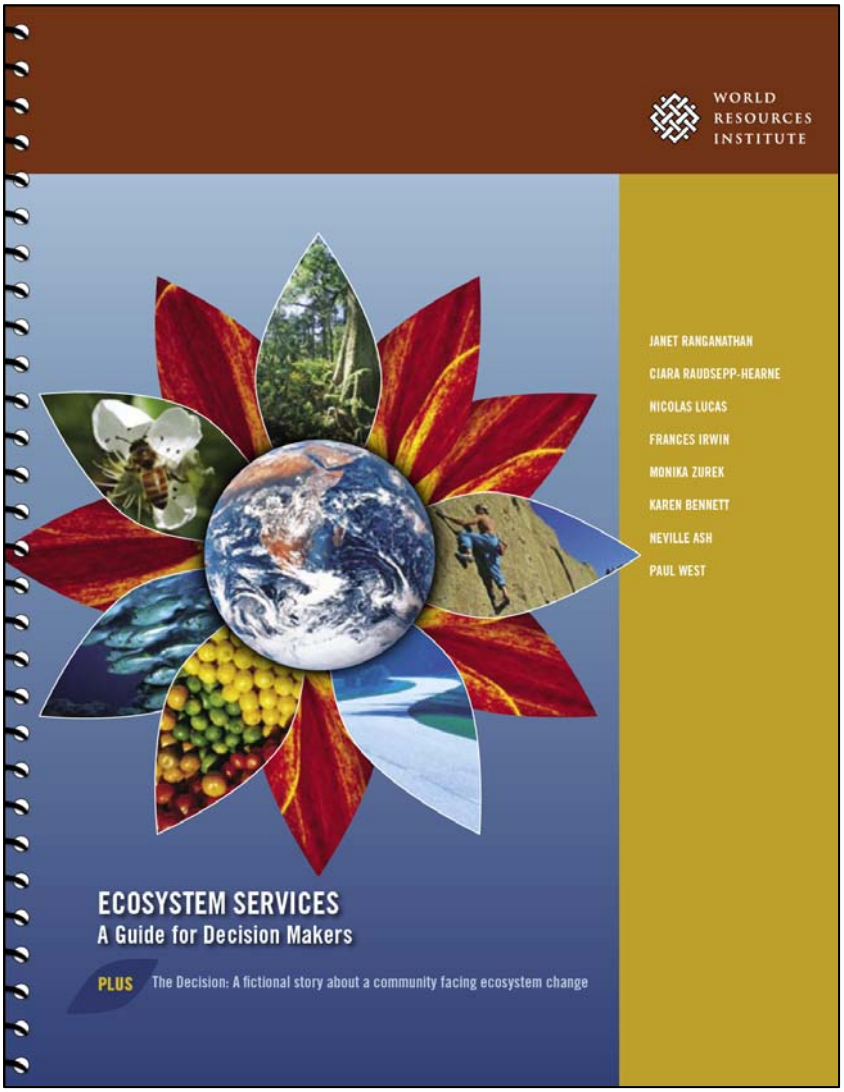
WORLD RESOURCES INSTITUTE

A Guide to

Ecosystem Services: A Guide for Decision Makers

Human well-being utterly depends on nature. Development, defined broadly to encompass social, economic, and environmental aspects of growth, aims to improve human well-being. Despite the inextricable connections, development and nature have frequently been considered in isolation or even in opposition.

