

Can those concerned with the fate of the hungry and poor and with the fate of the Earth reconcile their differing interests? In the 20 years since the United Nations Conference on the Human Environment was held in Stockholm, three views have been widespread. Early on, environmental concerns were viewed as an imposition of the developed "North" on the undeveloped "South," asking sacrifices of developing countries that industrialized countries never made in the course of their own economic growth. Moreover, according to this view, if the fate of the Earth is in doubt, it is threatened far more by the insatiable resource depletion and pollution of the industrialized countries than by the modest per-capita consumption of developing countries. A second view conceded the long-term interest of poor people in maintaining their environmental resources but noted the pressures on poor people to exploit their meager resources excessively and thereby degrade them for future use. Still another, rapidly spreading view asserts that poor people and threatened environments are inextricably linked and that a common strategy to address their fates is both desired and needed. The 1992 United Nations Conference on Environment and Development (UNCED)

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in Rio de Janeiro this June is intended to provide such a common strategy.

This evolution from perceiving conflict between two great social concerns to recognizing their complementarity¹ mirrors a long-term trend to link global problems. This trend arises both from a genuine appreciation of the interaction and multiple causation that underlie great world problems and from the widespread desire to find common ground among all good causes. Thus, there has been a series of reports on issues of global concern published by commissions convened by eminent persons, from the Palme Report by the Independent Commission on Disarmament and Security Issues on the threat of war, to the Brandt Report by the Independent Commission on International Development Issues that linked peace and development, to the Brundtland Report by the World Commission on Environment and Development on conjoining peace, development, and environmental efforts.² From "space-ship Earth" to "our common future," the search for the links between great global problems is a tenet of globally oriented and socially concerned groups and individuals.

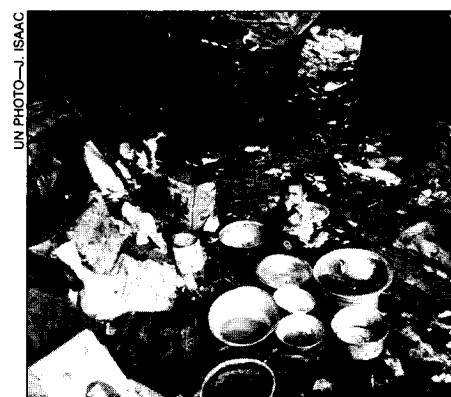
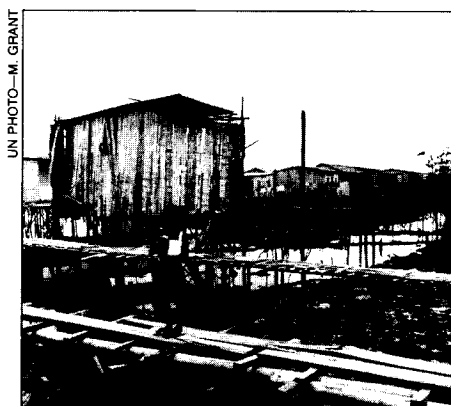
But if the people at the center of the political spectrum seek to link the fate of the hungry and poor with that of the environment, those on the left of the spectrum view conflict rather than complementarity as the central theme of analysis. The view that the poor and the hungry are relegated by the rich and the powerful to marginal lands that are degraded and cannot

sustain intensive use fits easily with theories of center-periphery conflict, rural exploitation, and underdevelopment. So, it is not surprising that a recent spate of reports, books, and collections of papers, spanning a broad spectrum of ideological perspectives and academic traditions, has found common cause between the fate of the Earth and that of the hungry and poor.³ The inclination to link these issues is not wrong, for in the rush to address the broad concerns of development and the environment, the fate of the hungry of the world could easily be ignored or forgotten.

At the same time, a review of the many pertinent reports and papers reveals how limited and selective is the literature that carefully documents the causal relationships between poverty and environmental degradation, while an implicit assumption of a strong relationship between the two is widely apparent. Thus, an assessment of what global overviews, country comparisons, and local and regional case studies exist that link poor people to threatened environments should provide insights into the validity of this assumption.⁴

Matching Poverty and Environment

How many poor and hungry people are there in the world? Which environments are most threatened? Does the geographical distribution of hungry and poor people match that of threatened environments? To answer such questions, analysts use "poverty lines" to separate the poor from the



less needy. But poverty lines are difficult to create, and there is a large amount of literature to guide their creation.⁵ To draw these lines, some use *absolute* measures of poverty, such as insufficient resources and income to provide minimal household necessities—mainly food in developing countries. Others use *relative* measures, which designate the poor as being at the lower end (for example, the lowest quintile) of a national or regional distribution of resources and income. Thus, it is not surprising that recent estimates of global poverty and hunger differ by as many as 750 million people (see Table 1 on page 6). Poverty estimates range from 630 million “extremely poor” people, through 780 million “poorest of the poor,” to 1,225 million people “living in absolute poverty.” Similarly, by one hunger measure, almost one-half billion people live without enough energy to maintain minimal activity and growth, while by another measure, more than a billion hungry and poor people have insufficient energy for work.

There also is little consistency in the way environments are classified. Climate, vegetative cover, resource use, and land forms, for example, are all freely mixed in discussions of global environmental problems and modified by terms such as fragile, vulnerable, and marginal.⁶ Here, however, threatened environments are defined as those areas currently undergoing extensive degradation or transformation that elicits widespread concerns; degraded environments are those areas in which the essential features of the environment are maintained but at very low levels of biological or resource productivity; and marginal environments are those areas that are unsuitable for some intended resource use. The literature indicates that the three major environments of global concern are the highlands, tropical and subtropical drylands, and rain forests. (Wetlands, especially coastal wetlands, in the developing world are also threatened, but they have been much less studied.⁷) Taken

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WHERE THE POOR LIVE

Are the Assumptions Correct?

By Robert W. Kates and Viola Haarmann

together, these three threatened environments occupy more than half of the world's land area and are home to one-quarter of its people.

Highlands occupy about 25 percent of the Earth's land area and contain about 10 percent of the world's population.⁸ They fringe the main mountain axes and the lower slopes of volcanic mountains. For the latter, in particular, which have very rich soils, population densities can be quite high. But in general, human populations are sparse in highland environments. These are "high-energy" environments because gravity can move large amounts of material downhill. Semi-arid and arid productive lands constitute about 22 percent of the Earth's land area and contain about 14 percent of its population. By one estimate, more than 60 percent of such land is desertified, or has lost at least 25 percent of its natural productivity.⁹ Other estimates of desertification are much lower, however.¹⁰ Tropical moist forests occupy about 8 percent of the world's land.¹¹ Half of

these forests are in Latin America, and the remainder are shared about equally between Africa, Asia, and the Pacific region. By one estimate, about 0.5 percent of this forest is being cleared annually, though some estimates of deforestation are up to three times larger.¹² Perhaps as many as 200 million people live in or near the tropical moist forests.¹³

There are no global data bases that allow one to test the widespread notion that impoverished people are concentrated in threatened environments. Ideally, one would want to compare the distribution of poor people against the distribution of threatened environments or of those parts of threatened environments that are already degraded. Estimates of the numbers of poor people are available only by country—and even then not for many countries—and not for regions within countries.¹⁴ Although maps and regional estimates of threatened environments exist, estimates of their areas differ greatly.¹⁵ Thus, attempts to test the hypothesis

that impoverished people are concentrated in threatened environments must rely on very rough estimates, often country-wide aggregates.

