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The problem

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The need to protect and maintain the natural environment is frequently pitted against development objectives as if the two were fundamentally incompatible. Nothing could be farther from the truth. Environmental sustainability, including the conservation of biodiversity, underpins human well-being. It is essential to the achievement of the other Millennium Development Goals and must therefore be integrated into development strategies across all sectors. But the Task Force on Environmental Sustainability maintains equally firmly that environmental strategies must be guided by the public and private human benefits derived from a healthy and functioning environment and that this is particularly salient for people living in poverty. Conservation strategies that pay insufficient attention to the immediate needs of people are doomed to fail, as are development strategies that fail to take into account the social and human costs of environmental degradation.

Achieving environmental sustainability therefore requires carefully balancing human needs with maintaining functioning ecosystems and curbing the pollution of water and air. At times, human well-being and environmental concerns are perfectly aligned, giving rise to win-win opportunities. More often, however tradeoffs will need to be carefully managed. This report provides practical guidance on how to design strategies to maintain an appropriate balance between conservation and resource use as a means toward environmentally sustainable development.

The task force proposes concrete measures to build development strategies on the foundation of environmental sustainability. Part 1 describes the unprecedented environmental change witnessed over the past decade, diagnoses the root causes of environmental degradation, and identifies the obstacles to achieving environmental sustainability. Building on this analysis, Part 2 lays out practical approaches to strengthen the management of the environment, integrate the principles of environmental sustainability into development strategies, and address the indirect drivers of environmental change.

Call for operationalizing environmental sustainability

The pursuit of environmental sustainability is an essential part of the global effort to reduce poverty. This was confirmed at the turn of the millennium in two important declarations. In September 2000, world leaders agreed to the Millennium Development Goals at the United Nations Millennium Summit. Highlighting the stark choices facing humanity at the dawn of the twenty-first century, the eight Goals and their 18 associated targets focus efforts of the world community on eradicating poverty in all its forms by achieving concrete and measurable objectives by the year 2015, thereby moving the world toward greater equity and sustainability (see the Goals on pages xvi–xvii). This global framework for action articulates a vision of shared responsibility between rich and poor countries to meet time-bound, quantified objectives. Among these objectives is to ensure environmental sustainability in development planning and implementation, formally stated in Millennium Development Goal 7.

At the 2002 World Summit on Sustainable Development, world leaders adopted the Johannesburg Declaration on Sustainable Development and Plan of Implementation. This declaration assumed “a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development—economic development, social development and environmental protection—at the local, national, regional and global levels.”¹ Leaders also formally recognized that poverty eradication, changing consumption and production patterns, and protecting and managing the natural resource base for economic and social development are three overarching objectives for sustainable development and essential requirements of it. This report emphasizes that meeting the last two objectives are fundamental requirements for meeting the first: eradicating poverty over the long term.

This report translates the call for environmental sustainability in Goal 7 into actionable recommendations for changes in policies, management strategies,

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and market dynamics that must be implemented at the local, national, regional and international levels. It focuses on priority interventions needed to meet the Goals. The task force recognizes that its recommendations, while general in nature, must necessarily be tailored by the implementing agencies to the context of each country and its unique environmental challenges. In developing these recommendations, the task force has drawn extensively on the work of the Millennium Ecosystem Assessment² and the Intergovernmental Panel on Climate Change, as well as the knowledge and experience of experts around the world.

Environmental sustainability can be defined as meeting human needs without undermining the capacity of the environment to provide for those needs and support life over the long term. However, this concept is difficult to operationalize for many reasons. Primary among them is the absence of specific national and international outcome targets. The Johannesburg Declaration on Sustainable Development and Plan of Implementation stated that “to reverse the current trend in natural resource degradation as soon as possible, it is necessary to implement strategies which should include targets adopted at the national and, where appropriate, regional levels to protect ecosystems and to achieve integrated management of land, water, and living resources, while strengthening regional, national, and local capacities.”

The Johannesburg Plan of Action and the most up-to-date decisions under some of the major international environmental conventions set targets such as the significant reduction of the rate of loss of biodiversity by 2010 under the Johannesburg Plan of Action, specific targets in the Plant Conservation Strategy of the Convention on Biological Diversity, and the adoption of strategies for integrated water resources management by 2005. While important, such agreements lack specific quantitative outcome targets, making it impossible to track progress and evaluate implementation success. This limitation, in turn, hinders learning, ongoing improvement of environmental strategies and plans, and justification of substantial investments in environmental management.