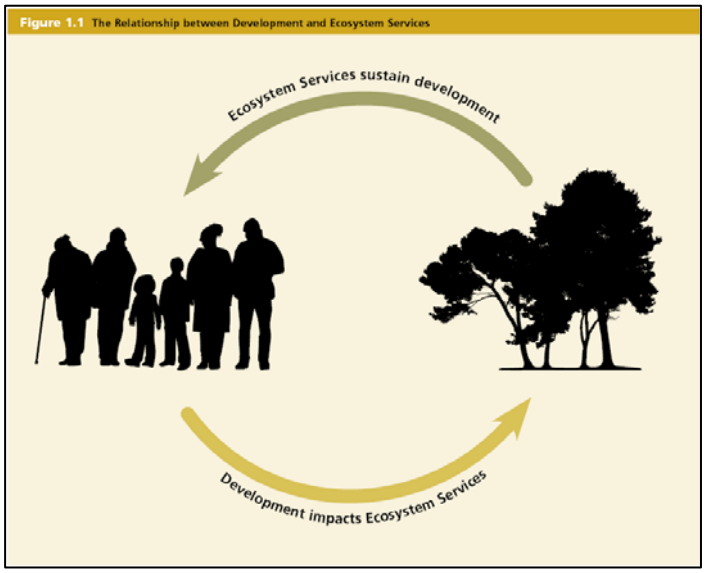


Nature is the source of such necessities as food and fresh water. Its ecosystems also provide less obvious services such as storm protection, pollination, and spiritual benefits. These and other benefits of nature's ecosystems have supported the extraordinary growth and progress of the human population. Yet many ecosystem services are in a state of decline, and we are learning that nature's benefits can no longer be taken for granted. Ignoring these services in decision making threatens our ways of living and impedes our ability to achieve our future aspirations.

About this guide:

We have assembled this "quick guide" as an abridged review of the most important concepts, stories, and themes from the long version of *Ecosystem Services*.

Recognizing the links between ecosystem services and development goals can mean the difference between a successful strategy and one that fails because of an unexamined consequence for a freshwater supply, an agricultural product, a sacred site, or another ecosystem service. **This guide will help decision makers recognize the links by demonstrating how to incorporate an Ecosystem Services Approach into *existing* decision-making processes.** An Ecosystem Services Approach expands the focus beyond how development *affects* ecosystems to include how development *depends* on ecosystems. In addition to focusing on how to protect ecosystems *from* development, we can also consider how to invest in managing ecosystems *for* development.



There is no single way to implement an Ecosystem Services Approach. The methods presented in this guide are illustrative; decision makers need not use all of them in order to strengthen their decisions. The guide builds on existing experience with multiple-use ecosystem management, ecosystem restoration, and conservation planning, but identifies ecosystem services more explicitly.

This guide is intended for use by a city mayor; a local planning commission member; a provincial governor; an international development agency official; or a national minister of finance, energy, water, or environment. It can help answer questions such as:
What is the relationship between ecosystems and development? (Chapter 1)
Why do ecosystem services matter? (Chapter 1)
How can an ecosystem services framework help organize a decision-making process? (Chapter 2)
What are the most common ecosystem services? (Chapter 2)
When and how can the economic value of ecosystem services be quantified? (Chapter 3)
How are ecosystem service risks and opportunities identified? (Chapter 3)
How can future ecosystem service changes be explored? (Chapter 4)
How can ecosystem service risks and opportunities be incorporated into development strategies? (Chapter 5)
What policies help sustain ecosystem services? (Chapter 5)

Our ability to identify, map, measure, and value the benefits that come from ecosystems is increasing. The Millennium Ecosystem Assessment – a four-year United Nations assessment of the condition and trends of the world's ecosystems involving more than 1,300 experts – established a benchmark. Efforts such as those by The Natural Capital Project on valuation, IUCN on payments, and the World Resources Institute on mainstreaming ecosystem services in public and private sector decisions provide new methods that decision makers can use to make the links between ecosystems and development. As we are better able to describe and value the benefits of ecosystem services, decision makers can better understand how their actions might change these services, consider the trade-offs among options, and choose policies that sustain services.

