TWENTY LESSONS IN ENVIRONMENTAL SOCIOLOGY

SECOND EDITION

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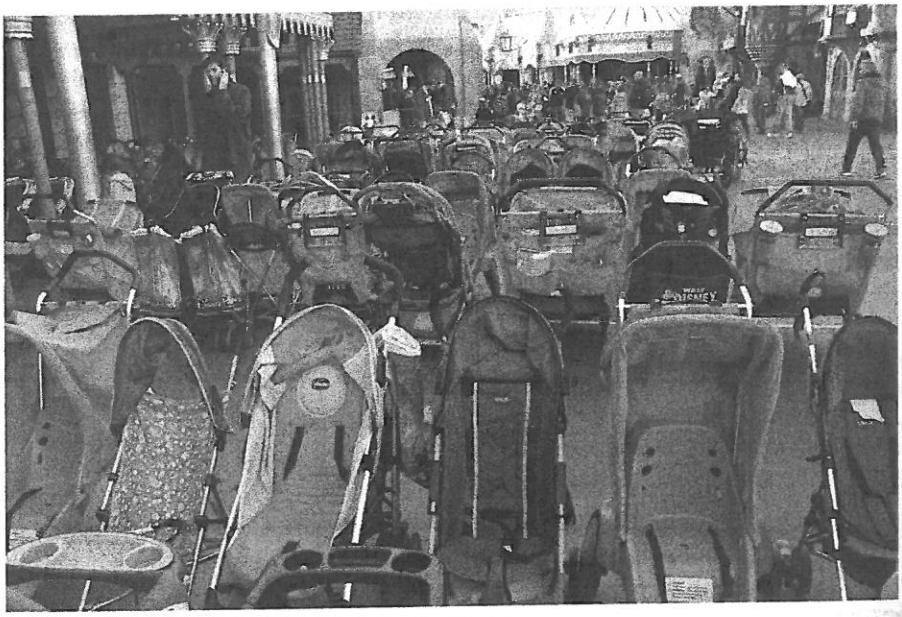
Population, Demography, and the Environment

Diane C. Bates



Strollers parked at Disneyworld, Orlando, Florida.
Photo by Ken Gould.

The world's human population as of January 3, 2014 at 2:44 p.m. (EDT) was 7,138,177,229, with more than one person added every ten seconds. Social scientists have long debated how human population affects environmental quality; population growth is frequently cited as a leading cause of environmental degradation. Understanding human population dynamics goes well beyond merely counting the number of people in a location. For example, out-migration from rural areas changes how households use agricultural land; middle-class out-migration from urban areas can create an environment hostile to public health by leaving abandoned and vacant properties in poor communities. The age and class composition of a population predict what sorts of environmental and health threats are likely to emerge from risks present in a given location. The stability and resources of a population affect its ability to respond to and recover from environmental threats. Social theory on the relationship between population and the environment has historically focused exclusively

on growth, but understanding how populations change over time is important for all students of the environment. Moreover, people experience population change at the local level rather than on the national scales more typical of demographers and social theorists. For example, residents of the Northeastern rustbelt may note how three decades of uneven population decline have left neighborhoods with vacant buildings, overgrown lots, and abandoned factories. Likewise, residents of the suburban sunbelt cannot help but observe how more and more people keep moving into the area and converting open space into residential subdivisions, office parks, and shopping centers. This chapter ties together these local experiences with the larger study of the interaction between human populations and our environment. It first defines several key terms in understanding population dynamics, then proceeds to a discussion of the main controversies in population theory. It closes with a nuanced analysis of an empirical case study that highlights how population growth in the South American country of Ecuador has variable effects on the nation's forest resources.

Population refers to the number of people living in a specific geographical area at a specific point in time. **Demography** is the discipline in the social sciences that studies the characteristics of human populations, including how they change. In the United States, the Census Bureau compiles the most comprehensive demographic data, including the decennial census and the annual American Community Survey. Census Bureau data represent the highest-quality demographic data available on a national scale and can be accessed freely at its website (www.census.gov). At the international level, the United Nations Statistics Division compiles census and other statistical information from member nations and publishes them annually in the *Demographic Yearbook* as well as making some of these data available on its website (www.unstats.un.org). Some of the most important demographic variables include population density, population growth rates, birth and death rates, and migration. **Population density** indicates the average number of people who live in a specified area unit, usually a square mile or square kilometer. **Population growth** measures changes in population over time by taking a population at one time and adding all the births and immigrants who arrive before a later time, while subtracting the deaths and emigrants. Rates are calculated by dividing the number of births/deaths/immigrants/emigrants for every 1,000 people in a given population. Although it does not distinguish between natural change (births and deaths) and migration, a crude population growth estimate can be calculated by dividing the population at a later time by the population at an earlier time. Likewise, simple population growth rates can be calculated by subtracting an earlier population from a later population, and then dividing by the earlier population.

