

2. *How have ecosystems changed and what are the health implications?*

The structure and functioning of the world's ecosystems changed more rapidly in the second half of the twentieth century than over any comparable period in human history. Humans are fundamentally, and to a significant extent irreversibly, changing the diversity of life on Earth and most of these changes represent a loss of biodiversity. Most changes to ecosystems have been made to meet a dramatic growth in the demand for food, water, timber, fibre and fuel.

- More land was converted to cropland in the 30 years after 1950 than in the 150 years between 1700 and 1850 (C26). Cultivated systems - areas where at least 30% of the landscape is in croplands, shifting cultivation, confined livestock production or freshwater aquaculture - now cover one quarter of Earth's terrestrial surface.
- Roughly 20% of the world's coral reefs were lost and an additional 20% degraded in the last several decades of the twentieth century (C19).
- The amount of water impounded behind dams has quadrupled since 1960; reservoirs now hold three to six times as much water as natural rivers. Water withdrawals from rivers and lakes have doubled since 1960. Most water use (70% worldwide) is for agriculture.
- Since 1960, flows of reactive (biologically available) nitrogen in terrestrial ecosystems have doubled and flows of phosphorus have tripled.
- Since 1750, the atmospheric concentration of carbon dioxide has increased by about 32% (from about 280 ppm to 376 ppm in 2003).

In the aggregate, and for most countries, changes made to the world's ecosystems in recent decades have provided substantial benefits (C5). Many of the most significant changes to ecosystems have been essential to meet growing needs for food and water. These have helped to reduce the proportion of malnourished people and improve human health. However, these gains have been achieved at growing costs in the form of the degradation of many ecosystem services; increased risks of large, non-linear changes in ecosystems; exacerbation of poverty for some; and growing inequities and disparities across groups of people.



Human well-being is affected by changes in the composition, functioning and flow of ecosystem services. Management of an ecosystem to achieve a particular goal (such as food, timber production or flood control) generally results in changes to other ecosystem services. These changes are not always taken into account in planning, but they sometimes have significant impacts on human health.

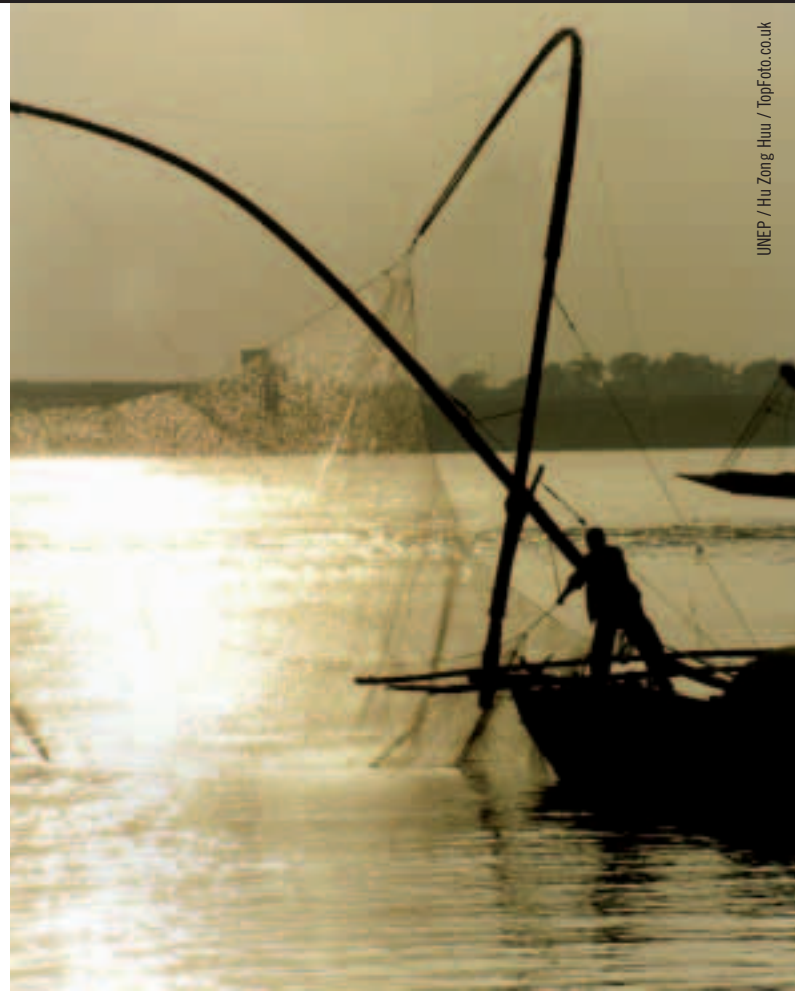
Poor populations are more vulnerable to adverse health effects from both local and global environmental changes. Richer populations exert disproportionate pressure on global ecosystems but are less vulnerable (R16). At present, major inequalities exist in access to ecosystem services. The status, or state, of these services is interlinked strongly with other components and determinants of poverty such as income, health and security. At the local level, poverty and the lack of access to clean, sustainable and efficient means for extracting ecosystem services can lead to local environmental degradation, with associated health risks. Also, poorer populations often live in environments that are more prone to infectious and other diseases, and have fewer resources for prevention and treatment. Richer populations have reduced health vulnerability to ecosystem degradation, partly because they are able to import resources from, and displace health risks to, other locations.