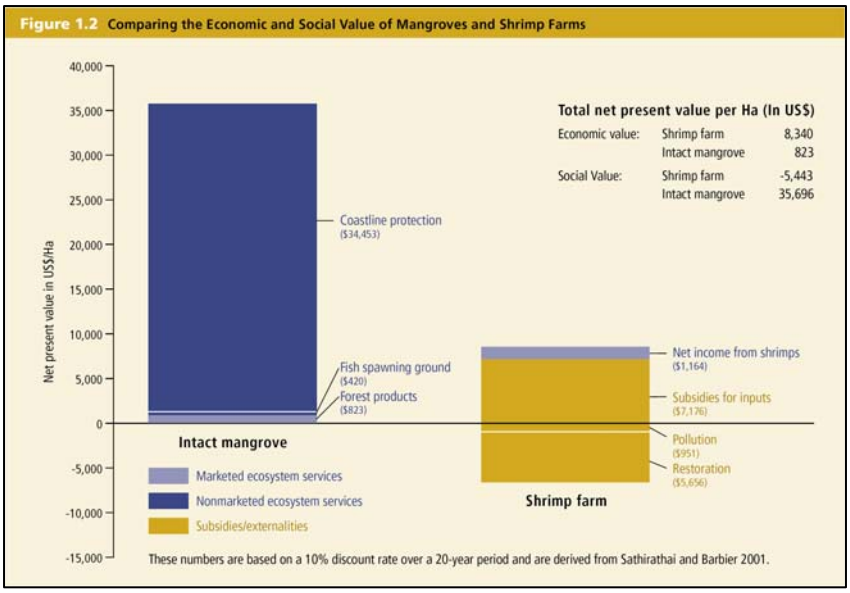
ECOSYSTEM SERVICES AND DEVELOPMENT

In the past, environmental decision making has focused largely on mitigating the *impact* of mining or dam building, for example, and on establishing areas to protect wildlife and its habitat or a scenic river. While important, these activities are only part of the picture. We need to consider mitigation and protection within a broader approach that recognizes that people in their daily lives *depend* on a range of services that ecosystems provide. These services are fundamental to attaining development goals (see Figure 1.1). Thus, decision makers – including those whose goals and actions might not at first seem connected to ecosystems – need to examine the dependence and impacts of their goals on ecosystem services. Whether developing a policy to increase the production of food or biofuel, preparing a coastal development plan, or constructing a water filtration plant, taking ecosystem services into account can strengthen decisions.

The following four examples illustrate how improved understanding of the links between development and ecosystem services can strengthen decision making.

Shrimp farming and mangrove losses in Southeast Asia

The expansion of shrimp aquaculture, particularly in Southeast Asia and Central America, has increased profits for a few growers, while supplying the global marketplace with low-cost shrimp. Unfortunately for many coastal communities, the proliferation of shrimp farms has driven widespread destruction and conversion of mangrove forests. A study of mangrove conversion near Tha Po Village in Thailand compared the economic returns from shrimp farms with those from sustainably managed mangroves. Conversion of mangroves to shrimp farms appears the economically sound choice when only the values of the shrimp harvest and forest products are considered in the economic analyses. However, if the value of non-marketed ecosystem services from mangroves (such as coastline protection and spawning ground for wildfish) is considered, the intact mangroves become the more sound development choice (see Figure 1.2).



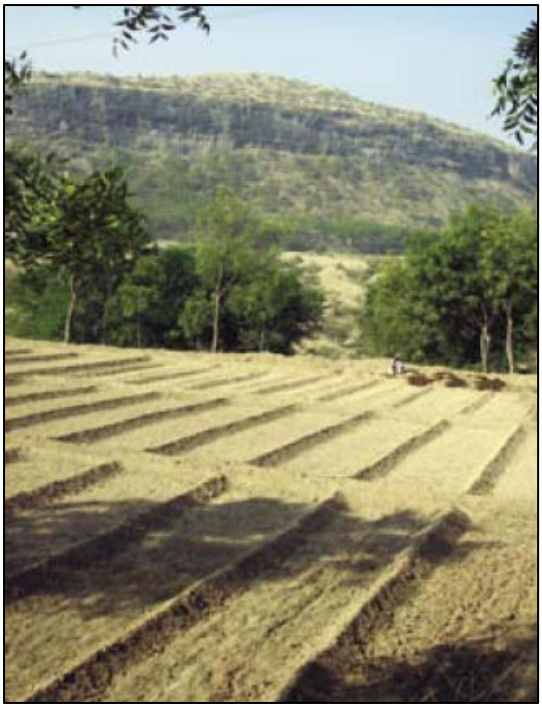
People in Tha Po Village, and other poor coastal communities where mangrove conversion is occurring, bear most of the costs associated with diminished ecosystem services, including lost forest resources, reduced coastline protection from storms, lower fishery yields, and water quality degradation from aquaculture pollution. Yet they receive few of the benefits, which primarily accrue to shrimp aquaculture operators and distant consumers who enjoy subsidized shrimp. If residents had been effectively involved in the decision and brought information about their use of ecosystem services to include in a cost-benefit analysis, might a more equitable and economically sound decision have been made?

U.S. farmers and soil conservation

Agricultural production is a major industry in the United States, but the production of crops, livestock, and biofuel often degrades other ecosystem services such as erosion control, nutrient cycling, and freshwater supply. In 1985, the U.S. government established the Conservation Reserve Program to help restore these degraded services. Through this program farmers are compensated for retiring cropland for up to 15 years and establishing conservation practices. In addition to receiving rent, participants receive technical training in how to implement best management practices.

In 2006, more than 3 million acres of farmland were enrolled in the program. Monitoring systems have demonstrated improvements in water quality, carbon storage, and soil retention. The program is alleviating some of the nation's biggest environmental problems: Chesapeake Bay pollution, New York City's drinking water quality, and declining populations of Pacific Northwest salmon. The European Union has a similar program under its Common Agricultural Policy that pays farmers for undertaking measures that meet development goals.