A noteworthy attempt to compare the distribution of poor people and "areas of high ecological vulnerability" was recently made by H. Jeffrey Leonard.¹⁶ As a surrogate for ecological vulnerability in rural areas, he used the International Food Policy Research Institute's (IFPRI) estimates of land of low agricultural potential¹⁷ and assumed that such land was arid, unfertile, or steep. As a surrogate for urban areas, Leonard used peri-urban squatter settlements, for which the classic cases (particularly in Latin America) are precariously perched on hillsides subject to landslides, flooding, and pollution. Combining those with the World Bank's estimates of poverty,¹⁸ he concluded that 57 percent of the rural poor live on lands of low agricultural potential and 76 percent of the urban poor live in squatter settlements.

Leonard's attempt to map the poor

TABLE 1
ESTIMATES OF POVERTY AND HUNGER

Region	POVERTY						HUNGER			
	Extremely poor ^a		Poorest of the poor ^b		Living in absolute poverty ^c		Energy deficient for maintenance ^d		Energy deficient for work ^e	
	Number of people (millions)	Percentage of total population	Number of people (millions)	Percentage of total population	Number of people (millions)	Percentage of total population	Number of people (millions)	Percentage of total population	Number of people (millions)	Percentage of total population
Asia					675	25				
South Asia	300	29	390	37			197	17	572	50
China	80	68	84	8			36	3	72	6
East Asia	40	4	33	7			37	9	70	14
Sub-Saharan Africa	120	30	156	30	325	62	141	26	239	44
Middle East and North Africa	40	21	39	15	75	28	12	5	31	10
Latin America	50	12	78	17	150	35	42	10	58	13
Total	630	14^f	780	17^f	1,225	23^f	477^g	9^g	1,053^g	20^g

^aThe extremely poor are people who fall below a poverty line of \$275 (purchasing power parity) per capita per year.

^bThe poorest of the poor are defined as the poorest 20 percent of the total population of all developing countries.

^cThe people estimated to be living in absolute poverty are based on the Worldwatch Institute's country estimates of absolute poverty and other social and economic indicators. Estimates should be viewed as midpoints in a range of plus or minus 10 percent.

^dUpdated to 1990 by the World Hunger Program, which used earlier food-energy estimates by the UN Food and Agriculture Organization that use a 1.2 times the basal metabolic rate for adults and adolescents (minimal activity) and a more generous requirement for children to determine food income or consumption adequacy. East Asian data include data for Southeast Asia.

^eUpdated to 1990 by the World Hunger Program, which used earlier World Bank food-energy estimates that use 90 percent of the estimated dietary requirement for active work as the level for food-income adequacy. East Asian data include data for Southeast Asia.

^fPercentage of world population for various years, including Europe, North America, and Australia.

^gThese numbers are global totals rather than column totals.

SOURCES: World Bank, *World Development Report 1990: Poverty—World Development Indicators* (New York: Oxford University Press, 1990), 29; H. J. Leonard, "Environment and the Poor: Development Strategies for a Common Agenda," in H. J. Leonard, ed., *Environment and the Poor: Development Strategies for a Common Agenda* (Washington, D.C.: Overseas Development Council, 1989), 18; A. B. Durning, *Poverty and the Environment: Reversing the Downward Spiral* (Washington, D.C.: Worldwatch Institute, 1989), 20.

onto threatened environments should be viewed as a restatement of a hypothesis rather than as an answer to the question of whether one can correlate poverty with threatened environments. Even if one accepts the crude and preliminary estimates of IFPRI, 43 percent of the rural poor live in areas of high agricultural potential. Moreover, it is not appropriate simply to equate land of low agricultural potential and squatter settlements with areas of high ecological vulnerability. In many parts of the world, land of low agricultural potential is little used, is appropriately used for pastoralism, or is forested. Although subject to erosion, desertification, and deforestation, these areas are not necessarily more vulnerable than are intensively used lands of high agricultural potential that are also subject to erosion, flooding, and, in the case of valuable irrigated lands, salinization and waterlogging. Similarly, although squatter settlements are crowded and have few or no urban services and amenities, their ecological setting may not be very dif-

ferent from that of the urban settlement they surround.

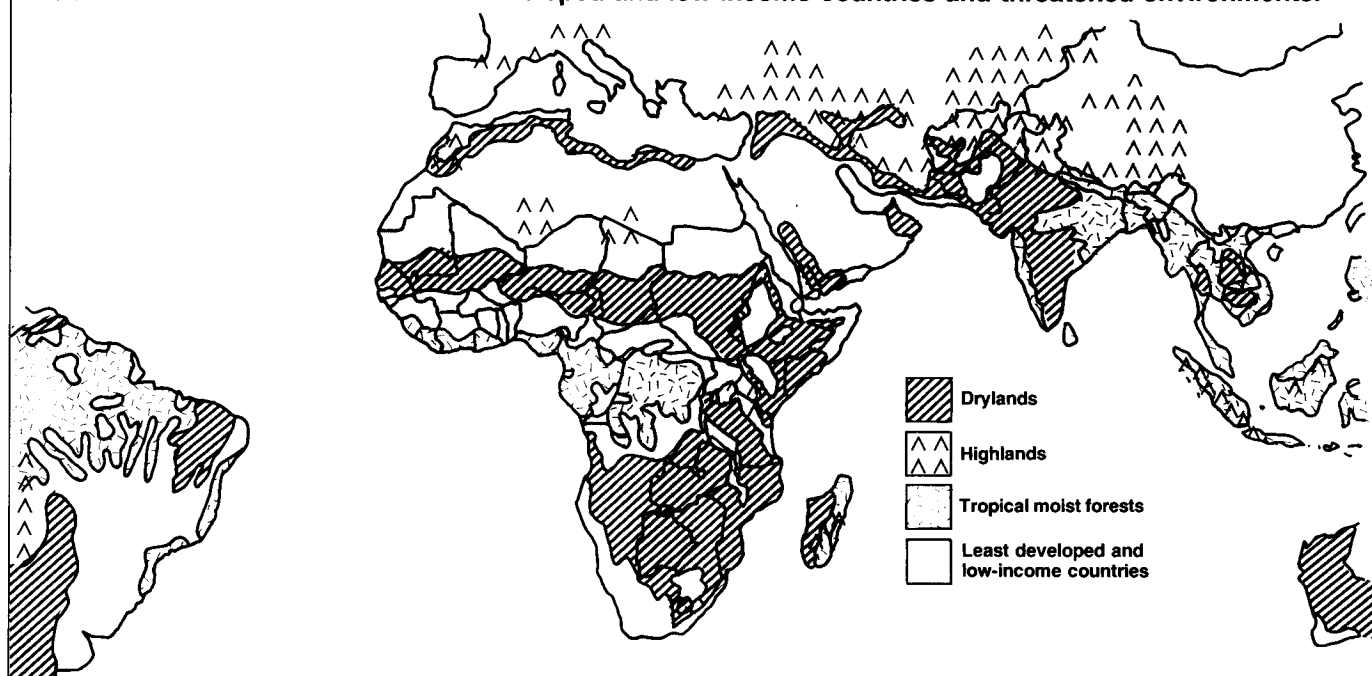
If it is difficult to match poor people against threatened environments, it is possible to match poor countries against them. Poor countries may be considered to be those included in the United Nations' aggregation of the 42 least developed nations and the World Bank's classification of 41 low-income economies whose annual per-capita income is less than \$500.¹⁹ There are many available statistics of land to determine the distribution of threatened environments.²⁰ For drylands, for example, one may use as an indicator the estimated areas of savannas and grasslands; for highlands, there are estimates of areas in steep slopes; and for rain forests, there are estimates of areas in tropical moist forests. From these sets of data (see the map in Figure 1 on this page, one can determine whether poor countries contain more than their share of threatened environments.