Many of the people and places affected adversely by ecosystem changes and declining ecosystem services are highly vulnerable and ill-equipped to cope with further losses (C6). Human alterations of ecosystems and their services shape the threats to which people and places are exposed and their vulnerability to those

threats. The same alterations of environment can have very different consequences, with reference to the differential vulnerability of the dependent social and ecological systems. For example, disease emergence and re-emergence due to altered ecosystems can occur in both rich and poor countries, and on any continent. Nonetheless, people in the tropics are more likely to be affected in the future due to their greater exposure to such diseases and the greater scarcity of resources to cope with such ecosystem alterations and disease outbreaks in such regions (R16). Highly vulnerable groups include those whose needs for ecosystem services already exceed the supply, such as people lacking adequate safe water supplies or living in areas with declining agricultural production (including a number of regions in Africa).

Vulnerability has increased as a result of the growth of populations in living ecosystems that are at greater risk from extreme weather or natural disasters, e.g. populations in low-lying coastal areas at risk of flooding, and populations in dryland ecosystems at risk of drought. Partly as a result of this, the number of natural disaster victims requiring international assistance has quadrupled over the past four decades. Finally, vulnerability is increased if either social or ecological resilience is diminished, e.g. through the loss of drought-resistant crop varieties; loss of farming expertise; or loss of institutional capacity to provide environmental management and health services that help protect local populations.

Historically, poor people disproportionately have lost access to ecosystem services as demand from wealthier populations has grown (C6, R19). Coastal habitats that primarily supported the food and livelihood needs of local populations often are converted to intensive aquaculture ponds or sites where species such as shrimp and salmon are cultured primarily for export markets. While some coastal residents may gain employment and income from these enterprises, others may lose access to cheap protein or alternative sources of livelihoods. Many areas where overfishing is a concern also are low-income, food-deficit countries. For example, many west-African countries support large distant water fleets that catch significant quantities of fish. Most of these fish are exported or shipped directly to Europe, yielding little direct benefit to the nutritional needs of local populations.



UNEP / Hu Zong-Huu / TopFoto.co.uk

In poor countries (excluding China), per capita fish consumption declined between 1985 and 1997 (C18). In some areas fish prices for consumers have increased faster than the cost of living. Fish products are traded heavily (approximately 50% of fish exports are from poor countries) and exports from poor countries and the southern hemisphere presently offset much of the shortfall in European, North American and east-Asian markets.

The regions facing the greatest challenges in achieving the MDGs also tend to be the regions facing the most serious problems in the ecologically sustainable supply of ecosystem services (R19.ES). Many of these regions include large areas of drylands, in which a combination of demographic growth and land degradation is increasing human vulnerability to both economic and environmental change. In the last 20 years, these regions have experienced some of the highest rates of forest and land degradation in the world.

Over 1 billion people survive on incomes of less than US\$ 1 per day, mostly in rural areas where they are highly dependent on agriculture, grazing and hunting for subsistence (R19). Although the wealthy are relatively well-buffered from changes in some ecosystem services, their mismanagement or overuse of those same services directly threatens the survival of poor people. Ecosystem conditions have a relatively direct and clear influence on human well-being in poor countries, as shown by the strong relationship between well-being indicators such as the infant mortality rate and ecosystem type in regions such as sub-Saharan Africa and Asia. In contrast, in high-income societies, for instance OECD countries, there is relatively little difference in infant mortality rates across populations living in a wide range of ecosystems (C6).

Diminished human well-being tends to increase immediate dependence on ecosystem services, and the resultant additional pressure can damage further the capacity of ecosystems to deliver essential services (SG2). As human well-being declines, there is a corresponding decline in the options available for people to regulate their use of natural resources at sustainable levels. This increases pressure on ecosystem services and can create a downward spiral of increasing poverty and further degradation of these services.

Within and between countries, poverty is a consistent underlying determinant of undernutrition and of diseases caused by lack of access to safe water, improved sanitation and other public services (R16). Over 90% of the world's undernourished population lives in poor countries (C8). South Asia and sub-Saharan Africa, the regions with the largest numbers of undernourished people, also are the regions where per capita food production has lagged the most.

Poverty and hunger have tended to force rural people onto marginal drought-prone lands with poor soil fertility; others have been forced to move to urban slums (R16). About 1 billion people are affected by land degradation caused by soil erosion, waterlogging or increased salinity of irrigated land. Erosion has caused a substantial reduction in crop yields in Africa.

In Africa, Asia and Latin America, 25–50% of the population lives in informal or illegal settlements around urban centres with few or no public services and no effective regulation of pollution or ecosystem degradation (C7). In many countries, local or regional authorities provide water and sanitation services only if proof of landownership is provided. Other problems exist in the provision of water and sanitation services to urban slums and peri-urban settlements. These include: the distance of such settlements from existing water and sewage networks; the cost of developing necessary infrastructure; rapid growth of such settlements, their irregular development; and the limited ability of many households to pay connection charges or monthly fees – unless the service is subsidized by the state.



Rapid, uncontrolled urban growth in Africa, Latin America and Asia has contributed to ecosystem degradation and increased pollution, with consequent health impacts.