matrix's use in national development planning in Sri Lanka.

Geospatial mapping offers another approach to identify and consider tradeoffs in the distribution of the costs and benefits derived from ecosystem service use. Overlaying high-resolution maps of poverty and ecosystem services, for example, can highlight relationships that are important for policy development and poverty reduction. With the help of detailed poverty maps, analysts can compare, for example, the spatial patterns of poverty with the spatial distribution of investments in piped drinking water. In Kenya the majority of rural communities obtain their drinking water from untreated surface water, groundwater, or a combination of surface and groundwater. Households that rely on surface water are particularly vulnerable to interruptions in water flows and to water contamination. Investments in piped water and water treatment are important means by which people can obtain enhanced benefits from ecosystem services and insulate their livelihoods and wellbeing from interruptions in the quantity and quality of water supplies. Detailed maps can provide a comparison in Kenya of poverty rates and the degree to which communities rely on ecosystems or on technology for their water supplies. These maps have been created and reveal that the poorest areas in the upper Tana have not benefited yet from investments in piped drinking water (WRI et al. 2007).

The Sub-Global Assessment (SGA) for Southern Africa describes another mapping tool. For the Gariep region, it used an irreplaceability concept to assess tradeoffs between food services and biodiversity. Food production was divided into

Box 5 | Using the Action Impact Matrix in Sri Lanka

Adapted from Munasinghe (2007)

Step 1: Identify national development goals

e.g., economic growth, poverty reduction, employment, budget deficit reduction

Step 2: Identify critical ecosystems relevant to national development goals

e.g., forests, managed ecosystems (grain and tree crops), coastal, marine, wetlands, water resources

Step 3: Identify how development goals affect ecosystems

Using a two by two matrix with development goals on one side and critical ecosystems on the other, assign values (+ or – and 1–3 for impact significance where 1 = low and 3 = high), e.g., economic growth has a moderate negative effect on coastal ecosystem services by increasing coastal development; employment has a low positive effect on wetlands by creating job opportunities in sectors that do not depend directly on ecosystem services

Step 4: Identify how ecosystems affect development goals

Using the same two by two matrix from Step 3, identify the relationship between critical ecosystems and development goals, e.g., degraded water resources have a high negative effect on managed ecosystems; deforestation has a moderate negative effect on poverty reduction through impacting the poor dependent on forests for their livelihoods

Step 5: Prioritize development–ecosystem linkages and identify remedial strategies

e.g., water resources and managed ecosystems—use of integrated river basin management; supply side water management options such as enhancing wetlands and use of ground cover to reduce evapotranspiration; and water pricing in irrigated agriculture

Step 6: Conduct detailed analysis of key interactions identified in Step 5

e.g., multiscale analysis of water resource services—supply and demand

Step 7: Update and refine Steps 3–6 based on results of Step 6



Thailand Environment Institute

Make the connection between people and ecosystems in ways that resonate.

two types: calorie production (cereal) and protein (meat). Based on targets for calories, protein, and biodiversity, replaceability values were assigned to map grids in the Gariep basin. These ranged from 0 (many options in other locations to achieve goals) to 1 (totally irreplaceable; the goals for services would not be met if this location were not included). While no site was found to be irreplaceable for protein and calorie goals, several sites were irreplaceable for biodiversity. This information supports a land use plan that guides protection of sites with a high degree of irreplaceable biodiversity, while steering grazing or cultivation on other sites (SA/MA 2004).

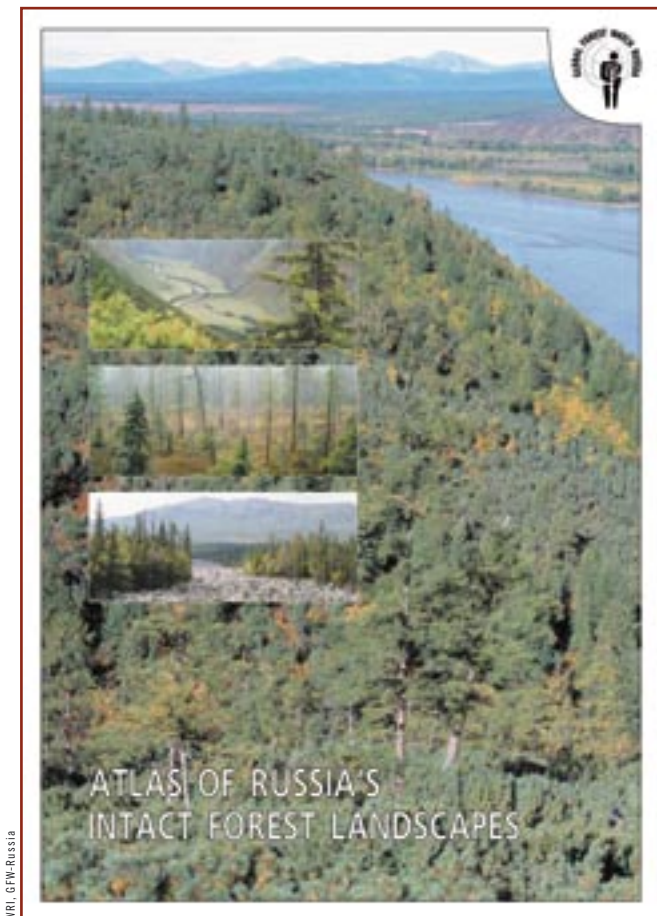
Scenarios are another potential tool for identifying trade-offs. The Assessment scenarios that describe the state of ecosystem services and human wellbeing under different policy and management approaches can also inform choices about development in the context of the potential for sudden, non-linear change or the relative merits of different policy interventions. How might deforestation and climate change interact with geological hazards faced by communities in mountainous areas? How might a new infrastructure development such as a major road system or large dam affect the supply of ecosystem services to different communities? While it is not possible to avoid all tradeoffs from ecosystem change, identifying them and taking them into account in decisions will increase the likelihood of creating more winners and fewer losers. Such tradeoffs would be facilitated by improving methods of valuing ecosystem services (Munasinghe 2007).

Frame Messages that Resonate with the Public Civil society and research communities

To resonate with citizens and spur calls by civil society for more effective policies, information on ecosystem services must be framed in ways that resonate. A civil society leader suggests several ways that Assessment findings might be framed to “promote the changes in individual behavior and social policy needed to protect ecosystems as moral and ethical imperatives” (Seymour 2007):

- Ecosystem degradation is exposing humans to increasing risk as the ability of ecosystems to provide services decreases. *Ecosystem maintenance can be framed as social insurance against risk* in the same way that social security helps manage the risk of old age. An important element of this approach would be ensuring that the benefits are widely shared and that the equity dimension is addressed. Civil society groups will need to use visionary thinking to prepare to take advantage of events—such as Hurricane Katrina—or other types of political “trigger points” to build the societal agreement necessary to adopt social insurance. Facing soaring payouts for natural disasters, the insurance industry is a likely ally.
- Costs and benefits of ecosystem degradation are often not equitably distributed. The benefits go to the more concentrated winners and the costs to the more diffuse losers. Thus *ecosystem stewardship can be cast as a fairness or justice issue*. In Indonesia, logging benefited the elite while rural communities suffered the damage of the deforestation. Making the links between ecosystem stewardship and the poor would reverse the caricature of environmental advocates as elitist. Connecting degradation of ecosystems to the exacerbation of poverty may be one way to build a norm in wealthier countries against the exploitation of natural resources to the detriment of the developing world, such as the import of illegal or unsustainably logged timber from tropical rainforests.

To convey these messages, graphic images and simple analogies are likely to be most effective. Ecological clocks might provide graphic images of the levels of degradation. Patterned after the Doomsday Clock used by the *Bulletin of Atomic Scientists* to track the danger of a nuclear catastrophe, ticking timepieces could track trends in the health of fisheries, climate, or other ecosystem services.



Major furniture manufacturers are using the atlas of Russia's intact forest landscapes to guide their wood procurement decisions.

Tailor Information for Citizens, Producers, and Purchasers

Civil society, research communities, and local communities

The urgent need is to disseminate the rich body of existing knowledge to the public in order to change how we use ecosystem services, writes a civil society analyst in China (Li 2007). Disseminating information in useful ways is as crucial as generating it. People need information about ecosystem services tailored to particular types of decisions ranging from protecting their family and participating in making policy to selecting investments and producing and purchasing goods. Many efforts are underway to translate information on ecosystem services into

appropriate forms for all of these purposes. The challenge is to improve these practices and move them into common use.

Individuals need many types of information about ecosystem services. One of the most fundamental is information about the quality of the air they breathe and water they drink. An analysis of 16 case studies by a coalition of nongovernmental groups called The Access Initiative looked at the quality and accessibility of monitoring data on air and water in nine countries. It found that information on daily air quality and trends was available in the press, on the radio, and/or on the Internet in urban areas in Chile, Hungary, India, Mexico, Thailand, and the U.S. However, detailed information on surface and drinking water quality was easily available only in the U.S. and South Africa. In Hungary, India, Mexico, Thailand, and Uganda, there was no active dissemination of this information to the public.

The analysis by The Access Initiative also looked at 17 case studies of how information is provided during emergencies ranging from a cholera outbreak and a fish poisoning to industrial fires and transport accidents. Overall the analysis found strong performance in providing information for larger disasters. However, in most cases, both the quality and accessibility of information about emergencies at private facilities was weak. The report concludes that lack of government and civil society capacity constrains performance on providing access, while attention by the media helps improve it (Petkova et al. 2002).

As the demand for sustainably produced goods grows, investment in ecosystem-sensitive practices will increase. The Assessment's business and industry report interpreted the Assessment's findings to point companies to business opportunities offered by investment in such areas as low-input systems for organic farming, including technologies that optimize food yield, nutrient loading, and water use (MA 2005g:27–29). To create demand for these goods companies and customers need information assuring them that they are getting goods that meet sustainability criteria. For the wood products industry, satellite imagery offers the promise of providing accurate and regular information for large areas of forests at lower cost than field verification and with greater reliability than self-reporting. WRI's Global Forest Watch initiative has pioneered the use of this technology for mapping the condition of the world's forests, producing maps of forest condition, change, and the location of the world's remaining intact forests (WRI 2006). When linked to leading wood products and financial companies

this information has led to more responsible forest policies. For example, IKEA, the world's leading home furniture retailer, requires that none of its solid wood products be harvested from intact forests as defined by WRI maps.

Pressure from both investors (see the discussion on paying for improvements in ecosystem service provision on page 42) and purchasers combined with business leadership is changing the practices of producers. As at other stages of the chain, geospatial maps and processes involving nongovernmental groups, business, and government play an important role. Kwa-Zulu Natal (KZN) Wildlife Agency has developed a public planning tool, KZN Biobase, which illustrates the scarcity of ecosystem types relative to current and proposed future land use. Mondi, a paper and packaging company with roots in South Africa, finds the results mapped in KZN Biobase have had "profound effect on how we look at things." The Biobase documents which areas need to be protected and linked and thus helps the company decide where to locate their plantations and environmental corridors. After a multistakeholder process that developed wetland and riparian delineation procedures, the forest industry has agreed to remove most forest plantations from all wetland areas in the next harvesting cycle (10–15 years for short rotation crops) (Gardiner, personal communication, 2006).

Educational initiatives can help get information to the business community. Coalitions of business schools in China as well as in North America and Latin America are working with WRI to make principles of sustainable enterprise a key part of the education of every business student (Bunch and Powers 2003:34–7). WRI's Environmental Enterprise Corps pairs business students with small entrepreneurs who are establishing or expanding environmental companies in Latin America and China (EEC 2005). These efforts can be replicated in other regions and expanded to other professional training efforts, such as accounting, investment, and banking.

STRENGTHEN THE RIGHTS OF LOCAL PEOPLE TO USE AND MANAGE ECOSYSTEM SERVICES

Ecosystem services are a lifeline for the poor in rural communities. Three quarters of the poor worldwide live in rural areas. Yet they often do not have clear rights to the land, fisheries, forests,

or other resources they use. Nor are they likely to have the ability to influence decisions about managing resources that they depend on for their livelihoods. For example, what rights do indigenous or other local people have when a conservation or protected area is established? This is an important issue given that at least half of all protected areas are on ancestral lands of indigenous or other traditional peoples (Gillis and Southey 2005:103; Hutton et al. 2005: 357–61). Similarly, what rights do the local community have when a company or a national government proposes a project that will affect the land or waters they use? Without rights and the capacity to use them, individuals and communities do not have the incentive and influence to make decisions that will sustain the resources they depend on for their identity and survival.

In most countries, decisions about how to manage and use ecosystem services are dominated by national governments, international donors, and multinational companies. Conservation groups have also played a prominent role through their efforts to protect nature by establishing parks and protected areas. However, there is increasing recognition at these levels of the need for more bottom-up approaches as local communities, sometimes with the help of human rights advocates, make the case to shift the balance of power and increase their voice. Similarly, groups working to reduce poverty and promote biodiversity conservation are finding a common cause in pro-poor development policies and projects that also emphasize the central role of the local community.

Of course devolving more rights to local communities must be accompanied by appropriate safeguards to ensure the interests of a range of users are considered. This might include national government setting minimum standards for resource use and access in decentralization. It could involve helping communities to establish monitoring systems for ecosystem services such as the earlier example on page 21 of Locally Managed Marine Areas in Fiji. It is also likely to involve establishing mechanisms to foster cooperation across levels as described in the next section, or mechanisms to hold decisionmakers accountable such as those described in the section following. Learnings from these movements show the importance of strengthening rights to resources, decentralizing authority to make rules for managing resources, and bringing local voices to the table to influence local development and broader policy decisions.

Ensure that Individuals and Communities have Secure Rights to Ecosystem Services

Civil society, local communities, and national governments

When people have secure rights to the ecosystem services that they rely upon for their livelihoods, it can have a profound effect on how they use and invest in those resources. A farmer who knows he has the right to use a field for his lifetime will likely invest in irrigation and soil management, while a farmer with no long-term access over the land will not (Bruce 1998).

Securing rights over ecosystem services need not involve giving full title or exclusive ownership. An emerging movement for tenure reform calls for legal support for traditional tenure including communal tenure systems (see Box 6). Such systems can include a broad range of rights and obligations such as the right to exclude others from unauthorized use, the right to derive income from the resource, or an obligation to use the land so that it does not harm others. Thailand, for example, has recently provided land registration, deeds, and credit to its rural population (WRI et al. 2005:62). New tenure laws have been implemented in Mozambique, and Tanzania and Uganda now recognize land held in customary tenure (traditional or communal arrangements) as fully legally tendered “as is” (WRI et al. 2005:85).

In developing countries women are important guardians of ecosystem services provided by water and land, but have few clear rights to them. In these countries women produce 60 to 80 percent of food, yet in those developing countries where data is available, only 2 percent own their own land, only 5 percent of those living in rural areas receive technical assistance, and less than 10 percent receive credit (FAO 2007). Water and sanitation sector authorities can help empower women and enable them to play a more progressive role in managing ecosystems (Krchnak 2007). Partnerships among conservation, environmental, poverty, development, and other civil society organizations can advance changes in laws

that prohibit women from getting loans or opening bank accounts and support equitable access to land and tenure arrangements by female producers (U.N. Interagency Taskforce on Gender and Water 2005).¹

The Millennium Challenge Corporation, a U.S. fund that supports development based on how well a country performs against governance benchmarks, is adding indicators on access to both water and sanitation and resources. The intent is to encourage countries to make it easier for the poor, often women, to register property or otherwise obtain access to land (MCC 2006). One challenge is likely to be ensuring that data on these indicators are monitored regularly in poor countries.

Decentralize Decisions about Ecosystem Services

Civil society, local communities, national governments, and international organizations

Ecosystem services are more likely to be sustained if local communities take a leadership role in their management under broad policies developed at the regional, national, and international levels. In the 1980s, international donors began to urge countries to transfer some functions to local governments to improve efficiency and achieve economic growth. By the 1990s, national governments began to grant powers to manage natural resources at the local level. Those given authority ranged from elected local authorities, appointed agents of government resource ministries, and elected or appointed groups using wildlife or agricultural land to local members of a political party, civil society, or traditional leaders. At the same time, some conservation groups have introduced a community-based management approach to try to move toward collaborative management of protected areas. Under this approach, the community sets the agenda and develops the rules that govern who uses the resources and under what conditions.

¹ Land tenure is also a broader issue that needs to be addressed for sustainable development to be achieved. As the Assessment notes: “rural communities in the formal tribal ‘homelands’ in South Africa had no rights of permanent residence outside those areas” (MA 2005a:4). Land tenure starts a process of building wealth, one that allows for inheritance and taxation systems that provide funding to the state, but allow families to build wealth as well. When the fall of communism occurred in 1989 in Central and Eastern Europe and the former Soviet Union, one of the first steps in many countries was implementation of land tenure programs. The rapid economic growth occurring, for example, in Central and Eastern Europe is due to a number of factors but property ownership as a wealth-building process should not be underestimated (Krchnak 2007).

Researchers have found that effective decentralization policy meets four criteria. First, it transfers meaningful power, including fiscal power such as collecting fees, taxes, or fines, to a local authority. Second, that institution is representative of local people and has knowledge of the local resources and people's dependence on them. Third, local people can hold the institution accountable through elections or other means. Fourth, fiscal and regulatory incentives are in place to promote sustainable management of resources over the long term (WRI et al. 2003:91–3).

Moving from top-down natural resource management to incorporate bottom-up approaches is challenging. Analysis of decentralized practices in Senegal, for example, shows that local communities still need prior approval from the forest service for almost any action, often through a complex planning process. Setting minimum standards may be a way to allow the community more flexibility. For example, the community might be given the right to manage dead wood, grasses and other products. They might also be given the right to cut for commercial purposes 25 percent of robust coppicing species, leaving enough to ensure erosion and wind protection. In these cases, no formal permission, planning, or replanting would be required. At the same time, cutting of some species above a certain size or of a particular species (such as teak) would be allowed only with permission from the national forest service (J. Ribot, personal communication, 2006).