According to the data, the incidence of poverty and dryness correlate closely in developing countries,

with 78 percent of the savanna grasslands found in low-income countries that contain only about one-half of the total area of developing countries (see Table 2 on page 8). And these drylands are even more concentrated in the poorest, least developed countries; although these latter account for only 20 percent of developing country area, they contain 63 percent of the drylands. Highland areas with steep slopes, however, appear to be about equally distributed among poorer and wealthier developing countries, whereas tropical moist forests are somewhat concentrated in low-income countries (71 percent) but not in the least developed countries (16 percent).

Thus, low-income countries have more than their share of drylands and tropical moist forests, but not of highlands. Overall, the poorest countries are primarily dry. This is a modest conclusion at best because country-level comparisons, though suggestive, are too nonspecific to draw conclusions about the poverty, hunger, and environment nexus.

FIGURE 1. The distribution of least developed and low-income countries and threatened environments.



SOURCES: Environmental data are taken from *Alexander Weltatlas*, 3rd ed. (Stuttgart: Ernst Klett, 1979), 85. Country data are taken from United Nations Conference on Trade and Development, *The Least Developed Countries: 1990 Report* (New York: United Nations, 1990); and World Bank, *World Development Report 1991: The Challenge of Development—World Development Indicators* (New York: Oxford University Press, 1991).

TABLE 2
DRYLANDS, HIGHLANDS, AND TROPICAL MOIST FORESTS IN THE
LEAST DEVELOPED AND LOW-INCOME COUNTRIES

Area	(A) All developing countries (millions of square kilometers)	(B) Low-income countries (millions of square kilometers)	B/A (percent)	(C) Least developed countries (millions of square kilometers)	C/A (percent)
Total area	76.5	39.9	52	15.5	20
Drylands	2.7	2.1	78	1.7	63
Highlands	11.1	4.5	41	2.2	20
Tropical moist forests	3.1	2.2	71	0.5	16

SOURCE: World Resources Institute, *World Resources 1990-91* (New York: Oxford University Press, 1990), 286-87, 306-07; United Nations Conference on Trade and Development, *The Least Developed Countries: 1990 Report* (New York: United Nations, 1990); and World Bank, *World Development Report 1991: The Challenge of Development—World Development Indicators* (New York: Oxford University Press, 1991).

Local and Regional Studies

To help one examine the links between poverty, hunger, and the environment, there are some case studies in which the connections between the impoverishment of people and the degradation of the environment have been specified and placed in the context of actual livelihoods and particular places, but they are few and far between.²¹ A search of the literature, including the last 10 years of issues of 40 journals dealing with aspects of environment and development, yielded only 30 studies that described specific links, and these were primarily the work of anthropologists and geographers. All of these studies reported positive findings linking poverty to environmental degradation. The absence of negative findings can be viewed as evidence for a strong connection, for a bias in researchers' case study selection to those for which positive links are likely, or for a bias against publishing reports of negative findings.

More than half of the studies were from drylands, one-third were from tropical moist forests, and only four were from highland regions.²² The studies included areas within 25 countries, with one-third from Asia, one-fifth from Latin America and the Caribbean, and the remainder from Africa. Yet, with remarkable agreement irrespective of location, the case

studies tell repeatedly how poor people lose their entitlement to environmental resources, how those resources are further degraded, and how such loss and degradation lead to further impoverishment.

Entitlement may be defined as the access enjoyed by a household to needed environmental resources by virtue of the household's socially recognized rights.²³ Among the many socially recognized rights are ownership, tenancies of various forms, customary allocations, and various common property rights. The environmental resources are primarily land, water, natural vegetation, and wildlife. Stocks and flows of such resources are often complex, subtle, and seasonal and are not easily recognized by outside observers or land and water project managers. Poor people lose their entitlement to such resources by displacement, by division, and by degradation.

The poor are displaced by activities that, in the name of development or commercialization, deprive the hungry of their traditional entitlement to the common property resources that are essential to their survival. Large-scale agriculture, hydroelectric development, export forestry, tourism, and wildlife preservation dispossess poor people of their resource access directly by expropriation and by destroying or limiting access to small but crucial seasonal resources. The

poor are also displaced by wealthier claimants to land who use both legal and illegal means. Finally, the poor are displaced by each other because limited land and employment opportunities often force the young from poor families to migrate in search of land or employment.

The entitlements of the poor are divided and reduced because of their need to share resources with their children or to sell off portions of their resources to offset extreme losses, such as crop failure, illness, or death; to fulfill social requirements, such as marriage dowries; or to provide simple subsistence. Throughout the developing world, the number of landless and land-poor households is increasing.

The resources of the poor are degraded by excessive or inappropriate use, by failure to restore or to maintain protective works, and by the loss of productive capacity because of natural hazards.²⁴ Those who are poor in resources often press what little resources they do have to levels of production or reproduction—for example, by reducing fallow, overgrazing, or excessive fuelwood removal—that cannot be sustained. The degradation of many common property resources, however, occurs because of excessive use, not by the poorest users, but by the wealthier ones, who often have large herds of livestock, require large diversions of water, or use the forest commercially.

The poor also may lack the ability to restore or maintain protective works, such as terraces or drainage canals; the means to hire people with specialized skills or to make needed inputs; or the access to public programs of resource improvement and renewal. Of course, the poor are also responsible for some of the inappropriate uses that degrade the marginal lands that are the migration destinations for the displaced, dispossessed, and disinherited. Finally, natural hazards, such as diseases, droughts, floods, landslides, and pests, also degrade the environment, causing it to lose the capacity to provide particular resources.

Many studies report that these

processes occur at the same time or in serial fashion, producing a spiral of impoverishment and degradation.²⁵ Resources are reduced by processes of displacement, are increasingly shared by division, and are then subject to degradation through the excessive use of the remainder. Such a spiral is suggested by the multiple pathways of Figure 2 on this page. At the top of Figure 2 are four major driving forces in the destructive sequences of the poverty-environment degradation spiral. Two are driven by forces external to the case-study locales: natural hazards and development and commercialization. Two are internal to the communities studied: population growth and existing poverty. These latter two are linked by the strong correlation between household poverty and birth rates. To some extent, all the driving forces are implicated in the various directions that impoverishment-degradation spirals assume,²⁶ but three major spiral sequences (numbers 1, 2, and 3 in Figure 2) emerge from the case studies. In each spiral, two of the driving forces dominate.