Watershed restoration in India to support sustainable rural livelihoods



Before an Indo-German Watershed Development Program was launched in 1996, Darewadi village in the Indian state of Maharashtra relied on tanker trucks of water during periods of water scarcity. Technical training and leadership development enabled the village to adopt new ways to mitigate the effects of drought. The villagers chose efforts that included tree planting, grazing bans, and soil and water conservation measures.

After five years, the village's restoration efforts were self-sustaining. Once-bare hillsides surrounding the village are now replanted with trees. The area supports nine to ten months of agricultural employment a year (compared with three to four months before the restoration project); extensive new irrigation supports more crop varieties; and the value of cultivated land has increased four-fold. The village has not needed trucked-in water in recent drought years. The Indo-German Watershed Development Program has funded more than 145 similar projects in 24 districts, successfully mobilizing villagers to restore their watersheds.

Encroaching desert in Western China

Minqin County in Western China historically served as a natural barrier against the dryness of the Tengger and Badain Jaran deserts. In the 1950s, Chairman Mao implemented a national plan to boost food production entailing cultivation, deforestation, irrigation, and reclamation. The long-term consequences on other ecosystem services such as water regulation from forests and natural water supply were devastating. The Minqin oasis has been slowly swallowed by deserts.

The nearby Hongyashan reservoir has also dried up, and groundwater is expected to run out in 17 years. This overexploitation of groundwater, along with the insufficient re-supplying of surface water, has led to water quality problems, making the majority of water in Minqin undrinkable. The Chinese government has spent nearly US$9 billion fighting the desertification in Minqin by replanting forests, reestablishing desert vegetation, removing dams, and enforcing logging and grazing bans. The government is also funding the relocation of area residents; in Northern Minqin, entire villages have been abandoned. It is too early to tell if the restoration projects will have the intended effects. Such desertification, the degradation of dryland ecosystems from overexploitation and land mismanagement, is a risk to an estimated 2 billion people globally – one third of Earth's population. If the problem continues unchecked, the next decade could see 50 million people forced to leave their homes.

Table 1.2 Ecosystem Services: Global Status and Trends

Ecosystem Service Type	Degraded	Mixed	Enhanced
Provisioning – the goods or products obtained from ecosystems	Capture fisheries Wild foods Wood fuel Genetic resources Biochemicals Freshwater	Timber Fiber	Crops Livestock Aquaculture
Regulating – the benefits obtained from an ecosystem's control of natural processes	Air quality regulation Regional and local climate regulation Erosion regulation Water purification Pest regulation Pollination Natural hazard regulation	Water regulation (for example, flood protection) Disease regulation	Carbon sequestration
Cultural – the nonmaterial benefits people obtain from ecosystem services	Spiritual and religious values Aesthetic values	Recreation and ecotourism	

Source: Adapted from MA 2005a.

ENTRY POINTS FOR MAINSTREAMING ECOSYSTEM SERVICES

Given that development goals depend on ecosystem services and that many of these services are in decline, decision makers need to deliberately take into account the connections between development and ecosystems. Entry points for incorporating an Ecosystem Services Approach into existing decision-making processes occur at all levels of governance and are important for both development officials and those approaching problems from an environmental perspective. Many entry points are at the national or provincial level. Some, such as the Millennium Development Goals, or international trade and investment, are at the global level but usually have their more detailed counterparts at the national or local level.

Project decisions are likely to be informed by broad national policy and international commitments, although specific permitting decisions are often made at the sub-national, watershed, or local level. Opportunities for mainstreaming ecosystem services can be categorized into four intersecting entry points:

National and sub-national policies: The preparation of national and sub-national trade, economic growth, or immigration policies provides important entry points for managing the cumulative demand and impacts on ecosystem services from individual or multiple sectors. Ministries of the environment, treasury, development and planning, among others, may play a role.

Economic and fiscal incentives: Fiscal measures such as subsidies, taxes, and pricing influence decisions throughout the economy, from firms and farms to factories and households. They can be designed to create incentives to sustain and efficiently use ecosystem services, as well as to create disincentives for activities that drive ecosystem degradation.

Sector policies: Ministries of commerce and industry, science and technology, agriculture and forestry, among others can play an effective role in advancing policies and actions that sustain ecosystem services. Environment agencies can work with other government agencies and departments to develop information, tools, and analyses that help make the connection between ecosystem services and the attainment of sector goals.
Governance: Strong governance is at the heart of sustaining ecosystem services. This includes public participation in decisions that affect or depend on ecosystem services, a free press, and requirements to provide information, including regular indicators of ecosystem health, to the public. All branches of government also have a role in providing oversight. Such mechanisms enable citizens to hold governments and business accountable for their use and management of ecosystems.