When the community itself sets the rules over natural resources management, systems are most likely to sustain all types of ecosystem services in the long term (Ostrom 2005:259). One example comes from Venezuela where managers in Canaima National Park tried for many years to persuade indigenous Pemon to eliminate their traditional burning of savanna. Recent studies, however, show that far from being a destructive activity in itself, when based on Pemon knowledge of nature and cultural values this practice can actually help control larger, more destructive fires (Rodríguez 2004). While it is important not to oversimplify the design of rules for managing common pool resources, researchers find that case studies do suggest principles—not blueprints—that can be used as questions in thinking through with local users how to improve the sustainability of a common pool resource (Ostrom 2005:271) (see Box 6).

Box 6 | Communal Management of Natural Resources

Researchers, who examined hundreds of cases, found that beyond providing a legal basis for common property it is also important for national governments to recognize the rights of users to develop and implement their own rules for using the resource. Besides secure tenure, the research shows that other principles, such as defined boundaries and at least minimal rights to devise institutions, are important for communal management of resources to be effective (Ostrom 2005:258).

Similarly, the Poverty Environment Partnership, an informal network of development agencies focused on integrating poverty and environment issues within the framework of international efforts to achieve the Millennium Development Goals, finds the process works best when local communities themselves are empowered to take the lead. In Namibia, conservancies run by elected committees of local people manage wildlife on millions of acres with technical help from the government and NGOs. As a result of their work, formerly endangered wildlife populations are rebounding and the communities are benefiting from jobs, income from tourists, and game meat. Since 1998, more than 95,000 Namibians have received benefits of some kind from the conservancies, and the number of conservancies has grown from four to 31. In 2004, the U.N. Development Programme recognized Namibia's Torra Conservancy by awarding it the Equator Initiative Award for their community-level work using biodiversity sustainably in order to reduce poverty. Ensuring equitable distribution of the benefits of conservancies within communities still presents a challenge. In a positive trend, women currently hold conservancy jobs, serve on committees, and chair three conservancies (WRI et al. 2005:114–23).

Bring Local Voices to the Table to Influence Development Projects and Policies *Civil society, business, research communities, local communities, national governments, and international organizations*

Decisions shaped by broad participation of community members are more likely to be fair and effective (WRI et al. 2003). Local

communities bring essential perspectives such as knowledge of local and traditional practices. They know where the sacred sites are located, what cultivation practices work, and where wood and water for the community originate. Without strong local voices, the benefits of an oil well or a park are likely to flow to the country's elite or to other countries. Meanwhile, the local community may become poorer, more fragmented, and lose a sacred site or clean water as well as opportunities for better health and education programs. The high poverty levels of people in undemocratic countries with oil and gas projects starkly illustrate this problem. Half of the combined populations of 34 developing countries that rely heavily on oil and gas resources for exports live on less than \$1 a day. Two thirds of the countries with large exports of oil and minerals are not democratic with the result that local communities are likely to have little say in how projects are planned and the revenues are used (UNDP 2005:124).

Clear rights to participate are essential to ensuring people can influence decisions that affect their local resources such as fish, forests, water, or minerals. The World Commission on Dams recommends that those whose rights are most affected and who face the greatest risk from a development project be recognized as having the greatest stake in the decisions and thus have a corresponding place at the negotiating table. Its report says "Effective implementation of free, prior and informed consent marks a significant step forward in recognizing the rights of indigenous and tribal peoples" (Dubash et al. 2001). Some countries including Australia and the Philippines are beginning to require that the government obtain the consent of indigenous people for projects within their land (WRI et al. 2005:72). The Action Impact Matrix method, described in Box 5, is a consensus-building exercise which has been used successfully since the 1990s to mainstream stakeholder environmental concerns into development decisions (Munasinghe 2007).

Implementing such provisions and principles raises basic issues about how a community with a range of interests gives consent and how its interests are balanced with those of the country and globe. One analysis of consent related to mining projects suggests that it is the "right of a community to be informed about mining operations on a full and timely basis and to approve an operation prior to commencement. This includes participation in setting the terms and conditions addressing the economic, social, and environmental impacts of all phases

of mining and post-mining operations" (Bass 2003). Goldman Sachs, a leading investment bank, says: "We prefer to only finance projects in indigenous areas where free, prior informed consultation results in support of the project by the affected indigenous peoples." They define this as ensuring that the project sponsor or borrower demonstrates that consultation relies on existing customary institutions; that local, regional, or national-level authorities have provided affected communities ways to be represented, consulted, or air grievances; and that applicable laws have been upheld (Goldman Sachs 2006:6).

More broadly, citizens need access to information, participation, and judicial review to influence policy as well as project decisions affecting ecosystem resources. These access rights are increasingly recognized in international declarations and



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Local communities have clear rights to resources.

laws, such as Principle 10 of the Rio Declaration, but are more slowly implemented in practice.² Particularly important for major development projects is the ability to influence the planning and implementation of international financial institutions such as the World Bank and regional banks. Over the past 15 years, these institutions have responded to controversy surrounding development projects by making more information available. Generally, they inform people about decisions that have already been made rather than providing information that would allow

people to participate in decisions. The African and Asian Development Banks, however, do require disclosure of social and environmental information at least 120 days before project approval for both public and private sector lending (Bank Information Center et al. 2005:3,7).

Civil society groups are working to improve the performance of national governments in providing access to information, participation, and justice by evaluating current laws and practice (see Box 7).

Box 7 | The Access Initiative

The Access Initiative, convened by WRI, is a global coalition that aims to “strengthen the capacity of public interest groups to track progress toward and build a global constituency for national-level implementation of a set of common participation and access standards.” It seeks to raise the awareness and commitment of governments to build participatory systems (Petkova et al. 2002:12).

An analysis of laws and practices in nine countries around the world carried out by the Initiative found that governments do best in providing citizens with access to information. Laws are frequently strong though implementation is often weaker. Countries rate lowest on providing access to justice (an impartial judiciary or administrative review) when disputes arise. They scored in-between on providing opportunities to take part in making decisions. Participation is now strongest in the environmental sector and weak or non-existent in other sectors such as power production. The analysis urged national governments and the international community to support independent monitoring as a step towards improving performance (Petkova et al. 2002).

Civil society coalitions have now completed access assessments in 27 countries, with assessments underway in another 15. Thailand has now completed its third assessment.

Through the related Partnership for Principle 10, civil society groups and national governments are making measurable, time-bound commitments to improve access. National government partners include Bolivia, Chile, Hungary, Indonesia, Mexico, Uganda, Ukraine, and the U.K. Uganda has achieved its commitment to adopt a Freedom of Information Act. A new member—Indonesia—is incorporating a number of commitments into a revision of its Environmental Management Act. They include increasing the public’s involvement in the environmental impact assessment process, incorporating public participation guidelines in new local environmental regulations, responding to public grievances in environmental cases, and publishing more environmental information on the Internet and in regulation booklets (PP10 2006; TAI 2006).

² Principle 10 of the Rio Declaration, adopted by 178 nations at the U.N. Conference on Environment and Development in 1992, says “Environmental issues are best handled with the participation of all concerned citizens. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.” The U.N. Economic Commission for Europe’s Convention on Access to Information, Public Participation in Decision-making, and Access to Justice in Environmental Matters known as the Aarhus Convention, provides a framework of key elements that have been elaborated by several protocols. Ratified by nearly 40 countries it is open to participation by all interested countries.

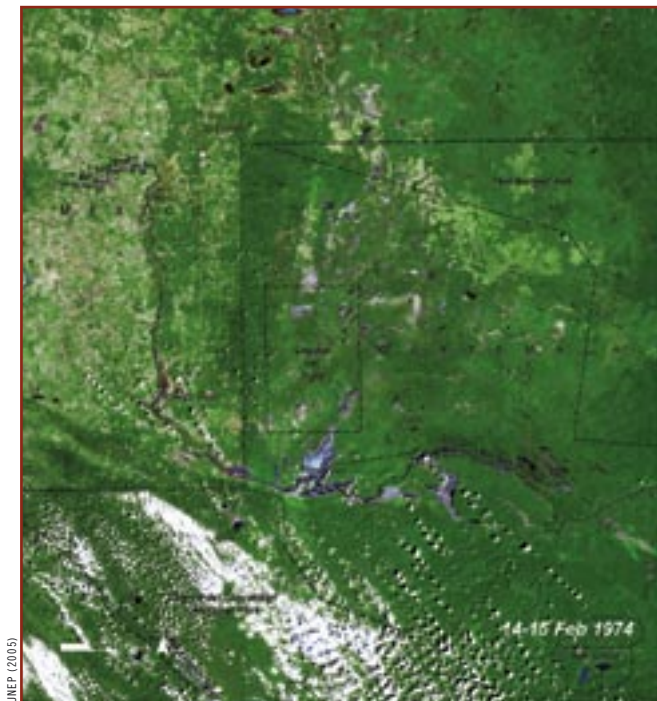
MANAGE ECOSYSTEM SERVICES ACROSS MULTIPLE LEVELS AND TIMEFRAMES

Because ecosystems and the services they provide cross political boundaries and operate at a range of timeframes, it is crucial that governance bodies have the authority and capacity to work at multiple timeframes—shorter and longer term—and levels—local, regional, national, continental, and global. Similarly, problems arising from ecosystem degradation or potential solutions do not respect political boundaries or occur in single timeframes. For example, in 2004 degradation of drylands in Africa contributed to the formation of dust clouds in the region that traveled thousands of miles causing toxic algal blooms off the coast of Florida, coral reef erosion in the Caribbean, and respiratory problems throughout North America (MA 2005e:11).

Findings from the Millennium Ecosystem sub-global assessments (SGAs) echo this need to work across boundaries; collaboration across several levels was critical to success in 21 ecosystem management cases. In contrast, six of seven ineffective

responses to ecosystem problems could be attributed to the lack of such multilevel collaboration. Assessment participants in areas as varied as the Caribbean, Portugal, and Sweden identified building the trust needed for interaction between informal networks, usually at the local level, and more formal institutions, often at the national level, as a key challenge to working across levels (MA 2005c:214–7). Successful collaborations were associated with local initiative and with a focus on longer term effects, such as the depletion of a fishery or decline in biodiversity (MA 2005c:214,186).

Today's institutions, however, usually focus on a single sector such as forestry or finance at a single political level or geographical scale and often on a short timeframe. A community group or social network is concerned about local livelihoods, a national agency about planning national development, and a secretariat of an international convention about improving the state of a specific type of resource such as biodiversity, migratory species, or wetlands globally. At every level, institutions are handicapped by their limited mandate, capacity, or



A biologically diverse region once spanned the border between Guatemala's El Peten and Mexico's Chiapas Forest. As the population of Mexico increased between 1974 and 2000, much of the land was converted to crops and pastures.

incentive to cooperate across geographical or political boundaries or consider the longer timeframes often needed to manage ecosystem services effectively. If ecosystem services are to be sustained to support human wellbeing, decisionmakers need to address drivers and effects of change that emerge at different levels and time scales. This will require working outside of traditional boundaries in multidisciplinary settings. In the past, such coordination across levels has been costly. Today, modern information and communication technologies make cooperating across political levels and ecosystem scales more feasible.

Nevertheless, thinking and acting across scales and levels remains a challenge. Cultural, technical, institutional, and resource barriers abound. Yet by choosing to perform multi-scale, place-based SGAs, the Millennium Ecosystem Assessment took an important step towards demonstrating that taking a more coherent approach is possible and leads to more effective management of ecosystem services. WWF's "3 X M" method for promoting poverty reduction and environmental sustainability by linking needed changes across the local, subnational, and national levels offers another approach to achieving coordinated action across levels (Reed 2006a). The SGAs, WRI reviews, and other initiatives like WWF's provide insight into four illustrative actions that can improve management across geographic scales and timeframes: establishing the conditions that support cooperation across levels, creating bridging organizations, utilizing comanagement practices, and raising the priority of working across levels.

Establish the Conditions for Cooperation with Communities

Civil society, research communities, local communities, national governments, and international organizations

Much of the conflict over the use of ecosystem services emerges between local communities and government, business, or civil society working at the national or international level. Conflicts range from confrontations over use and management of protected areas to disagreements over titling and use of indigenous land. As Table 3 shows, these issues relate not only to environmental concerns such as water pollution but also to changing economic structure and processes such as mega-projects and privatization. A basic step in working effectively across levels is to establish the conditions that will support cooperative

management. Most fundamentally, these conditions entail designing effective dialogues, integrating knowledge across levels, and looking broadly at all services—not just those in the marketplace.

To be effective, multilevel dialogues should provide sufficient time for a thorough airing of issues and conflicts, involve all players with a stake in the decision, and balance the power among parties. Effective solutions are elusive when only formal leaders are involved at the local level or when a national or an international body is left out, for example. As discussed in the previous section, on bringing local voices to the table, effective cooperation requires that local stakeholders have a say in the decision through approaches such as free, prior informed consent by communities. It is also important to address differences in power among the participants of the dialogue in day-to-day interactions, in developing environmental knowledge, and in national legal and political frameworks. This may require investing in community-driven research and training. Scientists who participated in the Assessment and civil society groups, such as those working on access to decision-making, can work closely with communities facing pressure on their resources. In some places networks have already been established. For example, a network of the Locally Managed Marine Areas in Fiji, described on page 21, provides training to interested communities not only in biological monitoring but in action planning and socioeconomic monitoring as well. Through such networks, local communities can learn the skills needed to play an active role in negotiating decisions and managing resources across levels (WRI et al. 2005:92).

Successful dialogues across levels also require integration of different forms of knowledge (Lucas et al. 2007). Historically, this has not been done. For example, state interventions in agricultural and education practices in rural South Africa have undermined the traditional teachings of local communities which believed certain locations and resources to be sacred, thereby protecting them from overuse. Many of these formerly protected resources which are vital to the rural South African communities for their supply of provisioning, regulating, and cultural services are now degraded (MA 2005c:96). The integration of many forms of knowledge provides a basis to broaden the alternatives considered and analyze tradeoffs among provisioning, regulatory, and cultural services that might otherwise have been missed.

Table 3 | Social and Environmental Impacts of Globalization in Latin American Case Studies

| Examples | Source of Conflict | Form of Global Market Economy | Environmental Indicator | Social Indicator |
|-------------------------------------|---|---|---|--|
| Salinas de Manaure, Colombia | Large-scale salt extraction and commercialization | Salt transnationals | Destruction of two coastal marshes, exceptional and unique ecosystems of semiarid Guajira | Exclusion and exploitation of local economy; indigenous social fragmentation |
| Machu Picchu, Peru | Tourism | Tourists, tourism companies, tour operators | Waste accumulation, anarchic management | Inequity in distribution of benefits from tourism; exclusion and exploitation of local economy |
| Los Pelambres, Chile | Copper mining | Mining transnational | Long-term water and land pollution | Erosion of local farming economies; displacement; social fragmentation |
| Cochabamba, Bolivia | Privatization of water | Water use and management transnational | Change in the use and management of water resources | Lack of respect to local definitions of water use; erosion of local traditions and customs |

Source: Rodríguez and Correa (2005)

One of the more challenging conditions thwarting institutional cooperation is the willingness to consider intangible issues as seriously as economic issues. Efforts to resolve conflicts over natural resources often focus on compensation through community development projects or jobs or new management practices, while issues such as different views of “identity, authority, different cultural constructions of nature and its use and different definitions of development” are ignored (Lucas et al. 2007). If these core intangible issues are not addressed, conflict is likely to continue. The Vilcanota SGA provides one illustration of how traditional beliefs can be accommodated. The Assessment team altered the conceptual framework to encompass the Quechua communities’ understanding of ecological and social relationships by adding a

category of ecosystem services to reflect the local knowledge of the protection of Mother Earth (MA 2005c:110).

The “water war” in Cochabamba, Bolivia, one of the more widely known examples of recent environmental conflict in Latin America, offers insights into how to establish effective cooperation across levels for the purpose of resolving natural resource conflicts. Cochabamba’s “water war” involved two different views of authority over water and its use (see Box 8 for a definition of the Andean traditional view of water). Based on their ancestral view of water, local farmers and indigenous people wanted to maintain their traditional management practices, while the government, viewing water solely as a resource, proposed its privatization along with the sewer systems. Only after a concerted effort by local farming and indigenous organizations, involving a

Box 8

The Andean Traditional View of Water

Adapted from CONDESAN (2003)

Water as a living being. Water is a living being; it provides life and gives meaning to the universe. Andean traditional cultures maintain a permanent dialogue with water. Water is treated and nursed like a child.

Water as a divine being. Water comes from Wirakocha, creator of the universe, who fertilizes the Pachamama (Mother Earth) and allows the reproduction of life. It is thus considered a divinity that is present in the lakes, rivers, seas and all sources of water.

Water as a base of social reciprocity and complementarity. Water allows the integration of human beings and nature, and the articulation of nature within human society.

Water as a universal and community right. Water does not belong to anybody. It is a common good. It is distributed equitably in accordance to needs, customs, and community rules and norms.

Water as an expression of flexibility and adaptability. Water acts in accordance to the rules of nature, ecosystems, and circumstances, and does not comply with rigid rules.

Water as a life giving and transformative being. Water follows the rules of nature. It acts in relation to the seasonal cycles and the conditions of the territory. Its sustainable use depends on the application and generation of knowledge and abilities obtained throughout centuries of humans interacting with nature.

national blockade and lobbying in the National Congress, was the traditional view heard and understood by national decisionmakers. This new understanding and shift in power relations allowed for the negotiation of a solution to the conflict. A legal change in the Potable Water and Sanitation System Law was made to ensure the protection of traditional uses and customs and a contract with an international consortium, which was to have been in charge of providing water services, was rescinded.