In the first sequence, poor people driven by development activities or commercialization and by population growth are displaced from their resources by richer claimants or by the competition for existing land or employment. For the displaced, either division of the remaining resources or forced migration to other, usually more marginal areas generally ensues. In the second sequence, meager resources are further divided because of population growth and existing poverty. Resources are then degraded by excessive use of divided lands or by inappropriate use of environments unable to sustain the requisite resource use. And in the third sequence, even in the absence of further displacement and division, poverty creates poor households unable to maintain needed protective works or to restore resources, while natural hazards, such as disease, drought, flood, soil erosion, landslides, and pests, further degrade these natural resources.

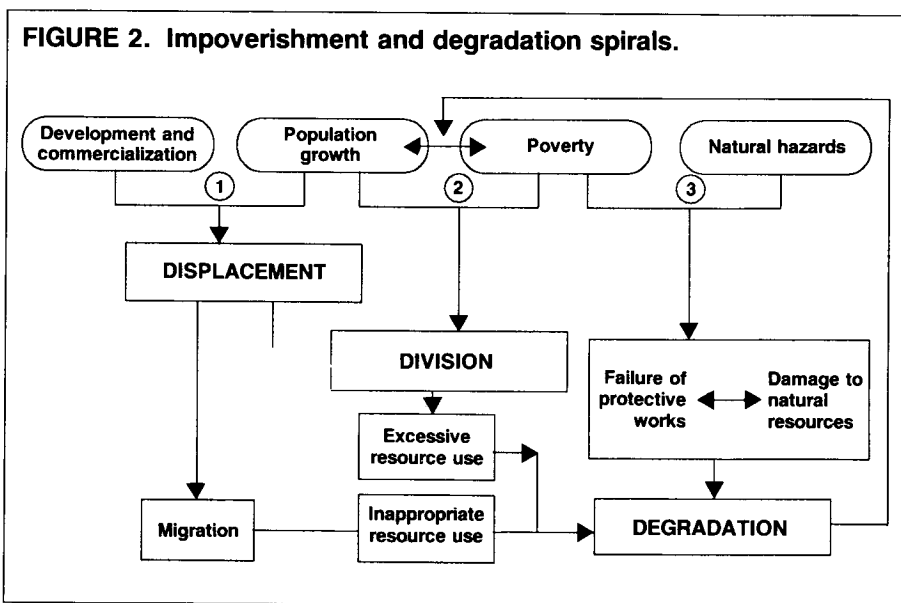
The case-study environments and localities differ in their particular combinations of displacement, division, and degradation; in the driving forces that set them in motion; in the ameliorative measures undertaken; and in their ecological and social contexts. Grouping these case studies according to the three categories of major threatened environments (drylands, highlands, and rain forests) helps to address some of these important differences. In each environment, two or three characteristic sequences of displacement, division, and degradation, creating spirals of impoverishment and degradation, are initiated by the driving forces of development, commercialization, population growth, poverty, and natural hazards.

The Dryland Cases

People's access to land and the availability of water determine the productive use of dryland. Rainfall patterns, infiltration rates, run-off, surface- and groundwater reserves, and their significant variability from year to year—all structure settlement, cultivation, and pastoralism. It follows that the severity of entitlement losses and displacement is directly linked to the loss of access to favora-

bly watered land and to resource reserves that serve to moderate the frequent ecological crises generated by natural events, particularly droughts. In this sense, dryland case studies tell of three major, typical sequences of displacement, division, and degradation:

- the sequence of people's displacement and subsequent disruption caused in long-standing livelihood structures through the introduction or encouragement of "development" activities in prime areas of water availability with subsequent loss of needed common property resources and environmental degradation in less suitable areas;²⁷
- the sequence of people's displacement—driven by population pressure or resource expropriation—from regions of higher agricultural potential because of limited opportunities for land or employment, leading to encroachment and expansion into areas of lower agricultural potential with subsequent excessive or inappropriate resource use;²⁸ and
- the sequence of degradation and displacement by extreme natural events, most often drought, leading to a dramatic reduction in resources from direct losses and from the disposal and sale of family holdings to compensate for such losses, and to



subsequent environmental degradation from excessive use and inability to restore or maintain the degraded resources.²⁹

Water supply is the key factor for the use of drylands, and the development of large-scale water projects often sets in motion the first sequence, especially when many people are affected by large dams of national significance on major rivers. Construction of high dams has long been a tempting undertaking for developing countries. These projects are envisaged as the mechanism to promote industrialization (with hydroelectric power) and agriculture (with irrigation) and ostensibly to create employment opportunities, increase food self-sufficiency, and strengthen foreign-exchange earnings. The result of such large-scale development projects is often that the original rural population is largely pushed away from the prime locations near the river, which are now organized into irrigation projects, and into more marginal, far less productive areas further inland. The limited capacity of these lower-productivity habitats to sustain increased populations results in increased environmental pressure, declines in primary productivity of natural resources, and increasing poverty for the populations forced to rely on them for survival (see the box on this page).

Other case studies tell of livelihood disruption through development and the alienation of water as a common property resource. Examples from India and Kenya show that attempts to secure alternative income sources can lead to serious water access problems. Thus, the development of a small-scale leather cottage industry in parts of dryland India has caused an alarming decline in water quality and crop yields that is endangering food security.³⁰ In dry parts of eastern Kenya, riverbed sand mining for urban construction by Nairobi entrepreneurs has reduced the land's water retention capacity, lowered the water table, and blocked access to sufficient dry-season water supplies.³¹

THE JEBEL AL-AWLIYA DAM ALONG THE WHITE NILE

The completion in 1937 of the Jebel al-Awliya Dam and Reservoir on the White Nile just south of Khartoum in the Republic of Sudan and the establishment of commercial irrigated agriculture on the riverine clay plains introduced into the area a high level of resource competition. In the interest of export crop production, particularly cotton production, large numbers of White Nile Arabs and their animals were displaced to the drier dune areas west of the river, and their access to prime cultivation and pasture land was critically reduced.

The annual migration cycle between the riverine clay plains in the winter dry season and the sandy uplands in the summer rainy season, which balanced the use of resources based on surface water and soil moisture availability, was broken. The dry-season decreases in surface water and pasture in the sandy uplands could no longer be compensated for by free movement to the riverine clay plains, where the retreating flood waters of the White Nile offered fresh pastures and good land for sup-

plementary grain cultivation. Instead, people and livestock are now concentrated in the narrow transitional zone between the two main environmental zones because of both the water scarcity in the dune area and the seasonal employment opportunities available in the irrigation projects on the nearby clay plains. Consequently, social and environmental pressures have been created in the areas adjacent to the riverine commercial agricultural belt that degrade the reduced resources available to the rural population and thereby depress the levels of sustenance and force people to make up the deficit by seeking low-paid jobs. The need for other jobs, however, conflicts with the labor requirements of their own cultivation and herding activities. The result is further environmental decline and impoverishment.

SOURCE: Summarized from M. M. Horowitz and M. Salem-Murdock, "The Political Economy of Desertification in White Nile Province, Sudan," in P. D. Little and M. M. Horowitz, eds., *Lands at Risk in the Third World: Local-Level Perspectives* (Boulder, Colo.: Westview Press, 1987), 95-114.