MORE ABOUT THIS GUIDE

This guide is one of several publications by the World Resources Institute focused on mainstreaming ecosystem services in public and private decisions. It introduces an Ecosystem Services Approach aimed at helping policymakers at all levels and sectors use the concept of ecosystem services in making decisions. Accordingly, while it introduces methods to incorporate the concept of ecosystem services into different types of decision-making, it stops short of providing detailed methodological guidance on how to assess the conditions and trends of ecosystem services.

A methods manual under development by the United Nations Environment Programme-World Conservation Monitoring Centre will provide more detailed technical guidance for scientists who conduct ecosystem assessments. WRI also has a separate guide on how to integrate an Ecosystem Services Approach in business decision making.

Ecosystem service-based decision-making tools are still at an early stage of development, and the examples of their application in actual decision making are limited. This guide attempts to circumvent this limitation by drawing on both real and fictional case studies to illustrate its points. It is a first take on practical steps to incorporate consideration of nature's benefits into development decisions and will need updating as more research and experience become available. That said, while research is still emerging on how changes to ecosystems alter their capacity to provide services, enough is known for decision makers to start incorporating ecosystem services into their goals and strategies. Such action will support both robust and sustainable development decisions and healthy ecosystems.

One of the innovative approaches of the guide is its **detailed examination of the ecosystem and development links in the fictional city of "Rio Grande."** Below is the final report card for the city's handling of ecosystem services at a time when leaders were facing a proposed biofuel refinery that could negatively affect freshwater, fisheries, tourism and more.

Table 3.4 Rio Grande: Ecosystem Service Dependencies, Trends, and Impact of Drivers

Report Card: The State of Ecosystem Services in Rio Grande

Ecosystem Service	How much does Rio Grande depend on the service?	Recent trend in service	Strength of impact of driver
Food - crops	High - supplied by farms in watershed and imports; agriculture important to economy	↑	High - land use change (forest conversion to agriculture) High - external inputs (fertilizers, pesticides)
Food - capture fisheries	Medium - supports local fishing population and provides fresh fish to community	↓	High - harvest and resource consumption from international trawlers High - external inputs (fertilizers, pesticides)
Fiber – energy (biofuel)	Low - will change if biofuel plant built	→	Low - technology adaptation and use
Fresh water quantity	High - demand from agriculture and growing city (quantity increasing because of rainfall but timing issue and quality degraded)	↓	High - land use change (wetland conversion to agriculture) High - external inputs (fertilizers, pesticides)
Water regulation	High - Rio Grande vulnerable to floods; precipitation increasing	↓	High - land use change (forest and wetland conversion to agriculture)
Water purification & waste treatment	High – Rio Grande's water treatment plant has limited capacity to address increases in sediments and pollution	↓	High - land use change (wetland conversion to agriculture)
Climate regulation	High – Agriculture dependent on stable climate and expanding coastal community vulnerable to storms	↓	Medium - land use change (forest conversion to agriculture) Low - climate change
Soil erosion regulation	High – waterway vulnerable to siltation	→	High - land use change (forest conversion to agriculture)
Pest regulation	High - monocultures increased vulnerability to pests	→	High - land use change (forest conversion to agriculture) Low climate change
Pollination	Medium - most crops requiring pollination, but pollinators can be introduced	→	High - land use change (forest conversion to agriculture)
Natural Hazard regulation	High – increase in coastal community population; climate change	↓	High - land use change (wetland conversion to houses and commercial property)
Recreation & ecotourism	Medium – tourism and recreation increasing in coastal area and forests	↑	High - land use change (forest conversion to agriculture)

Key:
- **Dependence** – Low, Medium, High denotes the relevance of service to Rio Grande.
- **Recent trend** – arrow denotes whether service has increased ↑, stayed the same → or decreased ↓ in the recent past.
- **Drivers** – Low, Medium, High denotes drivers impact in the recent past.

A PDF of *Ecosystem Services* can be downloaded from WRI's web site at:
www.wri.org

Requests for more information can be handled through WRI's media office:
Nate Kommers, media officer, +1(202) 729-7736, nkommers@wri.org
Paul Mackie, director of media relations, +1(202) 729-7684, pmackie@wri.org