More in-depth dialogue based on an increased understanding of the history of drinking water offers promise of developing an approach to management that recognizes the different natures of water in communities such as Cochabamba. A careful

look at practices over centuries shows that drinking water has more often served as a physical, economic, *and* social resource rather than one of these alone (Salzman 2006).

Form Bridging Organizations *Civil society, business, research communities, and international organizations*

One approach to fostering decisionmaking across multiple levels is the formation of bridging organizations. These groups provide forums for bringing together a range of formal and informal actors, sharing a diversity of knowledge, and developing collective solutions on a specific issue. By identifying and coalescing around common interests, participants develop trust and opportunities for action appropriate to a range of different spatial and time scales and political levels.

The SGAs provide a number of models of bridging organizations. In the Caribbean Sea SGA, a nongovernmental group brought together local communities and policymakers in St Lucia to get mangrove forests designated as marine reserves and set up reforestation projects to supply local demand for fuel wood (MA 2005c:217). In the Philippines, the Laguna Lake Development Authority created River Rehabilitation Councils that involved people's organizations, environmental groups, industry representatives, and local government units. With broader local participation, the Laguna Authority was able to clean up pollution, a goal it had been unable to achieve before the creation of the Councils (MA 2005c:212).

A nongovernmental group worked with a community in China to help its members present their interests to developers (Li 2007). The Institute of Environment and Development took part in preparing the social impact assessment for the West to East Gas Pipeline being built by Shell and ensuring that the compensation process for farmers was transparent and fair. At the beginning, the local farmers in a populous province highly dependent on agriculture said: "The pipeline is like time bombs buried by the government and developers, but the switches are in our hands." The Institute was able to bridge the differences by improving communication, explaining the compensation process clearly, and enabling the farmers to make their case. It is not standard practice to involve nongovernmental groups in working with local communities in U.N.-managed development projects in China. However, in this case, Shell's previous experience in

Nigeria led to their requiring nongovernmental participation in the project. Li urges China to make it standard practice to include NGOs in negotiations around large development projects.

Use Comanagement Practices Research communities, local communities, and national governments

Under a comanagement approach, institutions from different levels jointly manage ecosystem services. Usually this is a partnership between a local community and a regional or national government agency. This approach allows each level to bring its strengths—differing information, policy tools, financial resources, and political support—to a joint effort.

National and subnational governments are most likely to have authority to adopt and use regulations and economic incentives. They are also most likely to have scientific knowledge and data, particularly about changes that emerge over longer time scales such as changes in climate and biodiversity. In some cases, they may be able to affect drivers of ecosystem change located outside of local communities where the effects of these actions emerge. Thus these higher level institutions can provide the overall view for planning and information and also ensure that local action and national and international rules align.

In contrast, local communities usually have more detailed and longer term understanding of their own land, water, and plant and animal life from traditional or indigenous practices. They are the ones who are on the spot to implement changed practices and to monitor activity and the health of ecosystem services, particularly if they have clear legal access to the services. In rural areas they are also likely to be dependent on healthy ecosystems for their livelihoods and thus have a special interest in maintaining a steady supply of services.

An example from Samoa illustrates how comanagement can work in managing fisheries in the Pacific. The national government provides legal authority, research, and expertise as well as marketing information, credit, and transportation. However, communities are given clear tenure rights and authority to manage local resources. The Samoan Fisheries Division has worked with more than 40 villages to adopt management plans. The villages provide on-the-ground implementation and monitoring (WRI et al. 2005:93,96–7).

To be effective, comanagement requires ensuring that local residents have real authority to make decisions, as noted in the section on decentralizing decisions on page 27, and that user groups are accountable to local political authority. If local governance bodies have the ability to experiment with rules, it becomes possible to learn what works while avoiding large-scale failure. Comanagement does not require one level being in charge. Rather, specialized districts or private associations at the local level may be nested in general governance structures at regional and/or national levels that provide services such as judicial review (Ostrom 2005:283–6).

Raise Priority of Working Across Levels in National Institutions Civil society, national governments, and international organizations

At each level from the community to the international level there is a multitude of instruments, organizations, and institutions. The Assessment points to the importance of ensuring policy coherence across these levels. “International conventions must be coherent with national policies and these in turn must be coherent with local policies” (MA 2005d:519–20). National institutions are often the pivot between local or regional institutions and international ones. The priority they give this role greatly influences the ability to design and carry out coherent policies. The absence of coherent policies hinders the effectiveness of efforts ranging from scientific assessment to development and conservation initiatives.

High-level officials did not represent national governments in the Millennium Ecosystem Assessment. As a result, national governments are less committed to following up the Assessment’s findings either at home or internationally through conventions (Janetos 2007). Similarly, organizations focused on development and poverty reduction were not principal partners. Future assessments need to include high-level participation both from national governments and development groups so that they will incorporate results such as the importance of nutrient loading or increased risk of ecosystem disruptions into their own work (La Viña 2007).

International networks can give national leaders and managers an opportunity to improve skills to do their jobs, as well as help them make the links they need to work with col-

leagues in other countries and at other levels of governance. Implementation of international conventions can be the focus for bringing together representatives from different levels of government to develop policy, whether on preserving wetlands or protecting the climate. Networks can also be formed regionally. The African Ministerial Conference on Water aims to strengthen intergovernmental cooperation on water and sanitation in Africa. As women develop new strategies for managing water, a Women's Association of Water Ministers might be established to encourage information sharing and capacity building across regions of the globe (Krchnak 2007).

One of the most developed networks is the International Network for Environmental Compliance and Enforcement (INECE). Founded in 1990, it now links more than 4,000 practitioners in 120 countries ranging from inspectors, prosecutors, and regulators to parliamentarians, judges, and civil society groups. The network provides training and capacity building programs, raises awareness, and enhances enforcement cooperation. Through regular conferences, the network gives its members an opportunity to learn and build long-term relationships to address environmental compliance and enforcement issues (INECE 2006).

IMPROVE ACCOUNTABILITY FOR DECISIONS THAT AFFECT ECOSYSTEM SERVICES

Public and private decisionmakers are more likely to make choices that sustain ecosystem services if they are held accountable for them. The public frequently does not have the means to hold governmental or private bodies responsible for their actions affecting ecosystem services. Obstacles include strong resistance from corrupt regimes and lack of public information. Holding decisionmakers accountable can be particularly difficult because complex chains connect impacts and the actions that cause them. The causes and effects can be separated by decades and by hundreds or even thousands of miles. Monitoring is difficult in remote areas. Consider the degradation of water by fertilizer and pesticide runoff from intensive agriculture. Who besides the environment agency is accountable—farmers, food purchasers, policymakers, the World Trade Organization? Historically, the answer would probably be none of these groups.

Most basically, public officials can be held accountable through elections in countries choosing a democratic government. An informed public, nongovernmental organizations that are free to form and operate, and a media free to report are hallmarks of functioning democracies and provide the building blocks for accountability. On a global scale, democracies are on the rise. In 1950, 22 of the world's 154 nations were democracies, but now the global count has reached 119 democratic states out of 192 countries (Freedom House 2000).

Civil society, governments, and leading firms are engaged in a wide variety of efforts to develop methods of reporting on government and business performance. These include such projects as the "publish what you pay" initiative, which is a coalition of more than 300 NGOs worldwide that seeks mandatory reporting of payments from oil, gas, and mining industries to government officials for natural resource extraction. The group is aimed at helping resource-rich developing countries use their natural resources for economic development and poverty reduction rather than fueling corruption and social divide (Publish What You Pay 2006). Buoyed by modern information, monitoring, and communication technologies, transparency—"deliberately revealing one's actions so that outsiders can scrutinize them"—is fast becoming the basic mode of accountability (Florini 2003:32).

Returning to the question of who is accountable for pollution of water by pesticides and fertilizer, in the future the answer will move beyond environmental agencies to include all the other actors—farmers, purchasers, policymakers, and world trade officials—if they knowingly took action that contributed to the problem. Tracking votes of elected officials, developing a process to track implementation of the Millennium Development Goals, and increasing corporate transparency illustrate just a few of the measures that can be used to drive greater accountability for managing ecosystem services.

Hold Elected Officials Accountable Civil society, local communities, and national governments

Elected officials are ultimately responsible for decisions about the ways ecosystem services are used. Information on ecosystem health, the distribution of natural resource benefits, and voting records enable citizens to hold elected officials

accountable when they come up for reelection, creating incentives for improved performance. Civil society frequently plays a key role in calling for greater transparency as well as in using information to hold decisionmakers accountable by bringing it to the attention of voters.

Citizens need information on governmental decisionmaking processes concerning natural resources. Accountability for management of these services needs to be linked to locally elected officials such as parliamentary representatives. The Ugandan Parliament, for example, passed a motion in 2005 to record the votes of each legislator on bills and motions in parliament. This was in part a response to recommendations from a WRI-sponsored study in Uganda on legislative environmental representation by the Advocates Coalition for Development and Environment. Ugandan citizens, environmentalists, and journalists can now hold legislators accountable for their votes on natural resource issues (Tumushabe and Bainomugisha 2004).

One obstacle to overcome is the short timeframe of politicians who have an eye on the next election and thus little incentive to consider longer range goals and ways to track the condition and value of ecosystem services over decades. One way to address this is to develop and use annual public indicators of ecosystem health at both the national and local levels to provide citizens with a more complete picture of their nation's wealth. The European Union has developed three levels of indicators under its 10 headline objectives for sustainable development. One of these objectives is for natural resources management. Level 1, designed to follow advancement of the overarching policy objective, tracks the population of farmland birds and fish catches outside safe biological limits. Level 2 indicators, which give more detailed analysis of core policy arenas, include measurements such as developed area as a percentage of all land area and groundwater extraction as a percentage of total available groundwater. Level 3 indicators are targeted to a more specialized audience, such as the academic community, and cover data such as the portion of land area at risk of soil erosion. All of these indicators are published in annual reports and the data are made accessible to the public online (Eurostat 2006). With the help of analysis by academics and nongovernmental groups, individuals can use annual public indicators such as these to hold elected officials accountable for the state of ecosystem services and their influence on the state of the economy.

While most national governments provide regular reports on economic indicators such as gross domestic product (GDP), unemployment, and inflation, few provide parallel accounts for the health of their ecosystems, despite their clear relation to economic performance. The World Bank has developed one such measure of national wealth that includes environmental assets, such as land, soil fertility, and forests. When applied to a spectrum of countries, the measure showed that environmental assets are more important, relative to total wealth, in low income countries, amounting to 26 percent of wealth compared to just 2 percent in industrialized countries (World Bank 2005). For some countries, practices such as unsustainable logging or extracting minerals have led to an overall loss in national wealth as high as 50 percent, as in the case of the Congo (MA 2005e:55). Valuations of ecosystem services can also be used to support the development of national accounts that adjust growth in wealth for resource depletion and damage. To facilitate the development of such accounts that integrate with conventional measures of goods and services like GDP, agreement is needed on definitions and the services to be measured (Boyd 2006). A leadership forum such as the L20 discussed in Chapter 4 might push for agreement on common definitions of goods and services in national accounts and encourage use of such accounts.

Use public process to track ecosystem investments in meeting development goals
Civil society, national governments, and international organizations

The United Nations has adopted eight goals, known as the Millennium Development Goals (MDGs), to be achieved by 2015. These goals call for eradicating extreme poverty and improving health and education as well as ensuring environmental sustainability and equity. The Assessment shows that “any progress achieved in addressing the MDGs of poverty and hunger eradication, improved health, and environmental sustainability is unlikely to be sustained if most of the ecosystem services on which humanity relies continue to be degraded” (MA 2005e:2). Yet few if any countries are on track to meet the MDG on environmental sustainability. A major reason for this is that national governments do not have frameworks for planning and budgeting to reverse environmental degradation as

part of development strategies (Schmidt-Traub and Cho 2007). Some have further argued that the Assessment findings should be explicitly linked to all the MDGs (not just environmental sustainability) within national development strategies in order to receive more favorable attention from decisionmakers and donors (Munasinghe 2007).

National governments lack planning and budgeting processes to incorporate investments in ecosystem services in their development strategies for several reasons. To begin with, much of the attention paid to the environment occurs at the international level through conventions or at the local level through individual projects rather than at the national level. Environmental ministries seldom have proposals for specific investments in ecosystem services that document their costs and benefits in a way useful to development and financial planners. In contrast, the health community does have a concrete set of tested investments that reduce disease ready to insert into national budgets. This is partly because the outcomes and costs of specific interventions or best practices to improve ecosystem services are only beginning to be identified and quantified.

Practice in scaling up interventions to the national level is similarly at an early stage. Missing data and the site-specific nature of ecosystem issues also hinder developing proposals for specific interventions. In addition, investment decisions are political because they require tradeoffs among regions and sectors. For example, how will water be divided between agriculture and city drinking water? How should use of a forest be shared among timbering, tourism, and water conservation and purification?

The challenge for a national government is to convene a *public* process to implement the MDGs. A planning body led by the prime minister and planning or finance ministry would provide overall direction with the participation of other ministries, international institutions, civil society, the private sector, and other partners. An MDG Strategy Group made up of specialists from these groups—and including scientists and local practitioners—would identify targets, gather data, choose effective interventions, and translate information into implementation. An Environment Working Group would take the lead in organizing data about ecosystem services and in proposing the interventions needed to maintain or restore the capacity of ecosystems. With other members of the MDG

Strategy Group, the Environmental Working Group would identify the financial resources needed to implement the interventions and where they might be obtained. The Strategy Group would prepare a 10-year framework prioritizing and sequencing investments in all sectors, proposing needed policies and reforms, and assigning responsibilities for implementation. To translate this framework into action, the Strategy Group would develop a medium-term (3–5 years) expenditure framework to specify how resources for ecosystem services would be generated and disbursed (Schmidt-Traub and Cho 2007).

While planning and budgeting processes can sound arcane, these processes and the resulting documents are in fact basic tools in allowing the public to track where funds are supposed to go and whether they are actually being spent as designated. If data on implementation of specific interventions related to ecosystem services and targets for achieving them are included in a development framework and made public, the media, civil society, and other parts of government can use this information to track progress and hold the government accountable.

One barrier is likely to be the lack of access to information, participation, and judicial review in developing countries. All but one of the 40 countries classified by the World Bank as Heavily Indebted Poor Countries currently lack laws providing freedom of information (Banisar 2006; World Bank 2006). A process to provide accountability for achieving investments in ecosystem services may be the trigger for civil society groups to introduce or strengthen access laws and practices guaranteeing public information and participation as they have in Uganda (see page 37). Doing so is not easy. In Ghana and Honduras, two countries in which poverty reduction strategies have served as a focus to initiate efforts to adopt freedom of information laws, such bills became mired in legislative bodies. Supporters of Ghana's proposed law wrote "perhaps due to a desire by some members to perpetuate a culture of secrecy for self interest, the bill has developed cold feet" (McIntosh 2006).

A Commission on Macroeconomics and Ecosystem Services for Poverty Reduction, proposed in the next chapter, would help national governments build the links among finance, development, and environmental ministries needed to put into practice planning and budgeting processes to incorporate ecosystem investments into development strategies.

Increase Corporate Transparency *Civil society, business, and national governments*

Although national governments started requiring companies to submit public financial reports early in the 20th century, standards for reporting on impacts and use of ecosystem services have just begun to emerge in recent decades. Experience with reports reaffirms that what gets measured gets managed—especially when the results are available to the public. A facility-based, mandatory reporting program known internationally as Pollutant Release and Transfer Registers has demonstrated that when information is publicly reported in a standardized format and actively disseminated, it acts as a powerful accountability tool, driving companies to reduce their toxic releases dramatically (WRI et al. 2003:110–5).

Recent studies have found that approximately 700 multinational companies now use the Global Reporting Initiative (GRI) guidelines, which are developed by an international consortium of stakeholders, to prepare sustainability reports. Although select businesses have voluntarily begun disseminating information, and governments increasingly mandate some reporting by industrial facilities on pollution and wastes released to the environment, stronger incentives are needed to make the emerging reporting norms on the use of water and other natural resources as commonplace as financial reporting (Bazilchuk 2005:38–9). Stock exchanges may be in the best position to represent investors' interests. They could mandate the uniform disclosure of corporate interactions with ecosystems (Bateman 2007). The Johannesburg Securities Exchange (JSE) has considered requiring that all companies publish a report based on the guidelines of the GRI.³ Corporations that fail to follow socially responsible and sustainable policies may have their charters revoked and their listings removed from public stock exchanges (Goodland 2007).

Another form of accountability comes in the guise of consumers who, if provided with information on a company's ecosystem management practices, can choose whether or not to purchase their products. High profile campaigns and boycotts against a variety of products from fish to timber to coffee have focused consumers' attention on how their purchases affect



Stock exchanges can mandate corporate reporting on ecosystem services.

natural resources. In response, a plethora of product labeling and certification schemes have emerged, providing information and “seals of approval.” The jury is still out on their effectiveness in changing practices. The Assessment noted that forest certification, for example, has been more successful certifying already well-managed land in the North than trouble spots in the tropics (MA 2005a). Stepwise approaches, focusing, for example, on basics such as compliance with forest laws in countries where these are not routinely enforced, offer promise of raising standards at the bottom of the performance curve.

³ The King II report on corporate governance in South Africa suggested such a requirement. The JSE encourages compliance with all of the King II report, but does not require adherence to all of its recommendations, including the GRI reporting requirement (King Committee on Corporate Governance 2002).