In all marginal environments, common property resources (that is, non-privatized access to vegetation and water resources under a well-established system of local administrative rules and regulations) constitute a significant proportion of the total land resources on which the rural poor, in particular, depend and reduce the inequality in private property resources. Common property resources allow land- and resource-poor populations to supplement their livelihood with extractive activities, such as water collection, grazing, collecting natural products, and tree harvesting, and thus create stabilized livelihood opportunities. Development in these areas, however well intentioned, often works to the disadvantage of those who depend most on these resources (see the box on page 11).

In the second sequence, the main story is one of competition among different livelihood systems in transi-

tional zones between greater and lesser environmental advantage. Typical examples come from Kenya, with its gradually declining land and water resource potential from the primarily agricultural highlands to the primarily pastoral lowlands.³² In Kenya, the large populations in the limited areas of high agricultural potential are forcing more and more people to move onto the drier lowlands, where they settle near dependable water sources (perennial streams and swamps) and attempt to farm land that is often best suited for pastoralism. Thus, the displaced, in turn, partly displace the local pastoralists from access to the water sources and dry-season pastures. This increasing agropastoral competition for land and water has caused resource overuse, degradation, and economic decline, particularly among the pastoralists, and marginal subsistence among the agriculturalists.

In the third sequence, the spiral of

THE COMMON PROPERTY RESOURCES OF THE DRYLANDS IN INDIA

In the drylands of India, village pastures, community forests, wastelands, common threshing grounds, waste-dumping sites, watershed drainages, village ponds, tanks, rivers, and riverbeds all constitute commonly shared resources on which the livelihood of poor rural households depends. A survey of dry regions encompassing 82 villages in 21 districts of 7 states from Rajasthan in the north to Tamil Nadu in the south revealed that, although even today up to 28 percent of all village areas are comprised of common property resources, declines in such areas since 1950 have ranged from no less than 26 percent to more than 60 percent. At the same time, the intensity of use of common property resources by the rural poor—for example, through the collection of food items, fuel, and fodder, as well as the grazing of animals—remained extremely high. No less than 69 percent and up to 100 percent of small farm households (those with less than 2 hectares of land) depend on these resources for

survival.

In the last few decades, common property resources have been privatized through the reallocation of usage and property rights in the name of land reform as part of a strategy to improve the livelihood situation of the rural poor. The negative result, however, was the loss of the collective entitlement to use those resources, while up to 59 percent of the newly privatized lands were eventually sold, often to wealthy farmers, because of a lack of other necessary resources—such as skilled labor and efficient equipment or the cash to obtain them—that would have allowed the poor owners to develop, cultivate, and maintain the land productively. Now, the few remaining common property resources must be shared by more people, exacerbating degradation and impoverishment.

SOURCE: Summarized from N. S. Jodha, "Common Property Resources and Rural Poor in Dry Regions of India," *Economic and Political Weekly* 21, no. 27 (1986):1169-81.

displacement and degradation is turned around. In the arid reaches of the Sahel beyond the agronomic dry boundary or in the arid north of Kenya, drought, desertification, and the loss of crops and animals force cultivators and pastoralists to migrate south or cluster around water sources, thus increasing population pressure, displacement, division, and degradation in less marginal areas.³³

The Highland Cases

The salient environmental feature of the productive use of highlands is the vertical, complementary organization in both the physical processes and the livelihood systems operating in the different altitudinal zones. Threatened areas within highland environments are those with reasonable agricultural potential where high population densities result in tough competition over the limited amounts of arable land. Consequently, farmers' landholdings become increasingly

smaller, and there is a trend to use more marginal fringes (steeper slopes) of the environment that are poorly suited for sustained use. This trend exacerbates the problems of deforestation and soil erosion on a broad front. As in the drylands, case studies of highlands reveal three major sequences of displacement, division, and degradation:

- the sequence of population growth in regions with limited arable land leading to division of land into smaller and smaller units, extension of grazing and agriculture onto the steep slopes and forested uplands, and an inability to hire or provide the labor needed to maintain and preserve a productive resource use;³⁴

- the sequence of expropriation of desirable highlands for commercial development with subsequent concentration of populations on smaller areas or displacement into less productive, marginal areas and excessive or inappropriate use;³⁵ and

- the sequence of degradation and displacement by natural hazards—such as soil erosion, landslides, and flooding—which, because of a lack of restorative efforts, lead to further degradation and excessive use.³⁶

In Nepal, Peru, and Kenya,³⁷ small-holder hill farmers have to engage in a multiplicity of activities, away from as well as on the farm, to maintain the minimum levels of income necessary to meet short-term needs and to minimize the risk from failure of any one activity. They lack both the funds and the labor necessary to undertake intensive slope, soil, and vegetation conservation practices and to secure alternative sources of food, fodder, fertilizer, and fuel in response to environmental signs of degradation. Thus, deforestation causes not only erosion and soil loss but also the decreased availability of composted forest products and manure.

Soil loss and erosion result in reduced availability of plant nutrients and a subsequent decline in crop yields. The ability to "transfer fertility" from the forest to arable land is lost, and the potentially complementary functions of these altitudinal zones are disrupted. Instead, a downward spiral of increasing decline is set in motion. Nepal is a particularly striking example in this respect (see the top box on page 25).

The Rain Forest Cases

Significantly, almost all of the world's tropical moist forests are in the developing countries . . . [and these] tropical moist forests are especially prone to certain management problems, owing to their unique ecology. They are usually situated on agriculturally marginal soils, [and] they have more limited potential for recovery following disturbance than most other forest types.³⁸

At the same time, however, tropical moist forests have become prime targets for vast development projects, both commercial and on the level of small-holder farming resettlements. Two major sequences of displacement,

(continued on page 25)

Where the Poor Live

(continued from page 11)

division, and degradation stand out in this environment:

- the sequence of displacement of indigenous hunter-gatherers or poor farmers or collectors by commercial activities, leading to destruction of the forest and subsequent degradation and inability to sustain the requisite resource use;³⁹ and
- the sequence of displacement by spontaneous or planned immigrants because of limited opportunities for land or employment, driven by population pressure or resource expropriation, leading in turn to displacement of indigenous hunter-gatherers or poor farmers and resulting in destruction of the forest and subsequent degradation.⁴⁰

In tropical moist forests, the huge expansion of such commercial land uses as logging, ranching, and mechanized cultivation projects and industrial competition for the very resources that sustain traditional extractive agroecosystems cause the problem. In such forests, where the vegetation locks in soil nutrients—the major production potential—access to particular vegetative formations, through a multitude of extractable products such as fruits, fibers, and wood, provides a sizeable supplement to the inhabitants' subsistence. Thus, in Brazil, traditional populations' access to successional palm forests is threatened by large commercial enterprises (see the bottom box on this page).

State-sponsored development, like the Tucurui Dam and Reservoir in Amazonia, also displaces people.⁴¹ At the same time, the magnitude of these projects has enormous environmental effects, through the decomposition of thousands of square miles of flooded rain forest or riverine galleria forest or through large earth movements and land leveling for irrigation projects, which severely damage vulnerable soil structures and result in erosion and loss of natural fertility.