Millennium Development Goal 7 contrasts sharply with other Goals that set concrete benchmarks to be achieved by 2015. For example, Goal 4 has a clear target: reduce child mortality by two-thirds between 1990 and 2015. With the help of epidemiology, medical science, and decades of experience in providing specific medical interventions, each country can develop the range of necessary interventions, means for their implementation, and the interim milestones to reach the goal by 2015, barring major cataclysms, such as the earthquake and tsunamis of December 2004, which claimed the lives of so many children. Indeed, best practices are well documented and available to guide national policymakers.

Operationalizing environmental sustainability is more complex. Variability of species, ecosystems, and physical processes over time and space renders “the environment” a major management challenge. Moreover, environmental and

Environmental degradation is linked to poverty, hunger, gender inequality, and poor health

social objectives imply many tradeoffs. For example, establishing a protected area to conserve biodiversity often creates conflict with local residents, who use nearby resources to earn their livelihood. Similarly, reconciling competing demands on scarce environmental resources with the need to protect vital ecosystems is an ongoing challenge. Finally, arbitrating the interests of present and future generations—the objective of sustainability—is no easy task.

To move beyond such debates and obstacles, this task force offers the following implications of Millennium Development Goal 7 and its associated target 9: Environmental degradation is a major development issue that is inextricably and causally linked to the problems of poverty, hunger, gender inequality, and health, among others. A healthy, functional natural environment—a sustainable environment—provides many of the necessary conditions for achieving the Goals and in some cases is the foundation for reaching them. Traditionally, however, many national governments have assigned environmental concerns a low priority; the environment has often taken a backseat to seemingly more urgent problems of transportation and energy, for example.

It thus becomes fundamental to integrate the principles and practices of environmental sustainability into country policies and planning programs. Since environmental sustainability extends beyond local land-use practices to global consumption and production patterns, responsibility for working toward it must be shared. It is imperative that middle-income and wealthy nations, as well as poor ones, work together to make significant changes to national, regional, and global systems and institutions related to natural resource management, waste management, and biodiversity protection. These measures, among others, are necessary to achieve and sustain a healthy environment, thereby improving the health and well-being of all people.

Fundamental to environmental sustainability is management of the supply of those resources and waste sinks (Pearce and Barbier 2000). Thus, all countries must work toward environmental sustainability by identifying concrete and quantifiable objectives and implementing the process targets of the many existing multilateral and regional environmental agreements. This chapter makes the case for doing so.

Environment and human well-being

For too many of the world's people, environmental degradation eclipses the hopes of meeting even the most basic human needs. In developing countries, one person in five lacks access to safe water, 1.0 billion people live in drylands damaged by soil degradation, and 1.2 billion live on less than \$1 a day. All face the effects of a degraded natural environment.

The environment comprises a diversity of ecosystems—from forests, grasslands, and agroecosystems to freshwater systems and coral reefs. Each provides a suite of provisioning (goods), regulating, cultural, and supporting services—all of which contribute to human health, well-being, and livelihood

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(Balvanera and Prabhu 2004; Millennium Ecosystem Assessment 2003). Ecosystems and the services they deliver may have economic value because people derive utility from their actual or potential use, either directly or indirectly (Balmford and others 2002; Costanza and others 1997). Despite its importance to a country's natural wealth, the value of ecosystem services is not captured in national accounts because such services are usually considered public goods (box 1.1).

The world's poor depend disproportionately on ecosystem services, and are highly vulnerable to their disruption (DFID and others 2002). With few alternative income sources, their survival and livelihoods are based on small-scale agriculture, grazing, harvesting, and hunting or fishing. Without adequate infrastructure to provide safe drinking water, electricity and fuel, and transportation, people rely on fresh air, natural sources of fresh water, soil, and biodiversity to meet their basic needs.

About 1.3 billion people live on marginal lands (UNDP 2003a); these people are both the victims and the agents of environmental damage (Duraiappah 1998). Yet the role of sustainable resource management and environmental protection for poverty reduction is understated in most countries' poverty reduction and development aid strategies (Bojö and others 2004).

Links to other Millennium Development Goals

Environmental sustainability is inextricably linked to the other Millennium Development Goals (table 1.1). Thus, environmental degradation can have serious repercussions for achieving other Goals and targets. Advances toward one may accelerate progress toward another. Conversely, lack of progress on one may impede movement toward another. In other cases, progress toward one may hinder another.