Pressure is increasing for companies and governments to make public the amounts of revenues from oil and gas and other extraction projects and where they are going. Huge amounts are expected to go to countries such as Nigeria (US\$110 billion) and Angola (US\$43 billion) between 2004 and 2010. In the past, much money from extraction projects has disappeared through corruption rather than being used to improve human wellbeing. Canada is currently the only country that requires companies (through its securities law) to disclose royalty payments at a country level (National Instrument 51-101 2003), although South Africa does require access to information held by the private sector if knowing that information is required for the defense or use of a different right (South African Government 2000). The International Accounting Standards Board is reviewing its standard for the mineral sector. This process and changes in securities legislation offer opportunities to spur governments to include strong reporting on revenues in company accounting standards (Save the Children 2005).

When linked to public education programs and supported by financial incentives, greater transparency and accountability can support more informed choices at the shops and at the ballot box, driving more responsible ecosystem management by the private and public sector.

ALIGN ECONOMIC AND FINANCIAL INCENTIVES WITH ECOSYSTEM STEWARDSHIP

Economic and financial incentives must be aligned with ecosystem stewardship goals if good practices are to be the rule rather than exception. The Assessment found that “most resource management decisions are most strongly influenced by ecosystem services entering markets; as a result the non-marketed benefits are often lost or degraded. These non-marketed benefits are often high and sometimes more valuable than the marketed ones” (MA 2005e:6).

The earlier example in Chapter 1 (Box 2) of converting mangroves to shrimp aquacultures demonstrates how incentives can inadvertently support ecosystem degradation. From the aquaculture owner’s perspective, the short-term financial benefits of converting a mangrove swamp to an aquaculture make good business sense. The resulting loss of the mangrove’s non-

marketed services (e.g., nursery habitat and storm protection) is not borne by the owner, but accrues to adjacent communities who depend on these for their livelihoods and wellbeing. A bank which provides the owner with the initial investment to convert the ecosystem was almost certainly oblivious to the risks of ecosystem degradation. With no markets or payments available to financially support the provision of the nursery habitat and storm protection, these services would not have been considered by the owner.

How can incentives be changed in cases like the mangrove conversion discussed above to encourage ecosystem stewardship rather than degradation? Here we discuss four examples of approaches that help align incentives with sound management. The first two focus on how governments, through the use of taxation and subsidy policies, and financial institutions, through discounting ecosystem risk, can send more sustainable signals to markets. The third explores emerging markets and payments for ecosystem services, and the last focuses on how to ensure individual managers’ incentives are aligned with sound ecosystem management.

Eliminate Perverse Subsidies and Reform Taxation Policies

Civil society, research communities, local communities, and national governments

Subsidy and taxation systems strongly influence how individuals and businesses use or affect ecosystem services—whether they look for short-term gains or focus on the longer term. Policies now often create incentives for overuse of provisioning ecosystem services such as fisheries, food, and timber rather than for sustaining these services and also regulatory services. Numerous international and domestic subsidies in Argentina have exacerbated biological collapse in fish populations off the Argentine coast. Among other government policies, fishermen in Patagonia are given tax subsidies for purchases of fuel for their fishing vessels and are given access to publicly owned waters at a cost which is disproportionately low compared to the commercial value of catches. According to a U.N. Environment Programme report, over the past decade these policies have cost the Argentinean economy US\$500 million, not including the increasing problem of disappearing fish stocks (UNEP 2001). Farmers who irrigate in the

Great Plains of the U.S. receive a tax deduction for extracting groundwater in volumes that exceed what is naturally replenished each year (US IRS 2004).

Providing market incentives for sustaining ecosystem services requires reforming subsidy programs and eliminating perverse subsidies. As is clear from the above examples, national governments frequently subsidize activities that degrade ecosystem services rather than sustain them. Organization for Economic Cooperation and Development (OECD) countries, for example, provide about US\$300 billion annually in agricultural subsidy payments (Chigunta et al. 2004). These perverse subsidies support unsustainable practices at home and marginalize poor farmers in developing countries.

Subsidies for activities that degrade ecosystem services should either be eliminated or transferred to activities that support or restore ecosystem services. Analysts suggest that national governments review their budgets and eliminate subsidies for activities such as agriculture, capture fisheries, logging virgin forests, building hydro dams, and developing and using fossil fuels. Instead, these funds should be used to restore ecosystem services such as those provided by wetlands or sustainable agriculture (Bateman 2007; Goodland 2007).

Opportunities also exist to align taxation policies with ecosystem stewardship. Moving from income-based taxation to consumption-based taxation could provide price signals that better capture the costs of using ecosystem services (Box 9). As noted in the next section, a portion of such consumption taxes might be used to pay for maintenance of ecosystem services, although most of the revenue would be used for other purposes.

Taxation policy can be used to curb the current preference of the majority of investors for short-term gains over longer term profitability, a practice that inhibits investment in new technologies that could conserve ecosystem services. Governments can move from giving preferential tax status for capital gains (share appreciation) to favor dividends (profitability). At the same time, environmental activists can team up with corporate governance activists to pressure companies to find alternatives to stock option plans as compensation for corporate executives. As recent financial scandals demonstrate, managers can manipulate stock prices through short-term actions that undermine long-term profitability. Instead, executive compensation can be linked to long-term profitability measures (Bateman 2007).

Box 9 | A Move to Consumption-Based Taxes

The Assessment notes that markets currently do not capture the real value of ecosystem services. Taxing consumption offers an opportunity to place a price directly on the use of ecosystem provisioning services, such as timber. Governments can use the multiplier effect of consumption taxes on costs embedded in products to encourage “ecosystem friendly consumption.” If only levied on new consumer items a consumption tax would also provide an incentive to use items longer or to purchase used goods.

Businesses would also be encouraged to produce goods that are of higher quality and durability—touting the consumers' lower tax bill over the life cycle of a product. Individuals would benefit by being able to exercise more control over their taxes by regulating their consumption patterns.

Clearly a number of complex issues need consideration when making such a radical shift, including protecting the buying power of the poor for essential goods and services. However, “these issues have solutions when not treated as lines-in-the-sand political issues” (Bateman 2007; see also Goodland 2007).

Include Ecosystem Risk in Financial Evaluations *Civil society and business*

Ecosystem degradation creates new financial risks and opportunities for the private sector. Among the risks are scarcity and rising costs of inputs like fresh water, new policies and regulations to address degradation, and changing consumer preferences in response to concerns about ecosystem health. Opportunities include technologies and products that serve as substitutes for ecosystem services, markets for scarce resources such as water quality and wetlands, and new revenue streams from payments for ecosystem services. If financial institutions evaluated these risks and opportunities when making decisions such as whether to take an equity stake in a company or extend credit to a development project, it could have an enormous influence on how companies use

and impact natural resources. Conversely, the profitability of such decisions can be significantly impacted if key ecosystem services (e.g., availability of fresh water, flood protection) that support the investment are being degraded.

So far, the socially responsible investment community has taken the lead in investing in “green” or “clean technology.” But these investments are relatively small compared to the trillions of dollars that comprise the mainstream investment market. Some in-roads have been made with the mainstream financial market. WRI, for example, has worked with a variety of financial institutions, including multilateral development banks, export credit agencies, and private banks, to quantify the financial implications of climate change. In a first of its kind partnership between a U.S. brokerage house and an environmental NGO, WRI collaborated with Merrill Lynch to evaluate the interrelated risks of energy security and climate change on the automotive sector (Merrill Lynch and WRI 2005).

There has been less progress engaging the financial sector on ecosystem degradation, although some financial institutions are now developing policies. Goldman Sachs, a leading global financial institution, has adopted an environmental policy committing to reporting on the impact of its own operations ranging from greenhouse gas emissions to construction of facilities and procurement of goods. It will also influence investors by incorporating environmental, social, and governance criteria into analysis of companies. The policy explicitly recognizes the relationship between ecosystem protection and poverty elimination. With academic and NGO partners, Goldman Sachs is undertaking to provide and disseminate independent research on how markets can contribute to solving environmental and related social problems (Goldman Sachs 2006).

To be effective, policies like the one Goldman Sachs is undertaking need to be supported by information and tools that identify ecosystem risks. Increased recognition of risks will stimulate calls for greater disclosure of data by regulators and financiers. Better data and information will in turn enable financial institutions to routinely evaluate ecosystem risk, thereby steering investments toward actions that sustain ecosystem services.

Support Markets and Payments for Ecosystem Services

Civil society, local communities, and national governments

The Assessment shows the importance of taking into account the value of both marketed and nonmarketed ecosystem services in natural resource management decisions. Studies reveal that the benefits of managing landscapes to sustain their regulatory services such as water purification and flood control can exceed those of converting the ecosystem to intensive production.

For example, the net economic benefit per hectare from intact wetlands that can maintain water quality is almost three times the value after it has been converted to intensive agriculture (MA 2005e:57). While correct from a broader societal perspective, such valuations are irrelevant to individual landowners unless there are mechanisms to translate the nonmarketed services into economic value.

Programs that pay communities, organizations, or individuals to maintain or restore ecosystem services such as water purification, flood control, or carbon sequestration are one way to provide a direct economic incentive (see Box 10 for an example). Many of these programs are at an early stage of development, but an increasing number of examples are emerging. In Ecuador, a Water Conservation Fund (FONAG) collects user fees from those who benefit from the water in the Condor Bioreserves. It uses these funds to support watershed management projects (Krchnak 2007). In Brazil, states allocate some revenues from their largest source of funds—a tax on goods, services, energy, and communications—to municipalities to help them support protected areas for forests or other resources. Analysts of this Brazilian approach to use of taxes urge providing the public with regular information about the amounts of funds transferred and how they are used in order to provide accountability for the program (May et al. 2002).

One concern with payment schemes is whether they reach the poor. A project in Columbia’s Cauca Valley showed some success in using water fees from downstream sugarcane growers hurt by flooding to help mainly poor upland

Box 10 | Companies Pay for Reforestation to Keep the Panama Canal Open

For decades the 50 mile Panama Canal has been the preferred shipping route between the Atlantic and Pacific Oceans, avoiding the longer 8,000 nautical mile passage around the tip of South America. Unfortunately, deforestation of the surrounding land has threatened the canal's operations in two ways. First, deforested land has a lower absorption capacity during heavy rains increasing the risk of floods and erratic water supply. This is a problem because each ship that passes through the canal requires millions of gallons of fresh water to be pumped into the locks to raise and lower it as it passes through the system. Second, deforestation increases soil erosion leading to an increase in silt flowing into the canal. Removing this silt and the associated growth of aquatic vegetation that thrives in the nutrients in the soil is very expensive.

Concerned by the growing risks to the canal's operations, insurance companies have been requiring shipping companies to pay increasingly high premiums for cover in the event that the canal has to close. Escalating insurance costs and risks of closure seemed inescapable until John Forgach, chairman of ForestRe, a specialist insurance entity focused on forest risks, convinced insurance and major shipping companies to finance a 25-year bond to restore the region's forest ecosystem. Reforestation will lower erosion rates and provide a more controlled flow of fresh water to the canal. Insurance companies benefit by bearing a smaller risk of paying out damages, while shippers enjoy lower insurance premiums (Economist 2005a; BSR 2006).

communities change their land management practices to protect the watershed (WRI et al. 2005:107). The poor are more likely to benefit from payment schemes if they have secure tenure over the services that are being marketed (as noted on page 27).

A detailed analysis of experience with creating markets for ecosystem services notes critiques of payments such as violation of the polluter-pays principle and undermining a land ethic. The analyst says: "Service markets clearly pose potential concerns but, in an imperfect world, may well provide the most effective and desirable means of providing services in many

more settings than we currently assume." The vision is that farmers in the future might earn a living slowing floodwaters or purifying water as well as by growing crops and raising livestock (Salzman 2005). Box 11 illustrates how a forest landowner's revenue streams might change in the future to include payments for services not currently captured in the balance sheet.

Incorporate Ecosystem Stewardship Goals in Managers' Performance Objectives ***Civil society, business, research communities, local communities, national governments, and international organizations***

Business and other organizations routinely evaluate managers' abilities to meet specific objectives within budget. A basic step that all businesses—and other organizations—can take to help ensure ecosystem services are on their managers' radar is to incorporate them into performance objectives. If these goals are met, annual bonuses and other rewards may follow.






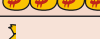


In the past, most businesses have considered environment a cost and relegated these issues to an environment department without much clout. Increasingly, companies are seeing that these performance objectives can apply across the company. Financial advisors can improve their understanding of ecosystem services and educate their clients. Facilities managers can save money by finding ways to use less energy, water, and materials, while product designers and marketers can look for opportunities to introduce products that place less demand on ecosystems.

Responsible companies with environmental policies and commitments should consider including ecosystem goals for managers in every part of the organization, not as standalone performance goals, but rather connected to the attainment of core social and economic goals. Goldman Sachs's policy says that "Each of our major business areas has an important role to play in integrating this policy into our operation" (Goldman Sachs 2006). One way to help ensure that Goldman Sachs's businesses play this role is to include the attainment of healthy ecosystems in managers' performance goals. Novozymes, a biotechnology company with headquarters in Denmark and operations worldwide, links bonuses of top managers to achieving social and environmental targets as well as to reaching financial targets. At the executive management level, one person is

Box 11 | From Goods to Services—Imagining the Revenue Potential of Tomorrow’s Forests

The Millennium Ecosystem Assessment highlights the fact that in the future the demand for ecosystem services will grow at a time when the capacity for ecosystems to provide these services will decline. In the not too distant future it is possible to imagine a transformation of the way landowners manage natural assets from managing for a single provisioning service to capturing the value of multiple services.

The table below presents what forest revenues on a community-owned and harvested 3000 hectare forest landscape in Indonesia might look like in twenty years based on a broader ecosystem service approach based on a broader ecosystem service approach (F. Stolle, personal communication, 2006).

| Customer | Ecosystem Service | Share of Revenue | |
|----------------------------------|---------------------------|--|---|
| | | 2006 | 2026 |
| Global timber market | Timber sales |  |  |
| Eco-tours Indonesia Ltd | Ecotourism/hunting | |  |
| NextPower, Indiana, US | Carbon sequestration | |  |
| Biodiversity Offset Exchange | Biodiversity credit | |  |
| Municipal Water Treatment Agency | Watershed protection | |  |
| Provincial government | Flood protection credit | |  |
| Local markets | Nontimber forest products | |  |

responsible for specific targets and that person’s bonus is linked to these targets (C.Frier, personal communication, 2006).

The action agenda outlined above seeks to ensure that ecosystem health is an integral consideration in the decisionmaking processes of organizations. Its implementation will challenge existing wealth and power structures and face strong resistance from those who stand to lose. To be successful it must be accompanied by a broader societal norm shift that changes the way people see and value ecosystems. This shift will take time. In today’s increasingly urbanized world, people take the avail-

ability of nature’s services for granted—clean water at the turn of a faucet, milk from a carton, and a regular supply of fresh vegetables and fruit from the local supermarket. They forget that a steady supply of nature’s services and their own wellbeing depend on sustaining healthy ecosystems. They are often unaware that nearly two thirds of ecosystem services examined by the Assessment are degraded. A concerted effort is needed to educate people about their dependence on nature and that its fraying services can no longer be assumed. Like organizations, societal norms must shift to make ecosystem stewardship second nature in everyday actions.



CHAPTER 4

Advancing the Action Agenda through New Institutions

What new institutions do we need to stimulate the significant changes in policy and practice required to sustain ecosystem services? What governance innovations might spur implementation of the action agenda outlined in Chapter 2? Many of today's institutions were created in the era before the globalization of the economy and recognition of the need to integrate economic, social, and environmental decisionmaking (WRI et al. 2003:137–72). While these institutions can implement

the action agenda as Chapter 3 describes, new institutions are likely to be needed to sustain ecosystem services by strengthening the role of developing countries and the voices and values of civil society and local communities.

The hurdles to establishing new forms of governance are high. New institutions are difficult to initiate for a host of reasons, including the legacy of existing organizations, limited resources, and the inevitable turf wars over boundaries of authority. Nevertheless, the demand for new institutions grows as the economy becomes increasingly globalized, communications shift to the Internet, and ecosystem challenges increase in scale and transcend traditional decisionmaking boundaries. The need for new forms of governance that can support healthy ecosystems has never been greater.

***The need for
new forms of
governance has
never been greater.***

The good news is that information and communication technologies provide opportunities for a new generation of governance arrangements using the flow of information as a primary tool. The Southern Africa SGA concludes: "Nothing may be more crucial to the sustainable management of ecosystem services than the free flow of information and the enabling of individual as well as institutional flexibility, creativity, and innovation" (SA/MA 2004:138). New technologies allow detailed mapping and meshing of data by location. They allow inexpensive phone calls or email exchange across the world. They make it possible to operate across multiple scales and levels (e.g., geographical, political, and economic) through networked groups that have the flexibility of informal bodies, and at the same time can leverage existing resources and do much of

their work remotely. After describing the changes that followed Gutenberg's invention of the printing press, Ann Florini suggests in her book *The Coming Democracy: New Rules for Running a New World* that "we are now, potentially, at a similar turning point. Information technology may once again be poised to transform politics and identity. If the print revolution made possible the nation-state system and eventually national democracy, where might the digital revolution lead us? Can it help us create new and possibly better ways of running the world?" (Florini 2003:3).

Numerous researchers are looking at the effectiveness of current modes of environmental governance and options for new institutions (Young 1998; Biermann and Bauer 2005). Conca (2006) suggests that the standard approach of developing international regimes, as states have done for ozone depletion and waste transport, for example, is not proving successful for resources such as water. Water governance requires other approaches because questions of who decides and what is knowledge are vigorously contested. In their introduction to global environmental governance, Speth and Haas (2006) describe the current approach through treaties and international law and then outline paths to the future through reform or through alternative visions. A common element in the alternative visions, they point out, is a call for a popular movement to drive change. Slaughter (2004) argues that the infrastructure for a new world order is already developing through the countless networks of national regulatory, legislative, and judicial officials. Environmental issues are often the focus as these networks collect and share information, coordinate policy, cooperate on enforcement, and provide technical assistance and training.