Linking the Fates

How justified is the link between poor people and threatened environments? On one hand, no available data base exists to match poor people with threatened environments. The data permit matching only poor countries (not numbers of people) with environments and yield, at best,

some broad generalizations. Clearly, poverty is not evenly distributed in the world. The familiar North-South distinction is really a latitudinal distinction between temperate lands and the tropics and semitropics, where most of the world's poor reside (see the box on page 26). The environments of the poorest countries are excessively dry, and poorer countries

POPULATION CONCENTRATION IN THE HIGHLANDS OF NEPAL

In the central belt of hills between the high Himalayas and the Ganges plain in Nepal, rural population densities on the limited areas of arable land reach 1,500 inhabitants and more per square kilometer. Cultivation in this belt takes place on irrigated (for rice, wheat, and potatoes) and rain-fed (for maize and millet) terraces. Only the steepest slopes and ridgetops remain unterraced, but they are used for pasture. The development of level but well-drained land in the form of terraces and the availability of natural fertilizers in the form of composted forest products and manure from forest-fed (with forest litter, tree cuttings, and grass) cattle are essential for this type of farming.

The need for farmland, firewood,

and animal fodder has contributed to the massive clearing and reduction of the forest cover. The subsequent problems of erosion and diminishing forest resources with the corresponding losses of organic and mineral soil nutrients on the terraces lead to lower crop yields and higher levels of mutually reinforcing degradation and poverty. Poor hill farmers do not have access to the amounts of labor and cash necessary to rebuild terraces or replant trees. At the same time, their low incomes do not allow them to compensate for their land's decreasing output by purchasing alternative fertilizer, fodder, fuel, and grain.

SOURCE: Summarized from P. Blaikie and H. Brookfield, eds., *Land Degradation and Society* (London: Methuen, 1987).

THE SUCCESSIONAL PALM FORESTS OF BRAZIL

In Maranhão State in Brazil, 85 percent of the rural population in the transition zone between the humid forests of the Amazon basin and the drier vegetational formations of the northeast is virtually landless (less than 1 hectare of land per household in shifting cultivation annually). For such people, resource extraction from the surrounding secondary forest cover is the main source of income. The extractable products from these successional (secondary) *babassu* (*Orbignya phalerata*) palm forests, such as thatch, fiber, construction materials, charcoal, animal feed, and palmito, represent significant household inputs and sources of cash with which the poor, landless rural majority supplements its income from small-scale shifting cultivation and low-paid jobs.

The expansion of commercial land

uses, such as ranching, mechanized cultivation, and industrial use of *babassu* fruits, together with the concentration of large land holdings in the hands of a minority of agricultural enterprises (43 percent of the land was concentrated in estates of more than 1,000 hectares each in 1980), has diminished freedom of access by the rural poor to palm groves and also has reduced the number and size of groves. The elimination of these successional resources degrades the environment and exacerbates poverty by depriving people of a substantial portion of their income and providing no viable replacement resources.

SOURCE: Summarized from S. B. Hecht, A. B. Anderson, and P. May, "The Subsidy from Nature: Shifting Cultivation, Successional Palm Forests, and Rural Development," *Human Organization* 47, no. 1 (1988):25-35.

are both dry and wet. Hills, however, are seemingly shared among both poor and wealthy nations.

If the global overviews are at best suggestive, the case studies are more informative, albeit selective. The universality of the driving forces of development, commercialization, population growth, poverty, and natural

hazards and the repetitive sequences of displacement, division, and degradation, which are all found in widely varying places and environments, are convincing. Some large, even if unknown, fraction of the world's hungry and poor is trapped in a spiral of impoverishment and environmental degradation.

For the poorest fifth of humankind, maintaining access to the natural resource base and the inputs needed for agriculture, herding, or fishing is becoming increasingly difficult because of growing population, increased competition for land, and development. Food-poor households are more often having to cope with the deterioration of their resources, the loss of crucial access to common resources, and restriction to the most ecologically marginal lands. Because of growing populations in land-poor countries, the children of the hungry become landless laborers or move onto marginal lands and degrade them in the process. Even in the land-rich countries of Africa, this process is well under way in the regions of highest land productivity. And in small ways, everywhere, the desperate search for fuelwood for energy, for pasture in times of drought, and for additional land taken from poorly protected reserves makes life more difficult, degrades the commonly shared resources, and results in extensive deforestation and desertification.

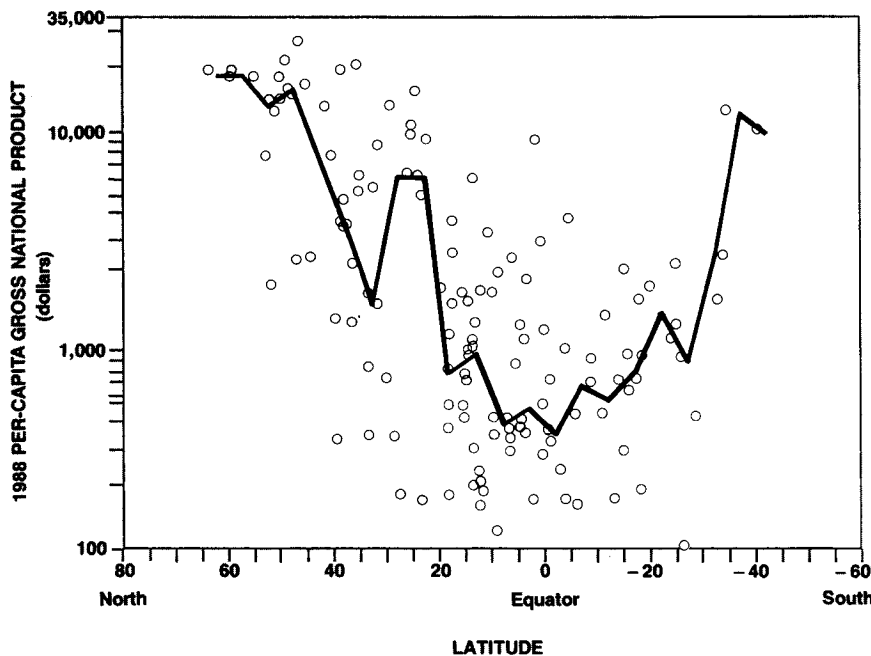
There are a variety of remedies espoused for the environmental plight of the hungry.⁴² At the local level, agroforestry and other agricultural techniques have demonstrated their ability to sustain productivity, provide fuelwood, limit soil erosion, and increase food and income. Everywhere, there is a heartening increase in the organization of the hungry and dispossessed on their own behalf and an emergence of local advocacy groups to strengthen their voice. But, although promising methods exist for limiting the environmental damage of human activities, these methods cannot replace a basic commitment to alleviate the root causes of unsustainable development.

