Determining the Impact of Human Activity

More people are using more resources with more intensity than at any point in human history. Fresh water, cropland, forests, fisheries and biodiversity all show signs of stress at local, regional and global levels. Increasing pressure on the environment is the result of, on one hand, increasing affluence—that is, more consumption, pollution and waste, and on the other persistent poverty—that is, lack of resources and the technology to use them, and lack of the power to change these circumstances.

Growing human numbers play a role in both scenarios. Global use of fuel-wood, for example, has doubled over the past 50 years; the Worldwatch Institute attributes this increase largely to population growth. But the six-fold increase in the use of paper since 1950 is ascribed mainly to rising affluence, and the multiple uses for paper products in an increasingly urban environment.

Population size, growth, distribution and movement help determine the relationship between people and their environments. Similar numbers of people can have very different impacts on the environment, depending on for example social institutions, means of production, property rules and forms of governance. Access to education, health and economic opportunity; consumption levels; and gender differentials (the "quality of human capital") all have an influence.

The most basic determinant of impact is scale. Thirty years ago Paul Ehrlich and J. Holdren described this relationship in the now-famous equation: I = PAT, meaning that people's impact on their environment (I) is a product of population size (P), affluence (A, representing output per capita or the level of consumption) and technology (T, representing the per unit output or efficiency in production).

This equation has been often used but also often criticized or elaborated. The main shortcoming is that the factors in the relationship are not independent, but are related in complex ways. Nonetheless, the approach has been useful in demonstrating that population dynamics are central to environmental change.

For example, since 1970 global carbon dioxide emissions per capita have been relatively constant, while GDP per capita has increased in both more developed and less developed regions. This means that improvements in technology have offset the effects of increased consumption. Whether carbon dioxide emissions continue to increase in step with population size will depend on economic and social trends, the institutional response to environmental problems and the pace of technological change.

Poverty and the Environment
Despite soaring global wealth, now estimated at $24 trillion annually, some 1.2 billion people across the world live on less than $1 a day—a condition classified as "extreme poverty" and characterized by hunger, illiteracy, vulnerability, sickness and premature death. Half the world lives on $2 a day or less.\(^2\)

More than a billion people cannot fulfil their basic needs for food, water, sanitation, health care, housing and education. Nearly 60 per cent of the 4.4 billion people living in developing countries lack basic sanitation, almost one third do not have access to clean water supplies, one quarter lack adequate housing, 20 per cent do not have access to modern health services, and 20 per cent of children do not attend school through grade five. Worldwide, 1.1 billion people are malnourished, unable to meet minimum standards for dietary energy; and protein and micronutrient deficiencies are widespread.\(^8\) Nearly 2 billion people in developing countries are anaemic.\(^6\)

Ending poverty has been an international aim since 1960. After significant advances between 1970 and 1990, the rate of poverty reduction in the 1990s fell to only one third of the pace required to meet the United Nations' commitment to halve poverty levels by 2015.

Although affluence consumes energy and produces waste at far higher rates, the effects of poverty also destroy the environment. Global attention has consequently focused on the complex relationship between environmental degradation, poverty and sustainability. Understanding it may be key to ending poverty and closing the gap between more and less affluent, as well as meeting the objective of sustainable development.

**A Complex Interaction**

Population pressures are increasing in many poor and ecologically fragile zones in urban as well as rural areas. Fertility in many of these places is already high, and more people are being driven to them by a shortage of land for subsistence farming, by economic policies encouraging large holdings, intensive agriculture and cash crops, and by poverty and high population densities elsewhere.

For example, slash-and-burn agriculture and logging are expanding in and around Mexico’s Calakmul Biosphere Reserve on the Yucatan Peninsula, because of rapid in-migration and high fertility. Under unrelenting population pressure, subsistence farmers have stripped forest cover from the Garo Hills in north-east India. Growing poverty in coastal communities and rapid population growth in large towns along the coast of West Africa are similarly driving destruction of the mangrove swamps for firewood and dynamite fishing in nursery waters.

In these and many other examples, the poor are the most visible agents of destruction in degraded environments. Poor people depend heavily on natural resources for direct income and their poverty offers them few choices. In the case of Garo alternative land was not available; on the West African coast urban demand for fish and firewood offered a source of immediate income. Here and elsewhere, the poor stand at the end of a long chain of cause and effect. They are the messengers of unsustainability rather than its agents.

A breakdown of consumption patterns shows that the "ecological footprint" (see below) of the more affluent is far deeper than that of the poor, and in many cases exceeds the regenerative capacity of the earth.
In most instances it is the wealthier farmers who engage in large-scale clearing of vegetation, over-use of agricultural chemicals, over-use of groundwater resources for irrigation, over-use of pastoral land for grazing and over-exploitation of soils for export production. Distorted pricing structures perpetuate wasteful input use. In Gujarat in India, poor tribal farmers pay the full cost of pump irrigation provided through a non-governmental organization while the richer farmers receive subsidized water through state schemes.

Higher-income groups consume more energy and produce more waste than the poor, who must extract value from every scrap. Very low-income households in Pakistan spend one 30th as much on fuel as rich households, although they expend much more time and energy on gathering it.

Rural communities will continue to depend heavily on agriculture and natural resources for their livelihood. Environmental degradation will only deepen their poverty, so environmental conservation and poverty alleviation are parallel objectives. In most situations where they enjoy secure tenure, the poor will invest to protect their land and their environment.