For example, the pollution and overappropriation of surface water and groundwater resulting from intensified agricultural production can prevent access to clean drinking water, thereby harming human health. Similarly, interventions to meet poverty reduction and food security targets might adversely affect the environment, and hence achieving target 9 (figure 1.1). In still other cases, synergies may be realized where a single intervention or package of interventions creates movement toward several goals more cost-effectively than if applied in a single sector. Clearly, any intervention in one sector must be evaluated for potential synergies or effects, both positive and negative, on another. Of course, tradeoffs and compromises will be required; at the same time, concerted efforts must be made to mitigate the adverse effects of advancing toward one goal at the expense of another.

To illustrate the extent of the environment's importance in achieving the other Goals, the task force devotes the remainder of this chapter to examining in depth the links between the environment and poverty, food security, and health.

Box 1.1
Accounting for
environmental
degradation and
resource depletion

The environment supplies goods and services that support life and human economic activity. Yet traditional national accounts fail to include measures of resource depletion and the costs of environmental degradation. The stock of natural capital includes renewable and nonrenewable resources—forests, mineral deposits, soil nutrients, and energy resources; these constitute a major part of the total wealth of all countries and are particularly important components in many developing economies. When countries “spend” this natural capital by extracting and selling it, they effectively convert natural assets into financial ones—a net zero change in wealth. Standard accounting measures fail to capture the effects of resource depletion, instead counting revenues from the sale of natural resources as earned income.

Accounting for natural resource depletion is conceptually and empirically difficult, but estimates of savings rates can be adjusted to include basic indicators, including energy and mineral depletion and deforestation. As there is no readily accepted, practical method for correcting measured national saving rates for resource depletion effects, this task force presents the World Bank’s preliminary attempt at adjusting savings rates for environmental degradation (World Bank 2004a), augmented by an estimate of the economic cost of soil degradation. The results suggest that gross national savings rates greatly overstate increases in the total stock of capital (see table).

Adjusted savings rates, by developing region

Percent of gross national income, 1980–2001

Region	Gross national savings	Adjusted gross savings
East Asia and the Pacific	35	29
Latin America and the Caribbean	19	16
Middle East and North Africa	24	9
South Asia	20	19
Tropical Sub-Saharan Africa	11	3 (1 ^a)

Note: Adjusted net savings equals net national savings plus education expenditure minus net deforestation and energy and mineral depletion.

a. Nutrient depletion indicators and fertilizer prices were used to calculate soil depletion at around 2 percent of GDP, which would reduce adjusted gross savings to 1.5 percent and adjusted net savings to 1 percent.

Source: Sachs and others 2004.

In the World Bank’s corrected savings measures (Hamilton and Clemens 1999; World Bank 2004a), the savings rate taken from the national accounts is augmented by expenditure on education (counted as consumption in the national accounts, but should be counted as investment in human capital), and then reduced according to estimates of the economic costs of deforestation and energy and mineral depletion. Sachs and others (2004) then make an additional correction for tropical Sub-Saharan Africa by measuring the estimated annual loss of three soil macronutrients—nitrogen, phosphorus, and potassium—currently being depleted with each harvest.

The results are dramatic. Whereas Africa’s measured national savings rate is about 11.1 percent of GNI, the savings rate net of resource depletion might be only about 1.0 percent of GNI. Whatever the precise number, the conclusion is that Africa and other developing regions experience significantly reduced savings rates as a result of environmental degradation.

Table 1.1
Key links between environmental sustainability and other Goals

Source: DFID and others 2002; UNDP 2002.