In practice, networks of all kinds—governmental, business, civil society, scientific, or multistakeholder—are already bringing more people and a wider range of values into setting the environmental agenda, designing new policies, and monitoring progress. In some cases they form transitional bodies such as the World Commission on Dams. No permanent institutions emerged from this initiative, but the Commission took a significant step towards changing the norm for making decisions about dams, for instance, to include a greater role for the local communities affected. Other networks, such as the Global Reporting Initiative, have become permanent bodies, in this case to support corporate environmental reporting. Analysts

are exploring global networks as an organizational form (Florini 2000; Reinicke and Deng 2000; Waddell and Allee 2004; Zadek 2006).

Here we discuss four proposals for governance forms that might help move the action agenda forward. They include Ecosystem Service Districts at the local level (Heal et al. 2001); Biome Stewardship Councils at the regional level (Rajan 2007); and a Commission on Macroeconomics and the Environment for Poverty Reduction (Irwin 2007) and a Leaders Forum at the global level (Jhirad 2007). We selected them because they show particular promise for moving ecosystem services into a key role in decisionmaking. They would be well suited to use networked, often informal approaches to increase the voice of local communities and developing countries. They would build bridges among managers of different ecosystem services and with economic, political, and environmental decisionmakers.

All four of the proposals described below build on existing structures, whether as participants or models. Ecosystem Service Districts could be based on local conservation units. Biome Stewardship Councils might emerge partly out of the Millennium Ecosystem Assessment's subglobal networks and build on the experience of groups such as the Arctic Council, while a Leader's Forum seeks to move beyond the group of industrialized country leaders known as the G8. A Commission on Macroeconomics and Environment for Poverty Reduction could draw on the experiences of an earlier Commission on Macroeconomics and Health in developing more robust processes to stimulate investments in sustaining healthy ecosystems that also reduce poverty.

For each new institution, we describe the basic proposal, outline how the structure would advance the action agenda, and suggest ways to get started. This discussion is not intended to be comprehensive, but instead to sow the institutional seeds of change for others to cultivate. Just as markets constantly change to incorporate new technologies and changes in consumer preferences, so must our forms of governance change in order to respond effectively to the challenges presented by ecosystem change.

ECOSYSTEM SERVICE DISTRICTS

Many countries have local districts responsible for a particular ecosystem service, such as flood protection or water purification in a watershed. Typically districts for these two services focus on the construction of capital assets such as dams or dikes or filtering plants to ensure the service is available. The option of using natural assets such as the flood protection services of forest or the water purification services of wetlands is seldom included in a cost-benefit analysis, even though natural solutions can be more cost-effective and provide other services into the bargain. An exception brought attention to the opportunities that nature's services can provide.

New York City's tap water has never passed through a filtration plant. The Catskill/Delaware watershed provides the city with 90 percent of its water supply filtered naturally through the ecosystem's wetlands and waterways. Yet in the late 1980s when the watershed was severely degraded by development and negligence, the municipal government of New York City considered building a filtration plant. Instead of building a US\$6–8 billion plant as initially proposed, however, New York City decided to spend \$1.5 billion to restore the watershed in the Catskill Mountains. Currently the only filter that New York City's water passes through is a large metal screen utilized to catch dead fish (Daily and Ellison 2002:3,68). This decision recognized that the Catskill watershed, if managed appropriately, could provide the same water purification services as the planned filtration plant, but at much lower cost. Some of the funds go to acquiring land or conservation easements,¹ some to managing land for water purification services, and some for construction of sewers and treatment plants in the watershed (Salzman 2005:889–92).² In the case of the Catskill/Delaware watershed, the payment for the natural water purification services also provides carbon storage and recreational and cultural services at no additional cost. Drawing on examples such as this, Geoffrey Heal and colleagues have proposed establishing Ecosystem Service Districts as a way to develop and use knowledge about natural assets (Heal et al. 2001). Although proposed for the U.S., the idea could also be adapted for other countries.

¹ A conservation easement restricts use of property to protect resources associated with it. An easement is sold or donated by the land owner, for example to prohibit residential or commercial development on agricultural land.

² Salzman notes that the New York situation is unusual because the state gave the city the authority to adopt land use regulations in the watershed early in the 20th century.

The Proposal

The goal of Ecosystem Service Districts is to protect and maintain natural capital at the local level in ways that support human needs. A District would identify ecosystem services, their sources, and their users. It would support analysis of both the ecological and the economic character of the services. This would include the quantity and quality of the service, the geographic extent, and the type and degree of human modification. The analysis would also consider how changing one service would affect another. In addition, it would look at the costs and benefits of alternative management approaches. A second step would be mapping the services: highlighting the spatial congruence of different services and helping identify optimal allocations of services. The maps could also be useful in forecasting changes in services and thus help managers anticipate emerging effects of threats, such as climate change.

***The goal of Ecosystem
Service Districts is to protect
and maintain natural capital
at the local level.***

Heal et al. suggest that efforts to establish Ecosystem Service Districts could build on a number of existing institutional arrangements. For flood control, the U.S. now depends on local flood districts within a larger structure of regional interstate agreements, and a National Bureau of Reclamation. To control erosion, the Soil Erosion Act established almost 3000 districts with authority to conduct surveys, perform research and demonstrations, and carry out measures to conserve soil. The bodies created under these programs could be the starting point for Ecosystem Service Districts. They could be given the authority to develop information, and mandated to compare the costs and benefits of using natural and built approaches to provide services such as water purification and supply and

storm protection. Noting that, of course, political jurisdictions do not follow boundaries of ecosystem services, the authors also suggest that information exchange among Districts would be important. Recognizing that providing Districts with the authority to control land use would be controversial, they raise the possibility of granting them the power to zone and condemn land and to tax.

Advancing the Action Agenda

Ecosystem Service Districts could contribute to advancing all five items on the Action Agenda (Table 4). Basic functions would include developing detailed data on amounts, value, sources, uses, and users of services. Districts could document sources and uses of services by scale. Thus pollination and soil fertility are largely local, flood control and water purification services are often regional, while carbon storage serves a global goal. Information could be used in providing accountability for decisions to use the services and to develop economic incentives. Districts would work with authorities at other levels to manage resources that crossed local boundaries. The authors of the proposal suggest, for example, that in the U.S. the Districts could be linked to regional authorities and to a National Interstate Panel on Ecosystem Capital. Local officials would manage the Districts. The process could bring to the table environmental scientists and ecologists, resource managers, lawyers, government officials at all levels, business, and nongovernmental groups.

Getting Started

The proposal authors suggest starting with the better known ecosystem services—water purification and flood control, and perhaps carbon storage—for which markets already exist or are emerging. Since their article was published, Hurricane Katrina has galvanized attention on the rebuilding of New Orleans. So far, this attention has focused largely on capital asset solutions such as reconstructing the levees, despite continued efforts to highlight the value of natural assets in reducing flooding. In order to refocus decisionmakers' attention on the role of natural assets, such as the flood protection services of wetlands, political opposition from those with vested interests in capital solutions will need to be overcome.

Table 4 | Ecosystem Service Districts: Advancing the Action Agenda

| Action Agenda | Illustrative Examples |
|---|--|
| Develop and use information about ecosystem services | Would develop specific information about types, amounts, value, sources, uses, and users of ecosystem services. |
| Strengthen the rights of local people to use and manage ecosystem services | Decisions made by local district. |
| Manage ecosystem services across multiple levels and timeframes | Information can be organized by level or scale of service; districts can be linked to regional and national structures. |
| Improve accountability for decisions that affect ecosystem services | Regular public reports in a standardized user-friendly format could be used to track the status of services and how decisions change that status. |
| Align economic and financial incentives with ecosystem stewardship | Information about types, amounts, and value of services could provide the foundation for developing and using incentives such as taxes, payments, and subsidies. |

One step that might lead towards Ecosystem Service Districts is building markets to achieve optimal functioning of a number of services such as water quality and climate protection. For example, the Great Lakes Protection Fund in the U.S. is supporting the Environmental Trading Network to develop tools and infrastructure that will encourage farmers and other land managers to achieve the highest levels of ecosystem function compatible with existing uses. This study is looking at how a range of credits could be generated and traded in a geographic area. It builds on experience with watershed trading in Michigan and Pennsylvania. Using tools that allow farmers to estimate and trade nutrient reduction credits online, farmers in these areas are already helping improve water quality. Other credits would relate to greenhouse gases, wetlands, and endangered species and their habitat (NutrientNet 2004; Environmental Trading Network 2006).

Thus, over time, ecosystem service districts could develop as the vehicle not only for documenting a variety of services but also as the entity to direct investment in improving their condition, raising funds (for example, through taxation), and controlling land use (for example, through zoning) (Flows, 2006; Kieser, 2006). Ecosystem service districts could also provide communities with a forum for resolving conflicts that arise in using services. For example, analysts have noted that in the

Himalayan Mountains, the many separate districts that exist for forestry, agriculture, water, tourism, and energy usually have little relationship to each other or to village councils (Ives and Messerli 1989). By beginning to develop comparable data on the services, districts might move incrementally toward a more unified approach.

BIOME STEWARDSHIP COUNCILS

The Assessment's four scenarios find proactive management anchored at the regional level particularly promising for identifying and implementing solutions to ecosystem degradation. One of these scenarios focused on integrated management and local adaptation. It showed that, while local approaches are unlikely to be successful alone, regional networks could help communities address social and environmental problems ranging from urban poverty to agricultural water pollution by sharing knowledge of successes and failures. Another scenario that emphasized technology and engineered solutions brought improvement in or stability of most ecosystem services (MA 2005e:77). However, it also came with risks related to use of large-scale human solutions that could be reduced by taking a more bottom-up approach.

In addition to the scenario findings, scientists working on the SGAs also identified the regional scale as especially promising for integrating individual studies and understanding the state of ecosystem services. This interest in the regional scale and level has also been expressed by indigenous and grassroots leaders, who have urged attention to developing regional institutions to support management of landscapes that cross national boundaries (Gillis and Southey 2005:88,93).

A region, of course, can vary in size. There is already much experience with watershed and river basin organizations. More recently the landscape has become a terrestrial parallel. It is defined as “a contiguous area with a specific set of ecological, cultural and socioeconomic characteristics distinct from its neighbours” (Fisher et al. 2005:84). In his review of the Assessment, Rajan (2007) proposes establishing Biome Stewardship Councils around a broader regional category—the biome—as a focus for managing ecosystem services. Biomes are large ecosystems with similar climate, soils, plants, and animals. In familiar words, they are woods, deserts, mountains, grasslands, tundra, and watersheds. A few existing organizations already come close to using biome boundaries, including regional seas conventions, the Amazon Basin Treaty Organization, and the Arctic Council.

The Proposal

The goal of Biome Stewardship Councils would be to maximize ecosystem protection and human welfare within a biome. They would lead regional collaboration to characterize threats to ecosystem services within the biome and develop and apply strategies to restore and maintain healthy services. Rajan proposes organizing them around 15 biomes (Figure 5).

***Biome Stewardship Councils
would maximize ecosystem
protection and human
welfare within a biome.***

Each Council would be made up of individuals elected or nominated by local community organizations on the basis of their contribution to sustainable development in the biome. Councils would also include at least one government official from each country within the biome. For example, a Council might have 120 members for a biome of 200 million people, one for each 2 million residents plus one from each country in the biome. Council members would agree on rules to govern in a way that upholds the basic value of ecosystem stewardship.

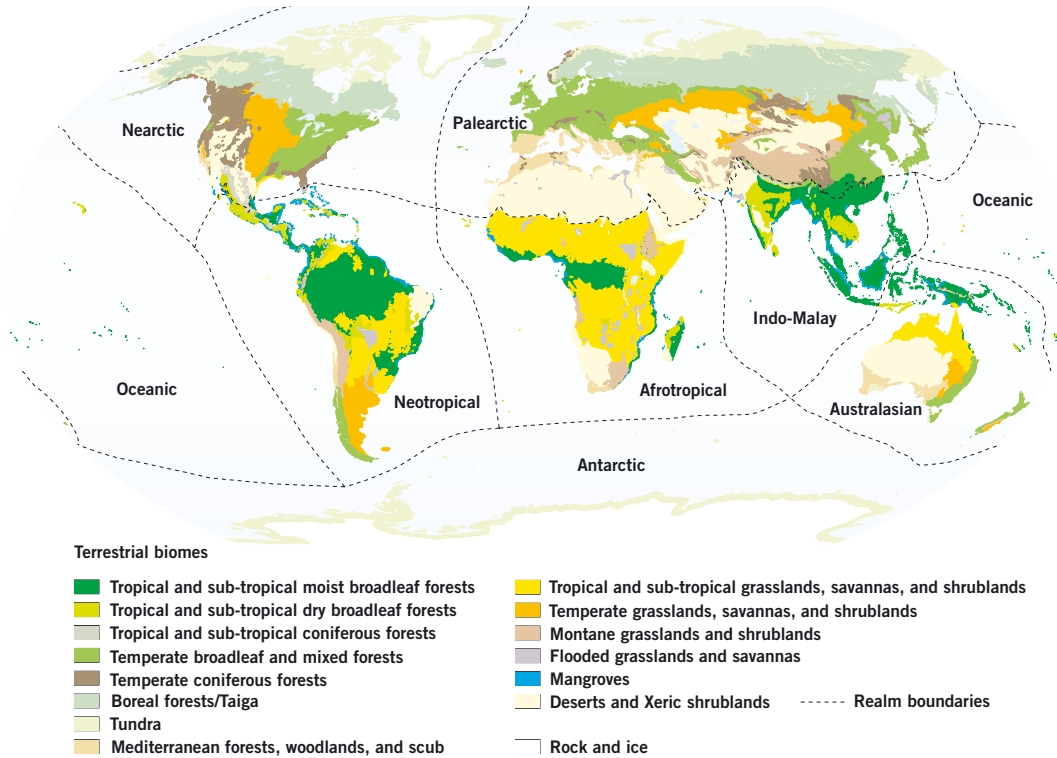
Having grassroots representation would provide political legitimacy and strengthen local voices in the policy arena. Of course, Councils might sometimes find themselves in disagreement with national policies. A Council might support sustainable hunting of some species to provide food and income to local communities, in conflict with a national wildlife protection policy, for example. Conflicts might also emerge at biome boundaries as a policy led to species encroachment or resource depletion. A process of arbitration or negotiation could be set up to deal with disputes. It might take the form of an ombudsman’s office at the international level. In addition, biennial summits of Council members could spur trading of ideas and build trust. Eventually, the Councils might gain regulatory functions.

Rajan suggests that councils could be staffed by a small technical secretariat with financial or in-kind support from nongovernmental and intergovernmental environment and development organizations, universities, and national government departments (such as forestry or natural resources). Staff might be seconded from these organizations to facilitate capacity building and knowledge exchange. Funding for the Councils could start with grants from private foundations and multilateral donor agencies. The cost for say 1000 staff for 15 biomes might be US\$150 million a year for 5 years. Some Councils might well be larger than others, depending on resources, population, and threats. During the first years, Councils would work with organizations to secure independent continuing sources of funds, for example from applying an excise tax on revenues from ecosystem services such as ecotourism.

Advancing the Action Agenda

Biome Stewardship Councils would put into practice all items on the action agenda (Table 5). Councils could play a significant role in developing and disseminating information. They might,

Figure 5 | Biomes Covered by the Millennium Ecosystem Assessment



Source: MA 2005e

for example, develop guidance on uses of different types of knowledge, ways to frame smaller studies in different fields so that they can be more easily linked at the biome scale, or methods of effectively involving diverse groups in designing and monitoring adaptive management projects (Norgaard 2007:4,6).

Councils could make an important contribution to bringing the voices of local communities and civil society to the table. Local communities would nominate residents experienced in managing ecosystem services in their communities through planning or local organizing and advocacy for sustainable development. Councils would also include representatives of often-marginalized groups such as indigenous peoples, women, and youth. In this way, they would strengthen the bottom-up governance of ecosystem services, providing a legitimacy lacking in technical secretariats of international conventions or organizations. The Great Lakes Water Quality Agreement

and International Joint Commission provide a Canadian–U.S. example. Their vitality has come from broad participation by scientists, environmental and citizens' groups, and industry as well as labor groups, indigenous peoples, municipal politicians, and educators (Young 1997:218–20). Through education and the gradual introduction of management innovations, the Councils would play a crucial role in moving societal and governance norms on ecosystem stewardship toward common practice.

Councils would be well positioned to connect local communities with national and global groups and to deal with transboundary issues. They could serve as bridging organizations between local communities and the global conventions on biodiversity, deserts, wetlands, and migrating birds. Councils could also use member experience in developing incentives, and apply them by tapping into the self-interest of residents

Table 5 | Biome Stewardship Councils: Advancing the Action Agenda

| Action Agenda | Illustrative Examples |
|---|---|
| Develop and use information about ecosystem services | A major function would be to prepare and disseminate data in consistent formats to support research, educate, and help address conflicts. Could help frame studies in different disciplines so results can be linked more easily and encourage use of all kinds of information, including scientific and traditional. |
| Strengthen the rights of local people to use and manage ecosystem services | Local communities would nominate members of the Council. Also share information among local communities in biome. |
| Manage ecosystem services across multiple levels and timeframes | Support comanagement by local, national, and international bodies. |
| Improve accountability for decisions that affect ecosystem services | Provide indicators and other tools to hold decision makers on ecosystem services accountable. |
| Align economic and financial incentives with ecosystem stewardship | Initially exchange experience on incentives. Eventually use them as management tools. |

in maintaining services, for instance to prevent flooding and droughts. One analogy might be to utility services—except with much more active participation by local communities. Over the longer term, the Councils' activities would be aimed at maintaining healthy ecosystems capable of providing the "essential services" in the utility comparison.