Eliminating the most obvious cause of unsustainable development, land shortage, requires the redistribution of land that is unused, little used, or in excessively large holdings to small holders of land and migration and resettlement to sparsely occupied but appropriate lands. Unfortunately, land

LATITUDE AND THE WEALTH OF NATIONS

Differences between the industrialized world and the less industrialized countries, or between the richer and poorer countries, are often referred to by the seemingly more neutral designation of "North-South" differences. As Figure 1 below demonstrates, however, this designation is incorrect. In a plot of each nation's per-capita gross national product against the latitude of its capital city, a line drawn through the median point within five degree columns does not simply decline from north to south. Rather it suggests a complex but overall "U"-shaped re-

lationship. This relationship between income and latitude appears to be more than an artifact because it is reproduced to a similar extent in both the Northern and Southern Hemispheres, though it is distorted somewhat in the northern subtropics by the wealth of the oil-producing countries. If there is any meaning to this relationship, latitude appears as a surrogate for the great climatic belts. Thus, the great differences in national incomes are not really North-South differences but are more aptly described as temperate-tropical differences.



Line drawn through median gross national product per capita of countries grouped at five-degree latitude intervals.

Note: The points of latitude are for the capital cities of 141 countries and territories.

SOURCE: Compiled and plotted by Tracy Zafian from data in World Bank, *World Development Report 1989* (New York: Oxford University Press, 1989), 164-65.

reform has not succeeded in many places. Progress in slowing population growth needs to be maintained and broadened. Much ongoing environmental degradation in the developing world results from agricultural activities and other land uses driven by short-term needs for survival, resettlement, and foreign-exchange earnings. Specifically, it will be necessary for national and international agencies to recognize that foreign debt should not be reduced simply by destroying natural resources and that expansion of populations into ecologically marginal land is a waste of both natural and human capital.

This June, the United Nations Conference on Environment and Development will meet in Rio de Janeiro, Brazil. This intergovernmental conference is designed to highlight the common future of both developing and industrialized countries. The delegates will seek to ratify some global bargains and to identify others needed. The discussions will probably equate poor people with poor countries or poor countries with all developing countries. But this global overview has shown that considerable differences and stratification exist among developing countries. The case studies reveal that the interests of poor people are not always the same as the interests of poor countries, for in the interest of "development," the poor may grow poorer. Over the long term, an international trust fund should be developed specifically to assist the poorest peoples to cope with the inevitable changes under way.

Yet it is not the absence of remedial measures nor the confusion of interests that some people fear most, but rather that the hungry will be out of sight and out of mind during the immense struggle to direct the fate of the Earth. The fate of the Earth directly concerns the well-being of the wealthy and articulate, while the fate of the poor and the hungry seems to make claims only on their altruism and solidarity. Thus, the ultimate question is not whether poor people or poor countries match up with

Population growth and other social pressures push poor people onto ever more marginal lands, including the steep slopes of Indonesia (right) and the drylands of India (below).



threatened environments but whether the world can jointly sustain efforts to overcome poverty and save the Earth.

NOTES

1. S. Davies, M. Leach, and R. David, "Food Security and the Environment: Conflict or Complementarity?" (Discussion paper for the Institute of Development Studies, University of Sussex, Brighton, U.K., 1991).
2. Independent Commission on Disarmament and Security Issues, *Common Security: A Blueprint for Survival* (New York: Simon and Schuster, 1982); Independent Commission on International Development Issues, *North-South: A Program for Survival* (Cambridge, Mass.: MIT Press, 1980); and World Commission on Environment and Development, *Our Common Future* (Oxford, England, and New York: Oxford University Press, 1987).
3. P. Blaikie, *The Political Economy of Soil Erosion in Developing Countries* (London: Longman, 1985); P. Blaikie and H. Brookfield, eds., *Land Degradation and Society* (London: Methuen, 1987); A. B. Durning, *Poverty and the Environment: Reversing the Downward Spiral* (Washington, D.C.: Worldwatch Institute, 1989); G. C. Gallop, P. Gutman, and H. Maletta, "Global Impoverishment, Sustainable Development and the Environment: A Conceptual Approach," *International Social Science Journal* 41, no. 3 (1989):375-97; H. J. Leonard, ed., *Divesting Nature's Capital* (New York: Holmes and Meier, 1985); H. J. Leonard, ed., *Environment and the Poor: Development Strategies for a Common Agenda* (Washington, D.C.: Overseas Development Council, 1989); P. D. Little and M. M. Horowitz, eds., *Lands at Risk in the Third World: Local-Level Perspectives* (Boulder, Colo.: Westview Press, 1987); and M. Redclift,

Sustainable Development: Exploring the Contradictions (London: Methuen, 1987).

4. This paper is based on the 1991 World Hunger Program Research Report (RR-91-2): R. W. Kates and V. Haarmann, *Poor People and Threatened Environments: Global Overviews, Country Comparisons, and Local Studies* (Providence, R.I.: Alan Shawn Feinstein World Hunger Program, Brown University, 1991). An earlier version of this report entitled *Hunger, Poverty and the Human Environment* appeared in the 1991 CASID (Center for Advanced Study of International Development, Michigan State University) Distinguished Speaker Series. Thanks are due to Barbara DeMaio for helping to edit and format this article.
5. A. Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford, England: Clarendon Press, 1982); and M. Lipton, *Poverty, Undernutrition, and Hunger* (Washington, D.C.: World Bank, 1989).
6. For an excellent discussion of fragility and fragile lands, see B. L. Turner II and P. A. Benjamin, "Fragile Lands: Identification and Use for Agriculture" (Paper prepared for the Bellagio Conference on Institutional Innovations for Sustainable Agricultural Development: Into the Twenty-First Century, at the Graduate School of Geography and George Perkins Marsh Institute, Clark University, Worcester, Mass., 14-18 October 1991).
7. See, for example, World Resources Institute and International Institute for Environment and Development, *World Resources 1986* (New York: Basic Books, 1986), 146-52; and M. Williams, ed., *Wetlands: A Threatened Landscape* (Oxford, England: Basil Blackwell, 1990). For high-potential agricultural land and irrigated areas in particular, see M. Yudelman, "Sustainable and Equitable Development in Irrigated Environments," in H. J. Leonard, ed., *Environment and the Poor: Development Strategies for a Common Agenda*, pages 61-85, note 3 above. Urban environments often combine environmental problems of both developing and industrialized countries. See, for example, T. Campbell, "Urban Development in

the Third World: Environmental Dilemmas and the Urban Poor," in H. J. Leonard, ed., *idem*, 165-87.

8. E. P. Eckholm, *Losing Ground: Environmental Stress and World Food Prospects* (New York: W. W. Norton, 1976), 74.

9. J. A. Mabbutt, "A New Global Assessment of the Status and Trends of Desertification," *Environmental Conservation* 11, no. 2 (1984):103-13.

10. In one study made 15 years ago, semi-arid grasslands were estimated to contain about 10 percent of the world's population, and about 50 million people were thought to be affected in "lands threatened by desertification." R. W. Kates, D. L. Johnson, and K. Johnson Haring, "Population, Society and Desertification," in Secretariat of the UN Conference on Desertification, ed., *Desertification: Its Causes and Consequences* (Oxford, England: Pergamon Press, 1977), 261-318.

11. G. Ledec, "The Political Economy of Tropical Deforestation," in H. J. Leonard, ed., *Divesting Nature's Capital*, pages 179-226, note 3 above.

12. World Resources Institute and International Institute for Environment and Development, *World Resources 1988-89* (New York: Basic Books, 1988), 71; World Resources Institute, *World Resources 1990-91* (New York: Oxford University Press, 1990), 101-06; and N. Meyers, "Tropical Forests: Present Status and Future Outlook," *Climatic Change* 19 (1991):3-32.