In addition to counting the number of people in a population, demographers typically collect and publish data on the characteristics of populations, such as age and gender composition, consumption levels, and subpopulations, such as racial or ethnic groups. Unfortunately, the relationship between population change and environmental quality is not as straightforward or easy

to define as demographic variables. Indeed, the relationship between human population growth and the environment has been the subject of social theory and social investigation for centuries.

MALTHUS, SOCIAL DARWINISM, AND MORAL CONTROL

Victorian-era social theorist Thomas Malthus famously proposed a relationship between environmental quality and population growth (see Lesson 2). His *Essay on the Principle of Population* (first published in 1798) asserted that, without restraint, human population growth would eventually exceed the production of food, resulting in a massive crash in population. Specifically, he posited that human population growth increased exponentially; two people in generation 1 produced two children (generation 1 population = 2); each of those two people produced two children in generation 2 (population = $2 \times 2 = 4$); each one of those four people produced two children in generation 3 (population = $4 \times 2 = 8$); and so on. Based on his assessment of food production in Europe, Malthus reasoned that the production of food would increase only in an arithmetic or linear fashion, such that the increase between generations would be constant. Given these projections, Malthus warned that if humans did not control their own population growth, then a combination of war, disease, and especially famine would control population anyway. In part due to his own devout faith, Malthus believed that humans were unlike other animals in their capacity to exert moral control over their behavior. He therefore indicated that the most ethical course of action would be to limit human population growth, beginning with the working classes of European cities, whose lack of moral control (in his view) created large families that the poor could not feed on their own. This conclusion resonated with the era's Victorian elites in its emphasis on restraint of sexual impulses, moral condemnation of the poor, and opposition to charity designed to improve the situation of the poor, since feeding the poor would only prolong the inevitable misery and population crash.

Herbert Spencer, a founding theorist in sociology, echoed Malthus in his writings about the moral superiority of the elite, although his work also naturalized social hierarchy (Spencer 1972). According to Spencer, human society was evolutionary and progressed from less to more complexity. Spencer, like Malthus, believed that moral human individuals and groups demonstrate higher levels of progress and that these traits could be passed to the next generation. Over time, more evolved groups would come to dominate weaker groups; Spencer described this as the "survival of the fittest." In his view, the moral superiority of the European (and especially British) elite reflected its evolutionary position, and this subsequently explained and legitimated European geographical expansion and subjugation of African, Asian, and Native American human groups.

Malthus and Spencer both influenced the theory of Charles Darwin, who explained that plants, animals, and even humans evolved in a process of

competition for survival. Darwin's *The Origin of Species* (published in 1859) asserted that environmental stressors gave a reproductive advantage to individuals and species that adapted best to them; more of their offspring would survive into the next generation. This reproductive advantage (that is, natural selection) will become more pronounced in subsequent generations such that entire species evolve to become progressively more suited to their environment. Darwin's evolutionary theory revolutionized scientific thought and reduced human exceptionalist arguments, including those advanced by Malthus. Ironically, Spencer's ideas were so well integrated into Darwinian theory that they are now sometimes referred to as "social Darwinism." **Social Darwinism**, like Malthusian theory, posits that the relationship between humans and their environment has a "natural" evolutionary course but that this course can be overcome through social action, particularly restraint on population growth among those groups considered less evolved.

MODERNIZATION: THE DEMOGRAPHIC TRANSITION, THE GREEN REVOLUTION, AND NEO-MALTHUSIANISM

Following two world wars and the decline of the European global empires, Malthusian and social Darwinist thought reemerged in modernization theory, at least inasmuch as population policies assumed a connection between uncontrolled birth rates and food production. **Modernization theory** attempted to explain global inequality as a result of different levels of economic and cultural progress rather than as a set of innate, inherited, or moral characteristics. European domination could be explained because Africans, Asians, and Native Americans did not have the science, technology, or economic knowledge of Europeans. In a postcolonial context, European and North American knowledge would be shared with "less developed countries" in order to shepherd them into a more rationalized modernity. In terms of population dynamics, two particular elements of modernization theory stand out: the extension of modern agriculture known as the "green revolution" and the emphasis on birth control, particularly in order to achieve the so-called demographic transition.