Getting Started

Rajan envisions the Councils starting out as advisory bodies gathering information, carrying out research, addressing conflicts, and providing education. They would not initially have political power, he emphasizes. Rather, in the longer term they would build "disaggregated sovereignty" as governments found it difficult to develop management policies at cross-purposes with Council recommendations.

In the near term, a two-pronged strategy could be used to get individual Councils started. Some of the Millennium Ecosystem SGAs are likely to spawn specific projects, providing an opportunity to build a foundation for individual Councils. In

parallel, a network with broad participation could begin developing links among nascent Councils. This network could grow out of existing biome-focused groups, such as the Amazon Cooperation Treaty Organization and the Arctic Council, with participation from scientists and others involved in the Millennium Ecosystem Assessment.

Priority biomes in which to begin establishing Councils could be chosen using criteria such as the following:

- Severity of ecosystem degradation in the biome (e.g., semiarid lands in Africa and Asia where millions of poor live, or coastal ecosystems at risk of storms);
- Existence of an active research team familiar with preparing integrated ecosystem assessments (e.g., Kwazulu-Natal Nature Conservation Services in Southern Africa) (Goodman 2000);
- Region with major development proposals pending (e.g., initiative on Integration of Regional Infrastructure in South America).

Any or all of these approaches might provide the roots of Biome Stewardship Councils. The key to successful Councils will be strong interest not only from scientists, but also from practitioners of resource management, policymakers, NGOs, local communities, and indigenous peoples. As the Assessment participants found, it takes time to build these ties, but a specific project such as an assessment can create the center of gravity to bring them together. The Councils would have the opportunity to establish themselves from the outset as learning organizations, with longer term goals such as supporting research, developing better ways to use experiential knowledge, sharing success stories, and building a biome community and leadership group.

At the same time as work begins in individual biomes, a broad-based network drawing on participants in the SGAs and NGO networks participating in implementation of the Conventions could undertake initial tasks to develop a formal structure for Biome Stewardship Councils. One place to start might be discussions with members of the Arctic Council. This organization seeks sustainable development in the Arctic region. Although differing from the proposed governance of the Councils as a body composed of national governments that rotate the chair, it is unusual in including permanent representatives of six indigenous peoples in the region. It has initiated an Arctic Monitoring and Assessment Program, an Arctic Marine Strategic Plan, and a Plan to Eliminate Pollution of the Arctic, as well as a Protection of the Arctic Marine Working Group (Arctic Council 2007).

COMMISSION ON MACROECONOMICS AND ECOSYSTEM SERVICES FOR POVERTY REDUCTION

The Assessment urges integrating ecosystem management goals within development planning and economic institutions. The U.N. Millennium Development Goals (MDGs) that aim to cut poverty in half by 2015 attempt to do this by including a goal for environmental sustainability. A target under the environmental sustainability goal calls for integrating the principles of sustainable development into country policies and programs and reversing the loss of environmental resources. Despite long recognition of the need to do so, linking environment and development remains a formidable challenge. The portion of official development assistance—overseen by finance ministers—for the environment fell from nearly 20 percent in 1995 to 9 percent a decade later. The major route for delivering development assistance is now Poverty Reduction Strategies in which environmental concerns were initially largely ignored (Toulmin and Bigg 2004:8–11).

Nevertheless a renewed effort to make the link between environment and development has begun. With few countries on track to achieve the sustainability goal of the MDGs, development agencies and nongovernmental groups mobilized a Poverty Environment Partnership at the 2005 U.N. World Summit to present the argument for increasing investments in the environment to reduce poverty (UNDP et al. 2005). Speaking on a Summit panel, Costa Rica's environment minister told environment ministers "We need to learn the language of finance and economics, and demonstrate the economic benefits of the environment" (Economist 2005b:82).

A Commission on Macroeconomics and Ecosystem Services for Poverty Reduction could provide the impetus needed to reach the tipping point in convincing development and financial ministers as well as political leaders that natural assets are fundamental inputs to human wellbeing. It would become common practice for national development plans to include growing investments in their budgets for specific measures to improve the health of ecosystem services. It would also become common practice for these budgets to be public and widely used by civil society to hold national governments accountable for achieving the MDGs. Such a Commission could draw on the earlier experience of the Commission on



Jonathan Faiboo, WRI

Healthy ecosystems are fundamental to reducing poverty.

Macroeconomics and Health, which has effectively helped national governments embed health investments in their development plans (Irwin 2007).

The Proposal

The experience of the Commission on Macroeconomics and Health demonstrates how a Commission can be convened and operate. Gro Brundtland, then head of the World Health Organization and earlier chair of the World Commission on Environment and Development (known as the Brundtland Commission), convened the Commission on Macroeconomics and Health in 2000. Chaired by Jeffrey Sachs and composed of 18 independent members, it worked through six taskforces. Its report made the case that health is essential for development. It explained “how disease is a drain on societies, and how investments in health can be a concrete input to economic development...improving people’s health may be one of the most important determinants of development in low-income countries” (CMH Support Unit of the WHO 2003).³

The report made the connections between health and development; it also used the work of health researchers to

spell out specific interventions to combat infectious diseases such as malaria, tuberculosis, HIV/AIDS, and childhood diseases, together with the economic benefits and costs of making these interventions. It mapped potential sources of funds and institutional changes that are needed. As the Commission completed its work, the World Health Organization began an implementation phase—working with countries to put the report’s findings into practice by mobilizing funds, setting up national groups to integrate updated health needs into their development plans, and using global standards to report the results.

Drawing on this experience in the health arena, a Commission on Macroeconomics and Ecosystem Services for Poverty Reduction would work with national planning and finance agencies. It would stimulate national planning and budget processes to propose, fund, and track use of environmental investments to achieve the MDGs and reduce poverty. The Commission could help implement the call by Schmidt-Traub and Cho for the international community to support national operational frameworks to reverse environmental degradation as a part of the development strategies based on the MDGs (Schmidt-Traub and Cho 2007).

A Commission might have four broad goals:

- Develop and communicate the case that healthy ecosystem services are fundamental to reducing poverty and achieving economic development;
- Provide guidance on developing proposals for specific investments in ecosystem services;
- Identify the amount of funds needed and likely sources including national, governmental, and international donors;
- Propose ways to set up a public national process to fund and carry out a plan for investments in ecosystem services.

The Commission might work with national governments to help them develop targets appropriate to their countries for tracking their implementation of the MDGs. For example,

A Commission would stimulate national planning and budget processes to propose, fund, and track use of environmental investments to achieve the MDGs and reduce poverty.

³ See <http://www.who.int/macrohealth> for a copy of the report and other documents related to the Commission and implementation of the report. The taskforces addressed: (1) health, economic growth, and poverty reduction; (2) international public goods for health; (3) mobilization of domestic resources for health; (4) health and the international economy; (5) improving health outcomes of the poor; (6) development assistance and health. They were chaired by Commission members and staffed by experts from international agencies, government, academia, NGOs, and the private sector.

the *World Resources 2005 Report* proposes rewording of Target 9 under the environmental sustainability goal to read “Maintain or restore the capacity of ecosystems to provide critical ecosystem services, and integrate the principles of sustainable development into local, national, and international policies and programs.”

Specific indicators under the target could include:

- Extent and condition of communal fisheries (coasts and inland);
- Extent and condition of forested areas held in common;
- Watershed conditions on communally held lands (vegetation cover, water availability, groundwater trends);
- Soil fertility on private farmlands, and land degradation).

The *World Resources 2005 Report* authors also suggest an additional target: “Ensure the poor have access to environmental resources and decision-making with indicators such as the proportion of rural households with access to secure tenure and with access to environmental information including extension services, pollutant or environmental health alerts, impact studies on proposed concessions or developments” (WRI et al. 2005:158).

Another step would be collecting best practices in environmental management, including a rigorous assessment of the links between inputs and the results for ecosystem services and reducing poverty. The Lancet Child Survival series (Black et al. 2003) provided detailed analysis of interventions for the Commission on Macroeconomics and Health. Schmidt-Traub and Cho (2007) propose that a joint taskforce of U.N. groups, the World Bank, and the environmental conventions might handle this task. A Commission could convene such a taskforce drawing on staff from these groups. Or this process might first be carried out in individual countries. The process of preparing reports would give participants an opportunity to develop a common language and result in a corps of people skilled in using it that could in turn assist other national ministries of planning, finance, and environment and natural resources to work more effectively together.

Advancing the Action Agenda

The Commission would use research on ecosystem services to make the case for integrating the goal of healthy ecosystem services into economic and social decisions, particularly financial decisions and development planning (Table 6). Earlier attempts to mainstream the environment have been piecemeal—introducing a new form of analysis or addressing a particular issue. An ambitious effort—one in which civil society and local communities have a significant role—is needed to provide the overall framework at the global and national levels for uniting development, finance, environment, and natural resource agencies in a common approach.

Getting Started

With less than 10 years to go to meet the MDGs, a major effort would be needed to convene a Commission, complete its work, and initiate support for implementation. The U.N. Development Programme and U.N. Environment Programme have already merged their poverty–environment programs to support country efforts aimed at environmental sustainability and pro-poor development (UNDP/UNEP PEI 2006). Working through a Commission, high-level economic and environmental leaders can raise the visibility of efforts to integrate investments in ecosystem services into development programs.

A challenge would be overcoming the common concern, noted by Schmidt-Traub and Cho, that not enough is known to set detailed targets for environmental investments. They urge not letting the better be the enemy of the good, and starting with what is known, using a “learn by doing” process of monitoring and evaluation as needed. The Millennium Project handbook took a first step in developing broad guidance for environmental investments, while leaving selection of more specific environmental interventions up to individual countries (Bahadur et al. 2005). Increasingly, better information is becoming available about interventions that work. One example comes from a program to regenerate watersheds in India. In the village of Darewadi in the state of Maharashtra, villagers’ income increased more than five times as they raised production of cereals and vegetables and added milk production (WRI et al. 2005).

Table 6 | Commission on Macroeconomics and Ecosystem Services for Poverty Reduction: Advancing the Action Agenda

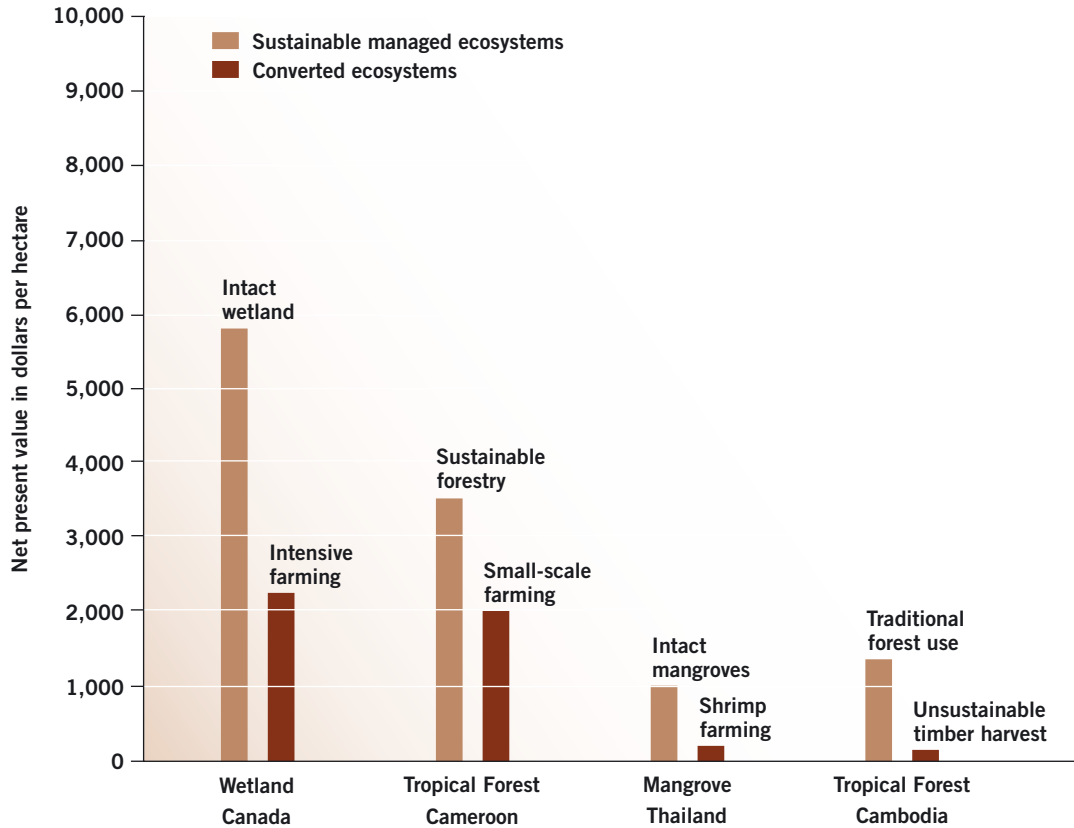
| Action Agenda | Illustrative Examples |
|---|---|
| Develop and use information about ecosystem services | Make the case for a link between healthy ecosystems, development, and poverty reduction. Develop a language and process for environmental/natural resource, planning, and finance leaders to work together. |
| Strengthen the rights of local people to use and manage ecosystem services | Provide a means for local communities to hold national ministries accountable. Include local participants in designing process. |
| Manage ecosystem services across multiple levels and timeframes | Strengthen the national–international link. |
| Improve accountability for decisions that affect ecosystem services | Budget with specific environmental investments would provide essential means for civil society to hold government accountable for expenditures and results. |
| Align economic and financial incentives with ecosystem stewardship | Develop more robust cost–benefit analysis of ecosystem investments for economic and development strategies. |

The Poverty Environment Partnership members—international financial institutions, national development agencies, and nongovernmental groups—could provide staffing for the Commission. They bring experience in analyzing how to integrate environmental issues into poverty reduction that could help develop more specific guidance on investments in ecosystem services in national development planning and budgeting, and also in improvements in access to information, participation, and justice that can improve accountability. On the finance side, the World Bank, for example, issued a report before the 2005 U.N. World Summit noting the key role of natural capital in developing wealth in developing countries and pointing out that “an important set of institutions—ministries of finance and treasury—often overlooks the analysis of natural resource issues” (World Bank 2005:8–9). National accounts that include natural capital are becoming more common. Environmental economists have also made progress in valuing natural resources. Recent studies show that intact forests in Algeria, Italy, Portugal, Syria, and Tunisia are worth more than felled ones. A wetland in Canada is worth three times as much intact as when cleared for intensive agriculture

(Dasgupta 2005). Figure 6 shows economic benefits under alternative management practices. The Natural Capital Project, a collaboration of The Nature Conservancy, the WWF, and Stanford University, is developing tools that will enable land use decision-makers to weigh the market and nonmarket value of ecosystem services (Natural Capital Project 2006).

Several nongovernmental groups that also participate in the Poverty Environmental Partnership would bring wide experience to a Commission. For example, WWF has worked to incorporate social equity and environmental sustainability into national and international macroeconomic policies and practices for more than a decade. A recent publication draws on projects in five countries to propose using common analytical standards for projects aimed at reducing poverty and improving environmental management in rural areas. It stresses the need to work across levels. It also calls for public reporting of revenues from natural resources (Reed 2006b). The Access Initiative described on page 30 provides one source of skills to address the public accountability for including environmental investments in planning and budgeting and tracking implementation.

Figure 6 | Economic Benefits of Ecosystems Under Alternative Land Management Practices



Source: MA 2005e

LEADERS' FORUM

A Leaders' Forum would provide a top-level international forum with broader representation than the G8,⁴ a group of leaders from industrialized democracies that meets regularly to discuss primarily economic and trade issues (Bradford 2005; Martin 2005; Linn and Bradford 2006). While a Commission on Macroeconomics and the Environment for Poverty Reduction

could serve as a foundation for integrating environmental and resource policies into national financial and development planning, a Leaders' Forum could stimulate the political leadership. One proposal is to establish a Leaders' Forum to deal with cross-cutting environmental and social as well as economic issues (Jhirad 2007).

⁴ G8 is a group of eight major industrial democracies whose heads have met annually since 1975 to address macroeconomic, trade, and other issues facing their societies and the international community as a whole. The host country rotates among members. The eight countries are Canada, France, Germany, Italy, Japan, the U.K., the U.S., and the Russian Federation.

The Proposal

It is national leaders who—working together—have the legitimacy to provide strategic guidance at the global level. The U.N. High-Level Panel on Threats, Challenges, and Change concludes: “There still remains a need for a body that brings together key developed and developing countries to address the critical inter-linkages between trade, finance, the environment, the handling of pandemic diseases, and economic and social development.” A Leaders’ Forum would provide an opportunity for political leaders to discuss and set policy directions on a range of issues. It could become the political forum for mainstreaming sustainable management of ecosystem services into national government development and financial policies—a catalyst providing a jolt of political energy (Bradford 2005:26).⁵

Former Canadian Prime Minister Paul Martin has proposed a leadership group starting with the countries represented in the G20.⁶ This group of finance ministers and central bankers includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the U.K., the U.S., and the European Union. It covers 90 percent of the world’s economic output, 75 percent of all trade and 67 percent of the world’s population. Like the group of finance ministers, but unlike the G8, a Leaders’ Forum would include heads of states of countries at different levels of economic development and also different cultures. The Forum would provide a place for direct, informal discussion among national leaders on political issues. It would move beyond dealing with crises to frank discussion about how to move forward on cross-cutting issues that have not yet reached the consensus stage for Security Council discussion, but where there is a need for input from a larger group of countries.

Advancing the Action Agenda

A Leaders’ Forum would address economic, social, and environmental issues in a way that highlights the connections among them. Thus it could support a stronger link between the health of ecosystem services and finance, trade, and development decisions. Through give-and-take sessions, members could exchange ideas on issues emerging on the international agenda and set the direction for national action. The point of this group would be communication and education—a learning process and development of norms—rather than formal agreement and communiqués. A major benefit, as Martin (2005) says, would be the flexibility to work across the boundaries of outdated institutions.

