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Global consumption of natural resources has reached unsustainable levels. Yet, a majority of the world's population remains impoverished and requires additional resources for future development. This article reviews recent trends in natural resource use and the associated environmental impacts in an international context, and contrasts resource use in the United States and India.

RESOURCE CONSUMPTION AND DEVELOPMENT

Consumption in the affluent Northern countries accounts for a vastly disproportionate share of world resources, and includes expenditures that may appear self-indulgent to Southern countries still struggling to meet basic needs. U.S. expenditures on lawn care or on video games, for example, are roughly comparable to the nation's total contribution to foreign development assistance. But, in recent decades natural resource use, together with its associated environmental impacts, has been growing more rapidly in developing countries than in the already industrialized nations.

Nonrenewable resources are, by definition, finite and hence will run out someday. However, physical shortages of most materials are not imminent. Reserves of major metals and fuels range from about 20 times larger than current annual production (for zinc, lead, and mercury) to well over 100 times larger (for iron, aluminum, and coal). As shortages become a threat, price increases often stimulate technological innovation which makes use of more abundant substitutes – as in the replacement of copper telephone wires with glass optical fibers. Recycling metals also reduces the demand for new resources. Yet, although global shortages are unlikely to check development in the early decades of the next century, current rates of use of most nonrenewable resources are not indefinitely sustainable.

Renewable resources are too often treated as free gifts of nature, but it is these very resources that are most in danger of severe degradation and depletion. Clean air is becoming an increasingly scarce resource for much of the world's urban population. More than one billion people lack access to clean water. More than 10 percent of the earth's fertile soil has been eroded or otherwise degraded; in Mexico and Central America, 25 percent of vegetated land has been degraded. Biodiversity is being lost at an alarming rate as tropical forests and other ecosystems are destroyed by development. The emerging shortages of renewable resources are concentrated especially, although not exclusively, in developing countries.

RESOURCES AND ENVIRONMENTAL DEGRADATION

The consumption of many types of resources gives rise to environmental degradation. Fossil fuel use results in: land degradation from coal mining, freshwater pollution from mine drainage and oil refinery operations, marine pollution from oil spills and tanker operations, and air pollution from all forms of combustion. Air pollution from fuel combustion has local effects on public health, regional impacts such as acid precipitation, and globally contributes to greenhouse gas emissions that may lead to climate change. Industrialized countries now account for just under half of all fossil fuel use, with about a quarter in developing countries (including China), and a quarter in the formerly planned economies of the ex-Soviet Union and Eastern Europe.

Metal mining degrades vast amounts of land: in 1991, more than one billion metric tons of copper ore were dug up worldwide to obtain 9 million tons of metal. Other effects include air pollution, leachings from mine tailings or abandoned mines, disposal of chemicals used in mining, and dispersion of toxic trace metals found in many ores.

Consumption of forest resources can lead to environmental problems as well as the loss of critical habitat and species. In many parts of Africa and Asia, fuelwood consumption exceeds forest growth, contributing to forest degradation. In principle, logging for timber can be sustainable, but often in practice it is not. Clearcutting in North America and similarly destructive practices in many tropical forests have contributed to habitat loss, soil erosion and watershed degradation. Commercial tree plantations – which are increasing in number – can supply wood on a sustainable basis and prevent erosion, but do not support the same level of biodiversity as natural forests.

There are 1.3 billion cattle in the world, and their numbers are growing much faster than the human population. More than half of the grain consumed in industrialized countries and in some developing countries is fed to livestock. In addition to the magnitude of grain consumption, problems associated with raising livestock include overgrazing of arid lands, and conversion of forest and other lands to pasture. On feedlots in industrialized countries, manure disposal and water pollution are also problems.

RESOURCE CONSUMPTION PATTERNS AND IMPLICATIONS: U.S.

The United States consumed 4.5 billion metric tons, or 18 tons per person, of natural resources in 1989. Construction materials and fuels accounted for more than 75 percent of the total, but significant amounts of many other materials were included as well. The intensity of resource consumption, either per capita or per dollar of GNP, is declining for some commodities but not all. Consumption of paper, plastics, and many chemical products is still growing rapidly.

U.S. per capita consumption of selected ores and basic materials ranges from 1.5 to 7 times the world average. Resources consumed in the U.S. are largely from domestic sources, with a few important exceptions (such as aluminum, petroleum, and iron). Thus, the local environmental impacts of U.S. resource use are felt primarily within the country. However, as the leading producer of greenhouse gas emissions, the U.S. also contributes to global warming. U.S. emissions of carbon dioxide (the most significant greenhouse gas), largely from fuel combustion,

are still growing, although not as fast as GNP. The U.S. has an obligation to the rest of the world to take a leadership role in seeking technologies and policies to protect the environment, and specifically to reduce and stabilize greenhouse gas emissions.

RESOURCE CONSUMPTION PATTERNS AND IMPLICATIONS: INDIA

In 1990, the wealthiest 1.5 percent of India's population had incomes equivalent, on a purchasing power parity basis, to (U.S.)\$6,200 per capita – well below the U.S. average income of \$19,300 per person for that year. At the same time, 59 percent of India's population (495 million people) had incomes equivalent to \$600 per person on average. Much of this group cannot rely on meeting basic needs for food, clothing and shelter; as such, they depend directly on the environment – particularly the common property resources of forest, ponds, and rivers – to meet many of their survival needs.

Not surprisingly, reported consumption by low-income groups is negligible for most goods other than basic food crops and clothing. On a per capita basis, the poorest half of Indians consume only 8 to 10 percent as much minerals and fuels as do the richest 10 percent. However, there are still important environmental impacts of resource use by the poor. Overuse of wells, ponds, and rivers for household water needs has contaminated water supplies; scavenging wood, crop residue, and animal dung for cooking fuel not only exposes households (particularly women and children) to risks of disease from burning these fuels, but also contributes to forest and soil degradation. Sanitation services are available to 37 percent of urban and 8 percent of rural India; improper disposal of human waste spreads pathogens via the air, water supplies, and direct contact. Thus, the poor are both agents and victims of environmental degradation.

The environmental consequences of resource consumption in India include not only growing industrial pollution, but also the resource degradation that results from poverty and population growth. Development and environmental goals are inextricably linked in countries such as India: development must alleviate poverty if renewable resources are to be preserved for current and future use.