Local control may be important: studies indicate that the condition of Nepal's forests has improved since management of forest resource was decentralized to communities. India's Joint Forest Management programme, which also devolves resource management to local people, has had similar environmental benefits in areas such as south-west Bengal. Local control may be more effective than government efforts in limiting illegal logging, fishing, water use and theft, but government participation can help offset the high cost and delayed benefits of investment in conservation.

Over the generations poor farmers have accumulated a vast amount of knowledge about sustainable environmental practices. Practices such as shifting cultivation sustained the poor for centuries, until populations grew too large or other factors intervened. Traditional practices may incorporate an understanding of local conditions not immediately evident to outside observers, however expert. In the mountainous areas of Sumatra, farmers rely on simple stone head-works to create irrigation systems along small streams. Although these structures seem leaky and inefficient, the leakage ensures an equitable distribution of water across the community.

When poor people move to new environments or when the balance of their old environment is altered, for example by rapidly rising populations, there may be a period of relearning in which a certain degree of degradation may occur. But imposing standardized technical solutions that ignore and wipe out indigenous knowledge may have a disastrous ecological impact.

**Box 11: Rural Migration**

Population growth is not necessarily detrimental to environmental sustainability but it does affect available choices and the prospects of any intervention. Although degradation invariably occurs initially as very low population densities increase, what follows depends on a confluence of factors. If investment needed to improve land is too expensive or the benefits too-long delayed, further degradation will almost certainly result as population rises. In other cases, where a higher population can result in a lower per capita charge for fixed investments (such as water harvesting technology), sustainability and productivity may actually improve in a supportive environment.
If developing countries with rapidly growing populations were encouraged and supported to adopt cleaner technologies, environmental degradation could be mitigated. At current levels of growth, Asia's greenhouse gas emissions are expected to triple in the next 20 years. Effective technology, if it were made affordable, could reduce the growth in emissions.

Globalization and Poverty

In the past 20 years, over 100 developing and transition countries have begun to undertake reform measures to improve the efficiency of their economies. These reform packages typically include fiscal discipline, lower budget deficits, reduced subsidies, tax restructuring, financial liberalization, market-determined interest rates, competitive and stable exchange rates, trade liberalization, encouragement of foreign direct investment, privatization of state enterprises, deregulation of protected industrial sectors and enhanced guarantees of property rights.

These reforms have been intended to increase countries' competitiveness in the global marketplace. International trade has increased dramatically during the period, though a small number of developing countries account for most of the increase outside of the more-advanced market economies. The desire to integrate into the global economy or to offset losses in financial crises has motivated many developing countries to increase their exploitation of natural resources.

Globalization has clearly increased overall prosperity and stimulated growth. It has also increased income inequality and environmental degradation. Although poverty has declined in percentage terms, the number of people living in poverty has steadily increased, and average incomes in many developing countries have remained low. At the same time, environmental degradation is worse than in any comparable period in human history. There is a clear link between environmental degradation and the rising inequality accompanying globalization—increasing poverty is causing many poor people to increase their pressure on fragile natural resources in order to survive.

Some critics\textsuperscript{10} have concluded that while globalization has led to significant economic reforms, policy makers have ignored the parallel social, environmental and institutional reforms required to prevent increases in inequality, poverty and environmental degradation.

Box 12: Kenyan District Adapts to Meet Population Challenge

Measuring Poverty's Dimensions

Traditionally, economists have defined poverty in terms of income, using either a relative standard such as the median income in a country, or an absolute standard such as the cost of a typical basket of goods and services.

More recent definitions also encompass measures of health, education, security, political voice and discrimination. The World Development Report 2000-2001\textsuperscript{11} measures poverty across three dimensions: opportunity, empowerment and security. The World Bank includes another dimension: capabilities.\textsuperscript{12}

These dimensions have multiple determinants, but environmental sustainability runs through each as a common thread.
Opportunity measures an individual's income, consumption and the level of inequality in a society. Opportunity may be enhanced by a stable economic environment, equitable asset distribution, and easy availability of infrastructure. Specific environmental interventions that improve opportunity include improving the productivity of land and fisheries, and environmentally sensitive pricing structures.

Empowerment measures an individual's participation in community decision-making. Empowerment is strengthened by decentralization, transparency and accountability in all aspects of governance, including the management of natural resources.

Security is a measure of an individual's protection against economic shocks and personal violence. Environment-focused interventions include disaster prediction and prevention mechanisms, and protection against the illegal exploitation of resources.

Capabilities are the substantive freedoms that allow a person to lead the kind of life he or she values. Reproductive health care, access to safe drinking water, better sanitation, reduction of indoor and urban air pollution, integrated programmes to combat vector-borne diseases, and other environment-focused interventions that reduce poverty are all relevant in this regard.

Each of these must be assessed not just in terms of national averages but also in terms of their equitable distribution. Women are often multiply disadvantaged.

Win-Win Solutions for Poverty and the Environment

There is increasing consensus that only an integrated approach to the problems of poverty and environmental degradation can result in sustainable development (see Chapter 6). The building blocks of a sustainable development strategy include:

- **Increasing the resource base of the poor**, through measures such as land ownership reform, participatory management of common resources, public investments in land conservation and the creation of employment opportunities.

- **Investing in alternative energy services and infrastructure**, such as sanitation, clean water, education, health care and other services.

- **Support to "green" technologies.**

- **Pricing policies** that do not encourage profligate use of resources such as electricity, water and fertilizer