The experience of the G20 finance ministers illustrates some of the topics that might be covered. They have prepared documents that offer guidance for domestic economic management, broadened the Washington consensus on economic

***A Leaders’ Forum
would provide an
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to discuss and set
policy directions.***

⁵ “Politics provides the electricity that charges the international system with energy, resources and resolve to undertake major challenges. Translating national political leadership into global political leadership seems to be the best means of introducing new dynamics into the international system so that global governance processes can generate guidance, oversight and new relations of the international institutions necessary for the global challenges of the 21st century to be adequately addressed” (Bradford 2005:26).

⁶ The G20 (Group of Twenty) Finance Ministers and Central Bank Governors was first convened in 1999. It brings together leading industrialized and developing economies for dialogue on key issues related to global economic stability. It started in response to financial crises of the late 1990s. It also works closely with international economic institutions.

development to include investment in health and education, and agreed on strong measures to fight financing of terrorism. Although it was not officially on the agenda, the finance ministers discussed climate change at their November 2006 meeting. The exchange focused on reducing subsidies for fossil fuels and providing incentives for alternative energy sources (Foley 2006).

The creation of a representative and effective Leaders Forum might well stimulate other needed institutional changes. It might encourage convening of parallel ministerial groups including one of ministers of environment and natural resources. Table 7 summarizes how a Leaders' Forum might work to advance the Action Agenda.

Getting Started

As global challenges grow and the G8 becomes increasingly ineffective as a steering group, a Leaders' Forum including 21st century powers and reflecting the world's cultural and geographic diversity is likely to emerge to deal with issues

such as health preparedness or climate change. Once formed, it could be a vehicle for reforming international institutions, Jhirad (2007) suggests. It would also be a logical forum at which to present the findings of the Commission on Macroeconomics for Ecosystem Services and Poverty Reduction proposed in the last section.

Linn and Bradford (2006) suggest that the easiest way to create a Leaders' Forum is to build on the G20 that already exists at the level of finance ministers. Thus it could be formed "by simple invitation without complex legal action and without opening the Pandora's box of deciding who is in and who is out of the group." Alternatively, rotation, evolution, and expansion can be used to build a more representative group. One approach might be to add four countries to the G8 - Brazil, China, India, and South Africa - and up to eight additional seats to be filled by a different set of additional countries depending on the subject of the summit. The problem with this approach, Linn and Bradford point out, is the challenge of deciding on topics and who will participate for each summit.

Table 7 | Leaders' Forum: Advancing the Action Agenda

| Action Agenda | Illustrative Examples |
|---|---|
| Develop and use information about ecosystem services | Use information about links between ecosystem services and human wellbeing to educate top leaders who in turn can help educate the public. Put key issues on national agendas along with economic, trade, and financial issues. |
| Strengthen the rights of local people to use and manage ecosystem services | Participation by emerging powers in Africa, Asia, and South America would broaden voices heard, though not directly local voices. |
| Manage ecosystem services across multiple levels and timeframes | Broaden national–international and North–South links. |
| Improve accountability for decisions that affect ecosystem services | Elected officials, who can be held accountable in democracies, participate. Civil society could use meetings as an opportunity to raise ecosystem service issues. |
| Align economic and financial incentives with ecosystem stewardship | Could discuss and encourage use of measures such as natural resource accounts and shift of taxes to consumption. |

The strength of these proposals is in offering forums in which innovations in governing ecosystem services might emerge. Although we have a sense of the kinds of actions that are likely to promote the health of these services, there is little agreement on the specific rules that will do so. Thus what is needed are institutions that bring people together to develop and share information and make decisions in new ways. Local communities and civil society networks would be crucial participants in all of these processes. While the Councils,

Districts, and Leaders' Forum might grow into permanent bodies, the Commission would complete its work in two or three years leaving implementation with national bodies, perhaps with some oversight from international agencies such as UNDP and UNEP. These new institutions might redirect some existing resources—to the Biome Stewardship Councils, for instance—but would also require new funding. In the longer term, payments for ecosystem services and green taxes might be sources of sustainable funding.



CHAPTER 5

Restoring Nature's Capital: Roles and Responsibilities

Imagine for a moment that the Earth is a business. Planet Earth Ltd. is an integrated global conglomerate that provides products and services to customers all over the world. It's been in business a long time, with such huge capital accounts that only recently, in the wake of other business scandals, have its owners decided to audit the books and examine how well it's really doing.

The audit reveals a company in deep trouble. Nearly two thirds of the company's 24 divisions examined are in the red; only four are profitable, while the other five showed mixed results regionally. The auditor's qualified opinion is sobering, pointing to the absence of internal controls: capital accounts undervalued and depleted for short-term gain and extensive use of off-balance sheet assets and liabilities. In addition, business units are pitted against each other with an inefficient transfer pricing mechanism, limited or no strategic planning, and underinvestment in R&D. Markets have distorted values for Planet Earth's assets, and there is no leadership to recognize the synergies between divisions. The company appears to be run without a CEO. The auditor contends that to avoid future bankruptcy the company's management must change its practices significantly or be replaced.

The Millennium Ecosystem Assessment can be compared to a business audit. The analogy shows that the results of the Assessment merit serious attention. Of the 24 ecosystem services assessed only four were enhanced, while 15 were being degraded or used unsustainably and five were stable globally, although in trouble in some regions. Overuse of provisioning services—food, fresh water, and timber—has run down natural capital assets. Important regulating services, such as water purification, pest regulation and flood control, are off the balance sheet, and their depreciation overlooked. Others such as climate control are undervalued and used inefficiently. Ecosystem stewardship is marginalized in less powerful ministries or relegated to the management of a single service like food,

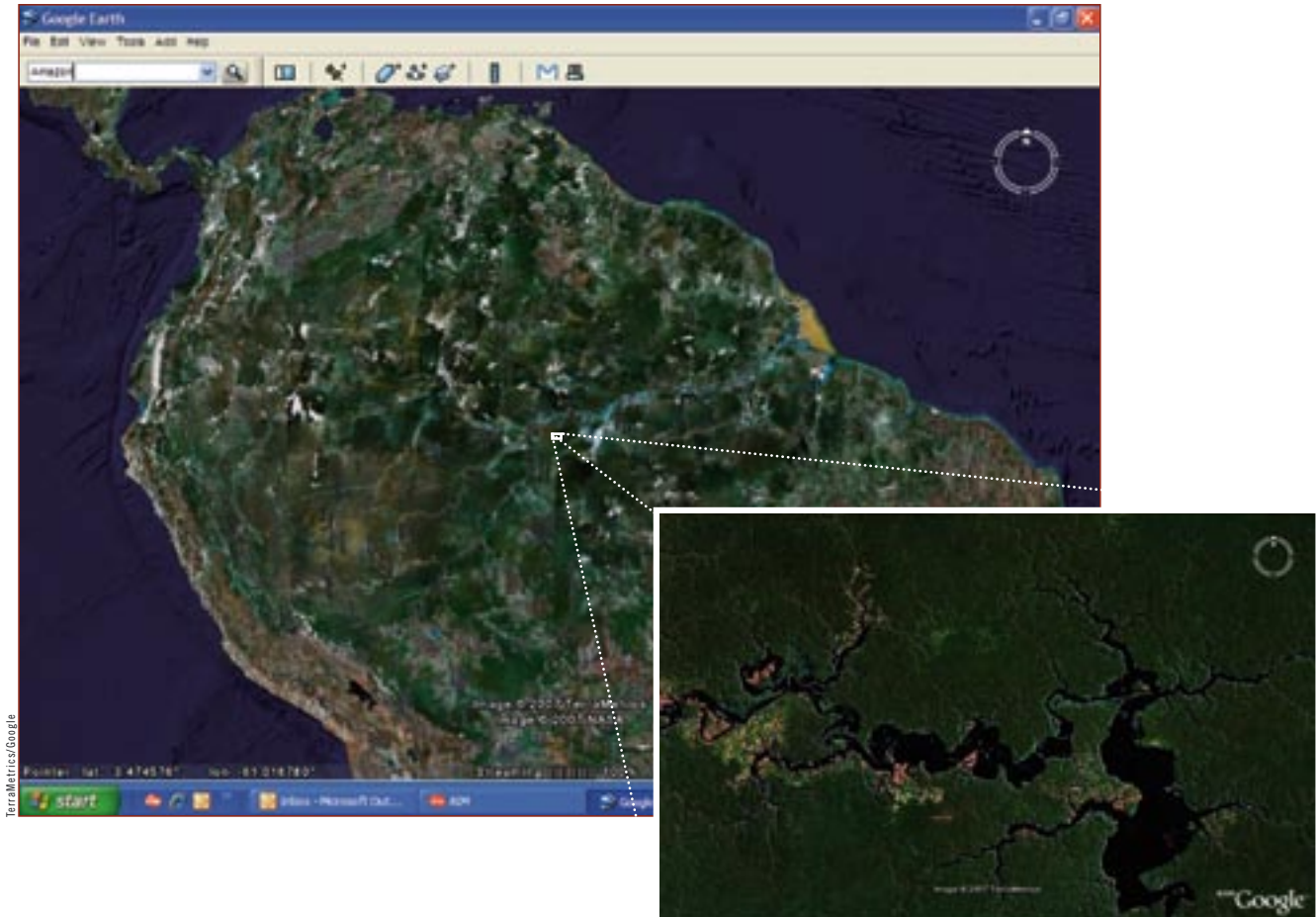
timber or water. Development planners have failed to make the connections between healthy ecosystems and the attainment of social and economic goals, ultimately jeopardizing all three. Investment in knowledge about how ecosystems function and how they relate to society's wellbeing is inadequate and fragmented in many different disciplines.

The Assessment's framework linking drivers, services, and human wellbeing may well turn out to be its most important contribution. It provides a template for developing a more complete profit and loss statement for Planet Earth. By looking at the contribution of ecosystems through the common lens of services for human wellbeing, the argument that ecosystem stewardship is a zero sum game is quickly diffused, making clear that healthy ecosystems are integral to healthy economies and healthy societies over the long term. At the same time, it provides a unified approach to assessing and managing services. Such an approach is especially important at a period of growing demand for services to support an expanding population and to help lift millions of people out of poverty, many of whom depend on ecosystems services for their livelihoods.

The Assessment provides the foundation for performing a periodic audit of ecosystem services. The next steps can take advantage of online, interactive, virtual globe tools such as Google Earth to organize and display information in easy-to-use ways. Using these techniques can lead to a sea change in how the public sees and values nature's services and in turn to the way society makes decisions about ecosystems and human wellbeing.

Everyone needs to be at the table to assist in this transformation: civil society, business, the educational and research communities, local communities, national government, and international organizations. The transformation means integrating ecosystem stewardship into all types of governance by increasing the availability of information on ecosystem services, and tipping the balance in favor of local rights to resources and local voices in decisionmaking. It means managing across levels and increasing the use of accountability mechanisms and economic and financial incentives. It means developing individual and societal norms that make ecosystem stewardship an integral consideration in all decisions. Tables 8–13 provide examples of steps that civil society, business, research communities, local communities, national governments, and international organizations can take to put the action agenda into effect.

The Assessment's framework linking drivers, services, and human wellbeing may well turn out to be its most important contribution.



New information and communication technologies are transforming the flow of information.

At the same time, new institutions can help put the action agenda into practice: a Forum to provide political leadership from a wider range of countries; a Commission to bridge the gap between macroeconomics and the environment, working toward the common goal of reducing poverty; and Biome Stewardship Councils and Ecosystem Service Districts as focal points for meshing the now disparate data on ecosystem services and experimenting with the most effective ways to disseminate and use the information to make decisions. Table 14 summarizes how various actors from local communities to business to national governments and international organiza-

tions can play a supporting role in the genesis and operation of these new structures.

The way forward requires rewiring the institutions of governance—making new connections to understand and find solutions to solve the complex interlinked challenges of ecosystem degradation. One thing is abundantly clear: “business as usual” is no longer an option. The time has come to stop operating Planet Earth Ltd. solely for the purpose of making a few shareholders rich in the short term, and instead manage it as a family trust fund, set up for the benefit of today’s and tomorrow’s children.

Table 8 | **Civil Society: Advancing the Action Agenda**

| Action Agenda | Illustrative Actions |
|---|--|
| Develop and use information about ecosystem services | <ul style="list-style-type: none"> • Develop and promote the use of tools that identify and help manage tradeoffs. • Disseminate information in ways that make it useable by policymakers and citizens. Use familiar examples of ecosystem change and make the connections to people's lives and policymakers' social and economic goals. • Tailor information on ecosystem service risk and opportunities for investors, producers, and purchasers. |
| Strengthen the rights of local people to use and manage ecosystem services | <ul style="list-style-type: none"> • Advocate for people to have secure rights over the natural resources they depend upon for their livelihoods. This includes providing legal support for traditional tenure including communal systems. Support efforts to empower women in developing countries to play a more progressive role in ecosystem stewardship. • Support decentralization of governmental decisions about ecosystem services to local communities. Reinforce communities' rights to set their own rules regarding natural resource management. • Strengthen the ability of local communities to influence development projects. Help build social networks that increase communities' capacity to participate effectively in development decisions and ensure a balance of power in environmental conflicts. • Bring local voices to the table. Support the participation of local communities in decisions that affect natural resources at the national and international scales. |
| Manage ecosystem services across multiple levels and timeframes | <ul style="list-style-type: none"> • Advocate for governments to establish the conditions for institutional cooperation across scales and levels, including resolving the root cause of natural resource conflicts. Facilitate dialogues across levels to address conflicts that involve a wide range of local people as well as elected leaders. • Support the formation of bridging organizations to bring together formal and informal actors for the purposes of sharing knowledge and developing collective solutions. Increase use of comanagement. Bring local knowledge of ecosystems to bear in comanagement practices across scales and levels and provide local communities with the authority to make decisions on the use of natural resources. • Call for national institutions to raise the priority of working across levels. |
| Improve accountability for decisions that affect ecosystem services | <ul style="list-style-type: none"> • Hold elected officials accountable for ecosystem stewardship. • Support the strengthening of national systems of public access to information, participation, and justice. Assess and make public government's progress on implementing emerging norms on participation. • Advocate for greater corporate transparency about the impacts of facilities and products on ecosystems. • Advocate for a public process to track investments in ecosystem services to meet development goals. |
| Align economic and financial incentives with ecosystem stewardship | <ul style="list-style-type: none"> • Promote and build constituencies for markets for nature's services such as watershed services and flood, erosion, and climatic control. • Provide analysis and build constituency for ecosystem-friendly taxes. Use initiatives to reform tax codes and cut budget deficits as opportunities to push for redesign of tax systems to promote sustainable use of ecosystem services. • Support and raise public awareness on societal benefits of payments for maintenance of ecosystem services. • Incorporate ecosystem stewardship goals in facility managers' performance objectives. |

Table 9 | Business: Advancing the Action Agenda

| Action Agenda | Illustrative Actions |
|--|---|
| <p>Develop and use information about ecosystem services</p> | <ul style="list-style-type: none"> • Assess the dependence and impact of business operations on ecosystem services. Request information from suppliers and customers on their dependence and impact on ecosystem services. Use the resulting information to assess the business risks and opportunities associated with ecosystem change. • Tailor information on the risks and opportunities presented by ecosystem change for investors and customers so that they can make informed investment and purchasing choices. |
| <p>Strengthen the rights of local people to use and manage ecosystem services</p> | <ul style="list-style-type: none"> • Recognize the rights of local communities to engage in and influence proposed development projects in corporate policies. • Bring local voices to the corporate decisionmaking table. Support the participation of local communities in business decisions and strategies that affect natural resources. |
| <p>Manage ecosystem services across multiple levels and timeframes</p> | <ul style="list-style-type: none"> • Support and participate in bridging organizations that bring together stakeholders and knowledge from across levels to inform and improve decisions. |
| <p>Improve accountability for decisions that affect ecosystem services</p> | <ul style="list-style-type: none"> • Increase corporate disclosure using standardized approaches such as those developed by the Global Reporting Initiative. Develop mechanisms for holding suppliers and other business partners accountable for their impacts on the health of ecosystem services. |
| <p>Align economic and financial incentives with ecosystem stewardship</p> | <ul style="list-style-type: none"> • Incorporate ecosystem stewardship goals in facility managers' performance objectives. |

Table 10 | **Research Communities: Advancing the Action Agenda**

| Action Agenda | Illustrative Actions |
|---|---|
| Develop and use information about ecosystem services | <ul style="list-style-type: none"> • Help design and implement regular monitoring systems of ecosystem services, taking advantage of modern information and communication technologies. Participate in regular assessments using the resulting information. • Develop tools that help identify and manage tradeoffs among services, over time, and in relation to who gets the benefits and who bears the costs. Train users in the application of these tools. Conduct analysis of the resulting information. • Disseminate information on ecosystem services in ways that make it useable by the public. |
| Strengthen the rights of local people to use and manage ecosystem services | <ul style="list-style-type: none"> • Assess the effectiveness of local social networks in strengthening the capacity of communities to participate effectively in development decisions. • Conduct research on the relationship between participatory decisionmaking processes and social, environmental, and economic outcomes. |
| Manage ecosystem services across multiple levels and timeframes | <ul style="list-style-type: none"> • Conduct research on the conditions for institutional cooperation across levels. Improve understanding of natural resources conflicts, their origins, and strategies for resolution. • Form bridging organizations to bring together formal and informal actors for the purposes of sharing knowledge and developing collective solutions. • Increase research on comanagement of natural resources across scales. Enhance knowledge and data about ecosystem impacts that emerge over longer time scales. |
| Improve accountability for decisions that affect ecosystem services | <ul style="list-style-type: none"> • Conduct research on use and effectiveness of existing tools, such as corporate sustainability reports, in holding companies accountable for decisions related to ecosystem services. • Perform analysis to devise methods to track investments by national governments in ecosystem services to meet development goals. |
| Align economic and financial incentives with ecosystem stewardship | <ul style="list-style-type: none"> • Provide analysis for ecosystem-friendly taxes. • Establish ecosystem stewardship goals in facility managers' performance objectives. |