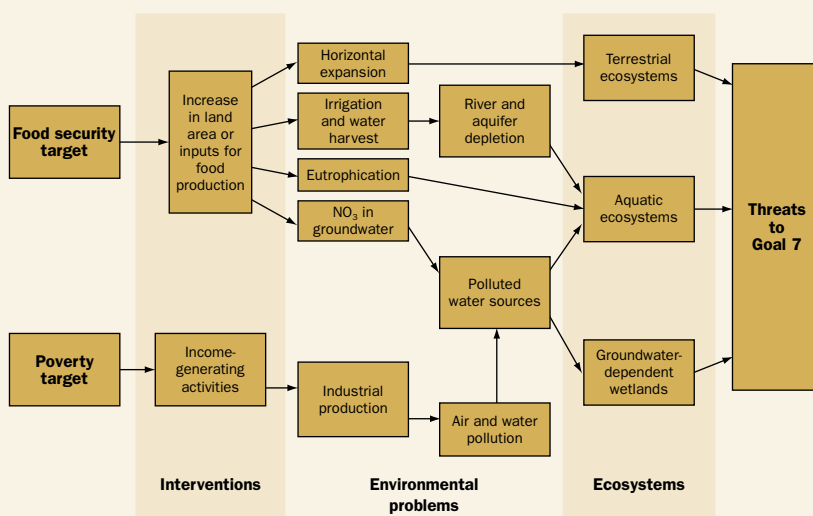
Millennium Development Goal	Examples of links to the environment
1. Eradicate extreme poverty and hunger	<ul style="list-style-type: none"> • Livelihood strategies and food security of the poor often depend directly on functioning ecosystems and the diversity of goods and ecological services they provide. • Insecure rights of the poor to environmental resources, as well as inadequate access to environmental information, markets, and decisionmaking, limit their capacity to protect the environment and improve their livelihoods and well-being.
2. Achieve universal primary education	<ul style="list-style-type: none"> • Time children, especially girls, spend collecting water and fuelwood can reduce study time.
3. Promote gender equality and empower women	<ul style="list-style-type: none"> • Time women spend collecting water and fuelwood reduces their opportunity for income-generating activities. • Women's often unequal rights and insecure access to land and other natural resources limit opportunities for accessing other productive assets.
4. Reduce child mortality	<ul style="list-style-type: none"> • Water and sanitation-related diseases and acute respiratory infections, primarily caused by indoor air pollution, are leading causes of mortality in children under age five.
5. Improve maternal health	<ul style="list-style-type: none"> • Indoor air pollution and carrying heavy loads during late stages of pregnancy put women's health at risk before childbirth.
6. Combat major diseases	<ul style="list-style-type: none"> • Environmental risk factors account for up to one-fifth of the total burden of disease in developing countries. • Preventive environmental health measures are as important, and at times more cost-effective, than health treatment.
8. Develop a global partnership for development	<ul style="list-style-type: none"> • Since rich countries consume far more environmental resources and produce more waste than poor countries, many environmental problems (such as climate change, loss of species diversity, and management of global fisheries) must be solved through a global partnership of developed and developing countries.

Environment and poverty

While consumption patterns of the rich drive overexploitation of natural resources, poor families, in their daily struggle for survival, often lack the resources required to avoid degrading their local environment. Their fragile resources, often poorly defined property rights, and limited access to credit and insurance markets prevent the poor from investing in sustainable environmental management. With few alternative sources of income, they rely extensively on natural resources and ecosystem services to supply such basic human needs as food, fuel, and drinking water. However, overextraction of resources disrupts the environment, causing many to lose access to the ecosystem services on which their survival depends. And when countries draw down natural capital without compensating increases in human, social, financial, or

Figure 1.1**Potential environmental consequences of food security and poverty alleviation strategies**

Source: M. Falkenmark, personal communication, 2003.



physical capital, they become poorer. Environmental degradation and resource consumption substantially lower national savings rates if incorporated into national accounts (see box 1.1).

Environmental sustainability must be viewed not only as an issue for the poor. In fact, considerable evidence suggests that the greatest threats to environmental sustainability derive from actions taken in the rich countries of the world. The Johannesburg Declaration on Sustainable Development and Plan of Implementation notes that “fundamental changes in the way societies produce and consume are indispensable for achieving global sustainable development” and calls on developed countries to take the lead in “changing unsustainable consumption and production patterns.”³

Deforestation, for example, is only partly caused by local demand for agricultural land or construction materials. It is even more fundamentally driven by the industrialized world’s demand for timber and growing international trade in forest products. Fisheries, mineral deposits, energy supplies, and biodiversity resources are harvested in developed and developing countries alike; however, the preferences and demands of the world’s richest countries largely determine the scale and intensity of resource exploitation. Increasingly, governments recognize the often disastrous human consequences of wanton resource exploitation (box 1.2).

Similarly, greenhouse gas emissions in the world’s developed countries have largely driven global climate change, which threatens human well-being, ecosystems, and biodiversity. Although developed countries represent only 20 percent of the world’s population, they have generated 80 percent of historical greenhouse gas emissions (Watson 2004). If developed countries do not reduce emissions and economic growth in developing countries generates equivalent per capita quantities of greenhouse gases, climate change will

Box 1.2
Shared
responsibility for
natural disasters:
Philippines
example

Source: United Nations
 Statistics Division 2004.