13. World Resources Institute and International Institute for Environment and Development, page 71, note 7 above.

14. World Bank, *World Development Report 1990: Poverty—World Development Indicators* (New York: Oxford University Press, 1990).

15. World Resources Institute, page 123, table 8.1, note 12 above.

16. H. J. Leonard, "Environment and the Poor: Development Strategies for a Common Agenda," in H. J. Leonard, ed., *Environment and the Poor: Development Strategies for a Common Agenda*, pages 3-45, note 3 above.

17. J. W. Mellor, *Agricultural Development Opportunities for the 1990s* (Washington, D.C.: International Food Policy Research Institute, 1989).

18. World Bank, *Social Indicators of Development, 1988* (Baltimore, Md.: Johns Hopkins University Press, 1988).

19. United Nations Conference on Trade and Development, *The Least Developed Countries: 1990 Report* (New York: United Nations, 1990); and World Bank, *World Development Report 1991: The Challenge of Development—World Development Indicators* (New York: Oxford University Press, 1991).

20. World Resources Institute, pages 286-87 and 306-07, note 12 above.

21. The authors are indebted to B. Bowonder, H. Brookfield, D. Campbell, T. Downing, G. Gallopin, J. Gritzner, M. Horowitz, N. Jodha, J. Mathews, D. Pimentel, P. Porter, and A. Rapp for taking time to direct us to the relevant literature and to C. Radel for helping the authors to find and digest it.

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ince, Sudan," in P. D. Little and M. M. Horowitz, eds., *Lands at Risk in the Third World: Local-Level Perspectives* (Boulder, Colo.: Westview Press, 1987), 95-114; F. N. Ibrahim, "Ecology and Land Use Changes in the Semiarid Zone of the Sudan," in Little and Horowitz, pages 213-29, note 3 above; N. S. Jodha, "Common Property Resources and Rural Poor in Dry Regions of India," *Economic and Political Weekly* 21, no. 27 (1986):1169-81; N. S. Jodha, "A Case Study of the Degradation of Common Property Resources in India," in Blaikie and Brookfield, pages 196-207, note 3 above; R. W. Kates, "Drought in the Sahel: Competing Views as to What Really Happened in 1910-14 and 1968-74," *Mazingira* 5, no. 2 (1981):72-83; P. D. Little, "Land Use Conflicts in the Agricultural/Pastoral Borderlands: The Case of Kenya," in Little and Horowitz, pages 195-212, note 3 above; M. O'Leary, "Ecological Villains or Economic Victims: The Case of the Rendile of Northern Kenya," *Desertification Control Bulletin* (United Nations Environment Programme), no. 11 (1984):17-21; M. U. A. Tennakoon, "Desertification in the Dry Zone of Sri Lanka," in R. L. Heathcote, ed., *Perception of Desertification* (Tokyo: United Nations University, 1980), 4-33; B. P. Thomas-Slayer and R. Ford, "Water, Soils, Food, and Rural Development: Examining Institutional Frameworks in Katheka Sublocation," *Canadian Journal of African Studies* 23, no. 2 (1989):250-71; J. T. Thomson, "The Politics of Desertification in Marginal Environments: The Sahelian Case," in H. J. Leonard, ed., *Divesting Nature's Capital*, pages 227-62, note 3 above; M. Watts, "Drought, Environment and Food Security: Some Reflections on Peasants, Pastoralists and Commoditization in Dryland West Africa," in M. H. Glantz, ed., *Drought and Hunger in Africa* (New York: Cambridge University Press, 1987), 171-211; and B. Wisner, "Man-Made Famine in Eastern Kenya: The Interrelationship of Environment and Development," in P. O'Keefe and B. Wisner, eds., *Land Use and Development* (London: International African Institute, 1977), 194-215. Summaries of these case studies can be found in Kates and Haarmann, pages 41-57, note 4 above.

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23. Sen, note 5 above.

24. See Blaikie and Brookfield's (note 3 above) useful definition of degradation "as a reduction in the capability of land to satisfy a particular use." This definition is, of course, anthropocentric because it uses human welfare as the measure. It is also highly variable because reductions in the biophysical capability of land will differ greatly according to the use of the resource. Blaikie and Brookfield suggest that degrading processes are both natural and human-induced and are subject to both natural restoration and human repair. They offer a measure of net degradation defined as (natural degrading processes + human interference) - (natural reproduction + restorative management).

25. See, for example, Durning, note 3 above; and O'Keefe, Wisner, and Baird, note 22 above.

26. These driving forces all appear in the various "boxes and arrows" of schematic models drawn by various authors, such as Leonard, note 16 above, and Blaikie and Brookfield, note 3 above. Authors of case studies tend to differ in their choice of which driving forces to emphasize and where in the spiral of poverty and degradation they choose to begin their analyses. Four emphases in particular stand out: the role of external, even very distant forces; the inequality of growth and modernization; the pressure of population; and the destruction of local and indigenous livelihood and knowledge systems. These, in turn, are linked to four traditions: neoliberal economics focused more on growth than equity; neo-Marxist analysis that minimizes the stress of population growth and emphasizes the effects of distant capitalists; a biocentric ecology that favors plants and animals rather than people; and a cultural ecology that tends to study small societies and to focus on indigenous knowledge.

27. See Beckman; Bowonder and Ramana; Horowitz and Salem-Murdoch; Jodha; and Thomas-Slayer and Ford, all in note 22 above.

28. See Campbell; Durning; Herren; Little; Tennakoon; Wisner; Beckman; and Horowitz and Salem-Murdoch, note 22 above.

29. See Ibrahim; Kates; O'Leary; Thomson; Watts; and Herren, all in note 22 above.

30. See Bowonder and Ramana, note 22 above.

31. See Thomas-Slayer and Ford, note 22 above.

32. See Campbell; Little; and Wisner, note 22 above.

33. See Ibrahim; and O'Leary, note 22 above.

34. See Blaikie and Brookfield, note 3 above; Collins; O'Keefe, Wisner, and Baird; and Seddon, note 22 above.

35. See O'Keefe, Wisner, and Baird, note 22 above.

36. See Blaikie and Brookfield, note 3 above; Collins; and Seddon, note 22 above.

37. See Blaikie and Brookfield, note 3 above; Seddon; Collins; and O'Keefe, Wisner, and Baird, note 22 above.

38. Ledec, page 182, note 11 above.

39. See Anderson; Hecht, Anderson, and May; Monosowski; and Stonich, note 22 above; and Ledec, note 11 above.

40. See Durham; Lopez; Painter; and Potter, note 22 above; and Ledec, note 11 above.

41. See Monosowski, note 22 above.

42. See, for example, J. A. Gritzner, *The West African Sahel: Human Agency and Environmental Change* (Chicago: Committee on Geographical Studies, University of Chicago, 1988); A. Kiriro and C. Juma, eds., *Gaining Ground: Institutional Innovations in Land-Use Management in Kenya* (Nairobi: ACTS Press, 1989); and World Resources Institute and International Institute for Environment and Development, pages 215-33, note 12 above.