Table 11 | **Local Communities: Advancing the Action Agenda**

| Action Agenda | Illustrative Actions |
|---|---|
| Develop and use information about ecosystem services | <ul style="list-style-type: none"> • Perform regular monitoring and assessment of ecosystem services. Support the dissemination and use of local knowledge to improve ecosystem management. • Participate in the development of and use tools that identify and help manage tradeoffs. • Disseminate information in ways that make it useable by local people. Use familiar examples of ecosystem change and make the connections to people's lives. |
| Strengthen the rights of local people to use and manage ecosystem services | <ul style="list-style-type: none"> • Ensure that individuals have secure rights to the ecosystem services they depend on for their livelihoods. • Set rules regarding natural resource management. • Build social networks that increase communities' capacity to participate effectively in development decisions. • Strengthen local participation in decisions that affect natural resources at the national and international scales. |
| Manage ecosystem services across multiple levels and timeframes | <ul style="list-style-type: none"> • Encourage local people and elected leaders participate in dialogues across levels to address conflicts over natural resources. • Bring knowledge of ecosystems to bear in comanagement practices across scales. |
| Improve accountability for decisions that affect ecosystem services | <ul style="list-style-type: none"> • Align taxation policies with ecosystem stewardship. • Develop mechanisms to hold elected officials accountable for ecosystem stewardship and use them. |
| Align economic and financial incentives with ecosystem stewardship | <ul style="list-style-type: none"> • Incorporate ecosystem stewardship goals in facility managers' performance objectives. • Support and participate in markets and payments for ecosystem services. |

Table 12

National Governments: Advancing the Action Agenda

| Action Agenda | Illustrative Actions |
|---|---|
| Develop and use information about ecosystem services | <ul style="list-style-type: none"> • Establish regular monitoring systems to track the state of ecosystem services. Incorporate local knowledge and monitoring information. Support regular assessments and analysis of the resulting information. • Use tools that identify and help manage tradeoffs among services, over time, and in relation to who gets the benefits and who bears the costs to strengthen decisions that affect or depend on ecosystem services. |
| Strengthen the rights of local people to use and manage ecosystem services | <ul style="list-style-type: none"> • Ensure that individuals and communities have secure rights to the ecosystem services they depend on for their livelihoods. • Decentralize governmental decisions about ecosystem services to local communities. Allow communities to set their own rules regarding natural resource management. • Strengthen the capacity of local communities to influence proposed development projects. Support social networks that increase communities' capacity to participate effectively in development decisions. • Bring local voices to the table. Strengthen participation of local communities in decisions that affect natural resources at the local, national, and international scales. Make measurable, time-bound commitments to improve access and participate in initiatives such as Partnership for Principle 10. |
| Manage ecosystem services across multiple levels and timeframes | <ul style="list-style-type: none"> • Establish the conditions for institutional cooperation across levels, including resolving the root cause of natural resource conflicts. Facilitate dialogue across levels to address conflicts. • Increase use of comanagement practices across levels in order to take advantage of different strengths in ecosystem management. • Raise priority of working across levels in national institutions. |
| Improve accountability for decisions that affect ecosystem services | <ul style="list-style-type: none"> • Strengthen national systems of public access to information, participation, and justice. Assess progress on implementing emerging norms on participation. • Establish a public process to make and track ecosystem investments to meet development goals. • Increase corporate disclosure on the use of ecosystem services and the impacts of their operations, suppliers, and products/services. |
| Align economic and financial incentives with ecosystem stewardship | <ul style="list-style-type: none"> • Create the enabling mechanisms to support markets for nature's services that currently have no value. • Make taxes ecosystem friendly. Use initiatives to reform tax codes and cut budget deficits as opportunities to promote sustainable use of ecosystem services. • Establish payment schemes for maintenance of ecosystem services. • Incorporate ecosystem stewardship goals in facility managers' performance objectives. |

Table 13 | **International Organizations: Advancing the Action Agenda**

| Action Agenda | Illustrative Actions |
|---|---|
| Develop and use information about ecosystem services | <ul style="list-style-type: none"> • Support regular monitoring and assessment of ecosystem services to inform international conventions. • Use tradeoff tools in development planning to identify, evaluate, and help manage tradeoffs among services and across scales. Build national capacity to use tools in economic and development plans. |
| Strengthen the rights of local people to use and manage ecosystem services | <ul style="list-style-type: none"> • Support the decentralization of governmental decisions about ecosystem services to local communities. • Strengthen the ability of local communities to influence proposed development projects. Support social networks that increase communities' capacity to participate effectively in development decisions. • Bring local voices to the table at international decisionmaking forums. Improve participation of local, indigenous peoples and civil society in decisionmaking processes at the international and regional levels. |
| Manage ecosystem services across multiple levels and timeframes | <ul style="list-style-type: none"> • Establish the conditions for institutional cooperation across levels, including resolving the root cause of natural resource conflicts. Facilitate dialogue across levels to address conflicts that involve local people, not just formal leaders. • Support the formation of bridging organizations to bring together formal and informal actors for the purposes of sharing knowledge and developing collective solutions. • Raise priority of working across levels in international and national institutions. |
| Improve accountability for decisions that affect ecosystem services | <ul style="list-style-type: none"> • Support the strengthening of national systems of public access to information, participation, and justice. • Foster national public planning and budgeting processes to make and track ecosystem service investments to meet development goals. |
| Align economic and financial incentives with ecosystem stewardship | <ul style="list-style-type: none"> • Incorporate ecosystem stewardship goals in facility managers' performance objectives. |

Table 14 | Advancing New Institutions

| | Ecosystem Service Districts | Biome Stewardship Councils | Commission on Macroeconomics and Environment for Poverty Reduction | Leaders' Forum |
|------------------------------------|--|--|--|---|
| Civil society | Put on the political agenda; help design; monitor | Put on the political agenda; help design; implement | Put on the political agenda; help design; monitor | Help shape the idea; influence the agenda |
| Business | Provide services; help collect and use information | Provide services; help collect and use information | Help shape the idea | Help shape the idea; influence the agenda |
| Research communities | Provide analysis to develop the idea and evaluate how it works | Scientists from SGAs could help develop | Conduct research on links between ecosystem services and poverty | Provide analysis to develop the idea and evaluate it |
| Local communities | Lead in implementing | Nominate and elect members; implement programs | Participate in research; implement and use results to hold national government accountable | Election of national leaders |
| National governments | Establish legal framework; use information in addressing issues at broader levels and scales | Second some staff from resource and environmental agencies | Help fund and design; participate; implement results | Heads of 20 countries provide leadership on integrating ecosystem services into development goals |
| International organizations | Facilitate exchange of experience; prepare guidance on services that cross levels and scales | Convention parties and secretariats find ways to work with Councils to protect biodiversity, climate, wetlands, dryland, and migratory species | Convene; perform analysis; facilitate exchange of experience on implementation | Provide supporting analysis |

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AUTHORS AND PAPERS CONTRIBUTING TO THIS REPORT

When the Millennium Ecosystem Assessment was released in 2005, the World Resources Institute invited 17 experts to review the Assessment findings and propose policy ideas to address them. These papers provided input to the action agenda presented in this publication. Edward Elgar will publish the papers introduced in this appendix as a separate volume (Ranganathan et al. 2007).

MARK BATEMAN (IW Financial, USA)

A Scenarios Approach to Developing Economic Management Strategies

This paper offers 10 discrete policy ideas as catalysts for significant change to ecosystem management and use. The paper is based on the findings of the Assessment's scenarios and pulls together the positive management aspects of each scenario to form its list of policy recommendations.

ROBERT GOODLAND (World Bank Group, retired)

Environmental Policy Priorities for the World Bank

The World Bank has historically financed more ecosystem damage than it has cured. However, as a global funding agency, it simultaneously has incredible opportunities to promote environmental prudence. This paper urges the Bank, and specifically its president Paul Wolfowitz, to take a key message from the Millennium Assessment: focus on integrating an ecosystems-based approach into mainstream Bank policy and operations. Prudent recommendations are then offered regarding how Bank policies should be specifically modernized.

FRANCES IRWIN (World Resources Institute)

A Commission to Spur Investment in Ecosystem Services for the Poor

The same regions that face the greatest ecosystem degradation and most rapid conversion of remaining natural assets also face the greatest development challenges. This paper recommends establishing a commission to work with national governments in overcoming the barriers to incorporating specific investments in ecosystem services targeted at helping the poor into development plans. It stresses the importance of a public process that sets targets and monitors progress. It suggests building on the experience of the Commission for Macroeconomics and Health that made the case that health is essential to development and resulted in increased investments in health.

ANTHONY JANETOS (Joint Global Change Research Institute, USA)

Looking Back and Ahead in Ecosystems: Reflections on the Lessons of the Millennium Ecosystem Assessment

This paper examines the process of scientific assessment used in the Millennium Ecosystem Assessment and how that process has evolved with other scientific assessments, and makes several recommendations for the future: (1) ensure that national governments have a strong role and voice in assessments; (2) ensure that new scientific assessments are part of an ongoing policy process; (3) ensure that there is substantive participation from the private sector; and (4) devote at least some resources to analysis of clearly different policy options.

DAVID JHIRAD (World Resources Institute)

Implementing Smart Globalization: Incentives and Opportunities for Business, Scientific and Political Leadership

This paper explores approaches to “smart globalization,” designed to accelerate poverty reduction, provide sound governance, and restore and enhance the ecosystems that create wealth. The paper examines incentives for business, financial, scientific, and political leaders to participate in this process, and makes several recommendations for these constituencies. The recommendations include: providing new tools and incentives for infrastructure investments; endorsing the Extractive Industries Transparency Initiative; assigning value to ecosystems goods and services through market mechanisms; exploring a new generation of complex, nonlinear mathematical models; utilizing and integrating low-cost environmental data collection using high-resolution satellite mapping; and reforming global governance through the creation of a Leaders' Forum of 20 nations.

KARIN KRCHNAK (The Nature Conservancy)

Policy Actions to Help Move Us Toward Ecosystem Security

This paper proposes policy recommendations aimed at answering the following questions. How do governments move toward integrated decisionmaking to slow and avert rapid changes and losses to ecosystems? How do the broad range of stakeholders that are not governments participate in and contribute towards improved management of natural resources? How can new ways of thinking and innovative approaches to manage resources be encouraged to ensure the integrity of these critical environmental services in the long term? Finally, the paper points out that institutional and political issues of coordination, inclusion, and participation can help build the trust, experiences, and confidence in working across multiple actors and processes to move toward sustainable development.

ANTONIO LA VINA (Ateneo School of Government, Ateneo de Manila University, The Philippines)

Development, Ecosystems and Governance: What are the Priorities for Policy Makers?

This paper explores the implications for development decisionmakers in poor countries of the results of the Millennium Ecosystem Assessment. In particular, the following key questions are raised and addressed by the author. How can a process like the Assessment be useful in development planning? How can specific findings about the health of ecosystems, as found in the Assessment, be addressed in national development plans? How can the results be integrated in such plans?

LAILAI LI (Institute for Environment and Development/LEAD, China)

Putting the Assessment into Action: Six Steps for Governments

Ecosystems, ecosystem services, human wellbeing, and the interactions among them form a complex system. This paper approaches its analysis from within this framework and argues for the value of justice and livelihoods for the poor as a main factor for decisionmaking at all levels; suggests that intergovernmental agencies play an important role in influencing national governments to incorporate ecosystem management into respective development strategies; and urges increased investment in education to communicate and disseminate the knowledge generated by the Millennium Ecosystem Assessment.

NICOLAS LUCAS (Centro Fueguino para el Desarrollo Sustentable, Argentina), IOKINE RODRÍGUEZ (Venezuela), and HERNAN DARIO CORREA (Colombia)

To Change Global Change: Ecosystem Transformation and Conflict in the 21st Century

This paper explores two fundamental political interpretations that the findings of the Assessment suggest: first, that there is a direct relationship between the shape of globalization and the contemporary forms of biophysical transformation of the Earth, which has consequences for global development; second, that global ecosystem change creates socio-environmental conflicts that must be assumed as a major political challenge for the coming decades.

MOHAN MUNASINGHE (Munasinghe Institute for Development, Sri Lanka)

Mainstreaming and Implementing the Assessment Results by Integrating them into Sustainable Development Strategy

This paper seeks to mainstream the Assessment results by integrating them into a sustainable development strategy at national and local levels, and implementing them on a more disaggregated basis through local communities and individuals. It also argues for explicitly linking the Assessment findings with global development concerns, especially the Millennium Development Goals. The Action Impact Matrix tool is proposed to link ecosystem goals with national development strategies. The Matrix helps to determine the priority issues and implement development policies and projects to manage ecosystems and restore damaged ecosystem services. It is a fully participative, consensus-building, multi-stakeholder exercise, involving persons from diverse sectors and disciplines, relevant to both development and ecosystems.

RICHARD NORGAARD (University of California, Berkeley)

The Implications of Interdisciplinary Scientific Assessments for Environmental Governance

Assessing the literature through the Assessment framework required extensive discussion between the participating scientists in order to reach collective expert judgment. The careful wording of the Assessment reflects the success of this deliberative, democratic, and scientific process. Yet it is the acquired skill of the Assessment's participants in making sound judgments that is needed for elucidating and implementing any particular policy choice.

SUDHIR CHELLA RAJAN (Indian Institute of Technology, Madras)

Meeting the Assessment Challenge: The Case for Biome Stewardship Councils

Concerted action that transcends conventional forms of country-level collaboration is needed to address the enormous challenges to the Earth's ecosystems. This paper proposes a new institutional arrangement in the form of cross-national stewardship councils, with strong grassroots representation, to develop biome-specific recommendations to maximize both ecosystem protection and human welfare.

GUIDO SCHMIDT-TRAUB (U.N. Millennium Project) and ALBERT CHO (McKinsey & Co.)

From Assessment to Action: Operationalizing Environmental Sustainability at the National Level

The Millennium Development Goals are the world's shared framework for addressing poverty in its many dimensions by 2015 and ensuring environmental sustainability. The Millennium Ecosystem Assessment systematically describes the environmental challenges facing the world today, but the question of how countries can develop operational strategies for ensuring environmental sustainability as part of their efforts to meet all Millennium Development Goals remains unanswered. Drawing on the work of the U.N. Millennium Project, this paper suggests how developing countries can operationalize the concept of environmental sustainability and develop operational strategies for meeting their environment objectives. This includes carrying out needs assessments to quantify the human and financial resources needed to implement the strategies.

FRANCES SEYMOUR (Center for International Forestry Research, Indonesia)

Framing the Millennium Ecosystem Assessment Messages for Political Resonance

How can environmentalists relay the complex findings of the Millennium Ecosystem Assessment in a way that is easily understood and compelling to a more general audience? This essay proposes messaging strategies for framing political approaches to ecosystem issues around efficiency, trigger points, social insurance, fairness, and ethical norms. It closes with a call for improved imaging of the problems and proposed solutions to mobilize political support around the conclusions drawn by the Millennium Ecosystem Assessment.

ACRONYMS

| | |
|----------|--|
| BSR | Business for Social Responsibility |
| CBD | Convention on Biological Diversity |
| CONDESAN | Consortio para el Desarrollo Sostenible de la Ecorregion Andina |
| COP | Conference of Parties |
| EEC | Environmental Enterprise Corps |
| FAO | Food and Agriculture Organization of the United Nations |
| G8 | Group of Eight |
| G20 | Group of Twenty |
| GDP | gross domestic product |
| GRI | Global Reporting Initiative |
| INECE | International Network for Environmental Compliance and Enforcement |
| IRS | United States Internal Revenue Service |
| IUCN | The World Conservation Union |
| MA | Millennium Ecosystem Assessment |
| MCC | Millennium Challenge Corporation |
| MDG | Millennium Development Goal |
| NGO | nongovernmental organization |
| OECD | Organisation for Economic Co-operation and Development |
| PP10 | Partnership for Principle 10 |
| SA/MA | South African Millennium Ecosystem Assessment |
| SGA | Sub-Global Assessment (of the Millennium Ecosystem Assessment) |
| TAI | The Access Initiative |
| U.N. | United Nations |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| WRI | World Resources Institute |
| WWF | World Wide Fund for Nature (formerly World Wildlife Fund) |

ABOUT WRI

The World Resources Institute is an environmental research and policy organization that goes beyond research to create practical ways to protect the Earth and improve people's lives. Our mission is to move human society to live in ways that protect Earth's environment for current and future generations. Our program meets global challenges by using knowledge to catalyze public and private action to:

- Reverse damage to ecosystems. We protect the capacity of ecosystems to sustain life and prosperity.
- Expand participation in environmental decisions. We collaborate with partners worldwide to increase people's access to information and influence over decisions about natural resources.
- Avert dangerous climate change. We promote public and private action to ensure a safe climate and sound world economy.
- Increase prosperity while improving the environment. We challenge the private sector to grow by improving environmental and community wellbeing.

In all of its policy research and work with institutions, WRI tries to build bridges between ideas and actions, meshing the insights of scientific research, economic and institutional analyses, and practical experience with the need for open and participatory decisionmaking.

Cover photograph: ©iStockphoto.com/lubilub

Editing, design and layout: Green Ink Publishing Services Ltd (www.greenink.co.uk)



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ISBN: 978-1-56973-641-8



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