In the Philippines, forest cover shrank 3 percent between 1990 and 2000, from 22.4 to 19.4 percent of land area. As in other countries, loss of forest cover, fueled by widespread legal and illegal logging, has impaired the natural functions of safeguarding watersheds and regulating river flows.

In late 2004, a series of typhoons battered the island of Luzon, triggering severe landslides and floods that killed more than 1,000 people. Deforestation, which had sharply eroded the soil's absorptive capacity, contributed to the scale of the disaster. It was reported that the Government of the Philippines blamed illegal logging for the disastrous scale of the damage (*New York Times*, Dec. 5, 2004); however, both legal and illegal logging practices bear responsibility for the environmental changes that have increased vulnerability to natural disasters.

accelerate, jeopardizing human well-being, biodiversity, and environmental sustainability.

Reducing poverty and achieving environmental sustainability, then, require charting a new path for development between the extremes of resource degradation on the one hand and unsustainable production and consumption on the other. Doing so will require a clear, ambitious set of objectives and strategies and creative, forward-thinking leadership in each nation. The rest of this report provides a foundation for achieving environmental sustainability, and with it the rest of the Millennium Development Goals.

Environment and food security

Food security is integrally linked to environmental sustainability, as all food ultimately derives from ecosystem services. More than 2 billion poor people rely directly on agriculture for subsistence and commercial food production. The ecosystem services critical for production include provision of freshwater for crop irrigation; maintenance of soil fertility through nutrient cycling; provision of crop genetic diversity, crop pollinators, pest control, and climate regulation; and provision of wild collected foods (such as bush meat, fruits, and fish). In West Africa, bush meat is the main source of animal protein; while coastal, pond, and lake fisheries provide the main protein source for people in Southeast Asia and other regions (Millennium Ecosystem Assessment 2004a, ch. 8). Currently, 30 million low-income people—a doubling over the past 30 years—earn their livelihoods primarily from fishing. Consequently, land degradation and depletion of fisheries seriously affect food security (Burke and others 2000; Roberts and others 2002).

Environmental degradation and biodiversity loss are urgent, fundamental problems that threaten the achievement of Goal 1. Where people lack access to modern agricultural technologies, the condition of the local ecosystem determines agricultural productivity and food supply. Thus, sustainable management of terrestrial and marine ecosystems is a prerequisite to global food

In developing countries, major environmental risks account for 18 percent of the disease burden

security. Over the past century, 75 percent of crop genetic diversity has been lost, leaving crops and varieties vulnerable to emerging and spreading disease, pests, and changing environmental conditions (especially those related to climate change). Land degradation continues as a result of inappropriate, intensive agricultural techniques and land conversion related to agricultural extensification. Inappropriate intensification causes salinization of irrigated areas, nutrient and pesticide leaching, and pesticide resistance, while extensification destroys natural vegetation cover and leads to soil erosion and loss of soil fertility, increased withdrawals of groundwater and surface water, and increased agrochemical load (Wood, Sebastian, and Scherr 2000). Unsustainable fish catch and pollution of coastal and marine ecosystems have caused precipitous declines in fish stocks (Pauly and others 2002). These forms of environmental degradation decrease food availability, sometimes irreversibly, complicating efforts to fight hunger.

Environment and health

Environmental degradation adversely affects human health through exposure to bacteria, parasites, and disease vectors (such as mosquitoes and snails); chemical agents (such as heavy metals, particulates, or pesticides in water, food, air, and soil); and physical and safety hazards (such as fire, radiation, and natural disasters) (Bojö and others 2001). However, the world's people are not equally affected. In developing countries, major environmental risks account for 18 percent of the disease burden, about twice the proportion in industrialized countries (Lvovsky 2001). The most vulnerable region is Sub-Saharan Africa, where fully 27 percent of the disease burden is attributed to environmental risks.

Pollution and contamination of air and water are major sources of human illness. Diarrhea, strongly linked to unsafe water and inadequate sanitation, is the leading killer of children under five. At present, 2.2 million people die each year from water contaminated by human feces (UN Millennium Project 2005a; WHO and UNICEF 2000). In most developing countries 90–95 percent of all sewage and 70 percent of industrial waste are dumped untreated into surface water (UNFPA 2001). Heavy metals, such as mercury, have accumulated in many of the world's fisheries, rendering fish stocks unsafe for human consumption. Persistent organic pollutants accumulate in the fats and tissues of animals in the food chain, posing further risks to human health.