The **green revolution** refers to a series of technological innovations to the production of food crops that were designed to increase productivity; more food could support more people. In general, these technologies reflected the system of agriculture that had been most productive in North America, particularly systems that produced single crops (*monocropping*). The green revolution introduced and/or expanded the use of mechanized tools (for example, irrigation, tractors, threshers), chemical fertilizers, and chemical pesticides in all regions of the globe. Another central technology for the green revolution was the development and introduction of high-yield varieties (HYVs) of rice, corn (maize), wheat, and other staple crops. HYVs typically produced more edible grain, while allowing plants to grow faster in more marginal

environments and withstand the use of chemical fertilizers and pesticides. Agricultural scientists used advanced genetics and biotechnology to create HYV crops in international laboratories, such as the International Maize and Wheat Improvement Center in Mexico and the International Rice Research Institute in the Philippines. Green revolution technologies greatly increased food production worldwide; for example, world rice production more than tripled from 147 million metric tons in 1961 at the onset of the green revolution to over 463 million metric tons in 2012.

Unfortunately, the green revolution created additional and distinctly modern problems (see Lesson 12). Monocrop systems, especially HYVs, typically required higher levels of chemical input (fertilizers and pesticides) than traditional agriculture. Consequently, world fertilizer consumption grew faster than crop production: from 31 million tons in 1961 to over 239 million tons in 2012. Chemical additions to agricultural crops have since been linked to salinization and a decrease in biodiversity among beneficial species and in neighboring nonagricultural lands. The high water demands of mechanized, industrial agriculture have also led to an extension of irrigation systems that has significantly and negatively altered freshwater resources, most dramatically in central Asia's Aral Sea, which has lost more than half of its volume and geographical area since the 1960s. Green revolution technologies raised the cost of production substantially by requiring the purchase of HYV seeds (which were often infertile, so seeds had to be purchased each season), chemical inputs, farm machinery, and irrigated water. The increased cost of production meant that over the long term the green revolution has favored larger producers over smaller ones and small producers have been progressively squeezed out of production of basic grains. Moreover, HYVs are typically grown in fields of single crops at a scale appropriate for mechanized agriculture, as opposed to traditional agriculture, which was tended by human workers and contained a greater variety of plant species, including nonfood species used for livestock or fiber. These changes led to massive displacement of the rural labor force and nutritional deficiencies for many small farmers in countries as different as Mexico and India. Unable to compete in agriculture, many of these small producers and agricultural workers have relocated to cities, which have expanded spectacularly since the 1950s in all regions of the globe.

While the green revolution unquestionably increased food production (albeit with social and environmental costs), advocates of modernization also held that a modern society would have low birth and death rates and, thus, low population growth rates. A **demographic transition** would occur when low growth rates were achieved through controlled fertility and low death rates were achieved through modern healthcare and sanitation. According to this model, in premodern societies, birth and death rates were both high but population growth remained small because the deaths more or less cancelled out the births. However, as sanitation, nutrition, and healthcare improved with modernization, life expectancies increased and death rates declined (especially infant mortality rates). Because of the cultural lag following technological change, birth rates remain high and population growth increases

dramatically. Only when family planning norms adjust downward to account for longer life expectancies and higher survival rates among children will population growth slow and stabilize, indicating that a demographic transition to a modern society has occurred.

The demographic transition model is based on the historical experience of European and North American societies but has been expanded to include Asian nations such as Japan, South Korea, and Taiwan. Less developed nations in Asia, Africa, and the Americas did see their death rates decline significantly in the postcolonial period, while their birth rates remained at traditionally high levels. Consequently, population growth in less developed regions of the world expanded dramatically in the latter half of the twentieth century: Africa's population more than quadrupled in these 50 years, Latin America's more than tripled, while Asia's and Oceania's more than doubled (see Table 8-1). Even regions where the demographic transition had allegedly occurred increased their population, with North America nearly doubling its population and Europe adding a third of its population. Note, however, that these are raw population figures and do not distinguish between births and increases due to immigration, which accounts for significant proportions of the increases in both Western Europe and North America.