Acute and chronic respiratory infections are related to ambient air conditions influenced by the incidence of wildfires, vehicle pollution, and industrial discharge. Indoor air pollution from the use of biomass fuels in poorly ventilated houses has been linked to 1.6 million deaths worldwide (Warwick and Doig 2004).

Many of today's emerging or resurgent diseases, such as malaria, dengue, and mosquito-borne encephalitis, are on the rise because of human disruption

of natural ecosystems. Environmental change is cited as one of the six major factors leading to the emergence or resurgence of many of these diseases (Patz and Wolfe 2002; Cohen 2000). Forest clearance, drainage of wetlands, international movement of livestock, illegal wildlife trade, human encroachment on wild areas, human travel, and climatic events can facilitate disease transmission (Daszak, Cunningham, and Hyatt 2000; Patz and others 2004; Harvell and others 1999; Millennium Ecosystem Assessment 2004a, ch. 14) (box 1.3). Insofar as these activities involve environmentally unsustainable practices, better land-conservation measures can reduce the global burden of infectious disease, thereby reducing childhood mortality, malaria, and other diseases and directly benefiting Goals 4 and 6.

There are tradeoffs between the risk of infectious disease and development projects that damage habitat or ecosystems that may be preventing epidemics of infectious disease. To the extent that the risk mechanisms are understood, the potential for preventing or reducing the risk of certain diseases can be achieved through incorporating sustainable conservation measures into

Box 1.3
Protecting natural habitats can alter the risk of infectious disease

Source: Millennium Ecosystem Assessment 2004a.

A range of biological mechanisms are responsible for altering the incidence of infectious disease. Key examples of this disease-ecosystem relationship are described here:

- Dams and irrigation canals provide ideal habitat for snails, the intermediate reservoir host species for schistosomiasis; irrigated rice fields enlarge the extent of mosquito breeding surface, increasing transmission of mosquito-borne malaria, lymphatic filariasis, Japanese encephalitis, and Rift Valley fever.
- Deforestation increases the risk of malaria in Africa and South America, while its effect in Southeast Asia is uncertain.
- Natural systems with preserved structure and characteristics are not receptive to introduction of invasive human and animal pathogens brought by human migration and settlement (this is the case for cholera, kala-azar, and schistosomiasis).
- Uncontrolled urbanization in the forest ecosystem is associated with mosquito-borne viruses (arboviruses) in the Amazon and lymphatic filariasis in Africa. Tropical urban areas with poor shelter and lacking closed-pipe sanitation promote transmission of dengue fever.
- Habitat fragmentation, with subsequent biodiversity loss, increases the prevalence in ticks of the bacteria that causes Lyme disease in North America.
- Zoonotic pathogens (defined by their natural life cycle in animals) are a significant cause of both historical infectious diseases (such as HIV and tuberculosis) and newly emerging ones (such as SARS, West Nile virus, and Hendra virus); in addition, zoonotic pathogens can result in high fatality rates and are difficult to vaccinate against since the primary reservoir hosts are nonhuman (for example, Nipah virus).
- Intensive livestock agriculture, treated with subtherapeutic doses of antibiotics, can lead to the emergence of antibiotic-resistant strains of *Salmonella*, *Campylobacter*, and *E. coli* bacteria; overcrowded and mixed livestock practices and bushmeat trade have facilitated interspecies host transfer of disease agents, leading to dangerous novel pathogens, such as SARS and new strains of avian influenza.

development plans; therein lies the potential to achieve a double benefit of sustainable human health and environment.

Finally, the world's stock of biodiversity and genetic resources has proven critical in the fight against illness and disease; however, anthropogenic environmental change has threatened these priceless and irretrievable resources. In most developing countries, up to 80 percent of medicines are derived from medicinal plants (Balick, Elisabetsky, and Laird 1996). The growing body of literature on the ethnopharmacopeia of certain regions or societies is further evidence of the importance of biodiversity to human health.

Other links

To reiterate, environmental sustainability is linked in important ways to all of the other Millennium Development Goals (see table 1.1). As the context for all human behavior, the environment influences educational opportunity, gender disparity, water quality and sanitation, as well as the interests of urban slum dwellers and small island and landlocked developing states. Chapter 2 discusses the state of six key elements of the environment that are critical for achieving the Goals.