Population pyramids are often used to display the explosive population growth that occurs before a demographic transition. These graphs present national populations by age and sex (that is, the age and sex structures of the population) as a means for distinguishing between countries that have already made the demographic transition and those that have not. Figure 8-1 depicts population pyramids for Kenya, China, and Germany to highlight these different stages. Kenya's population pyramid in 2012 looks like a pyramid, in which the largest categories of the population are children (0–14 years); this portends a future baby boom as these young people enter their prime childbearing years (15–29). In contrast, China's population pyramid displays a population evidently in the early stages of a demographic transition: The top half of this graph looks like a pyramid, with the largest proportion of people past their prime childbearing years (ages 40–49). However, the graph tapers in age categories

Table 8–1 Population and Population Growth in Selected Regions, 1950–2000

	Population 1950 (millions)	Population 1980 (millions)	Population 2000 (millions)	Percent Change
Africa	250	483	1022	408%
Asia	1,403	2,638	4,164	297%
Europe	547	693	738	135%
Latin America and the Caribbean	167	362	590	353%
North America	172	255	345	201%
Oceania	13	23	27	207%

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2010: Table 1.

below these ages, indicating that people are having fewer children. Finally, the pyramid for Germany exhibits characteristics of a population that has undergone a demographic transition, as evidenced by the relatively equal distribution among age categories. In fact, Germany's age structure reveals an aging population, with almost equal proportions of older and younger people.

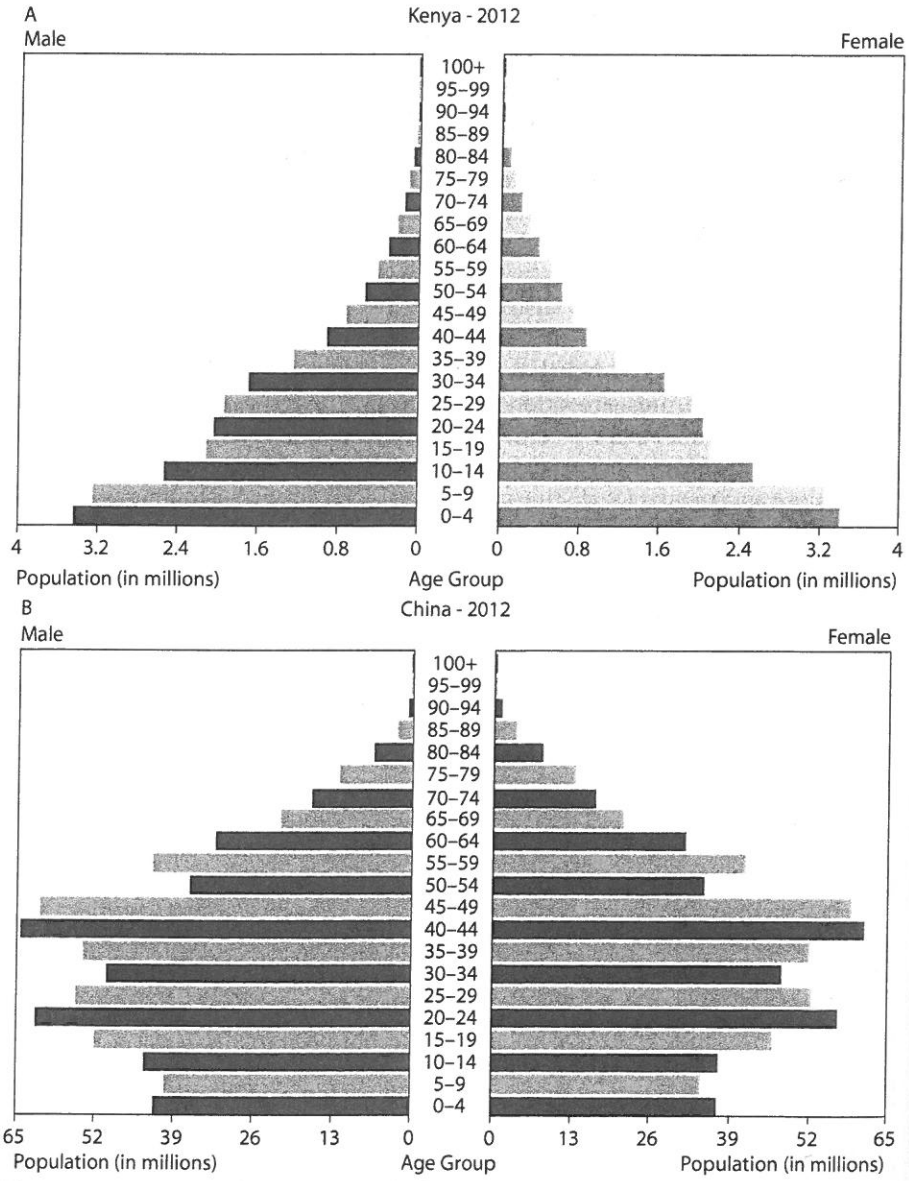


Figure 8–1 A–C Population pyramids for Kenya **(A)**, China **(B)**, and Germany **(C)**.

Source: U.S. Census Bureau, International Data Base 2012.

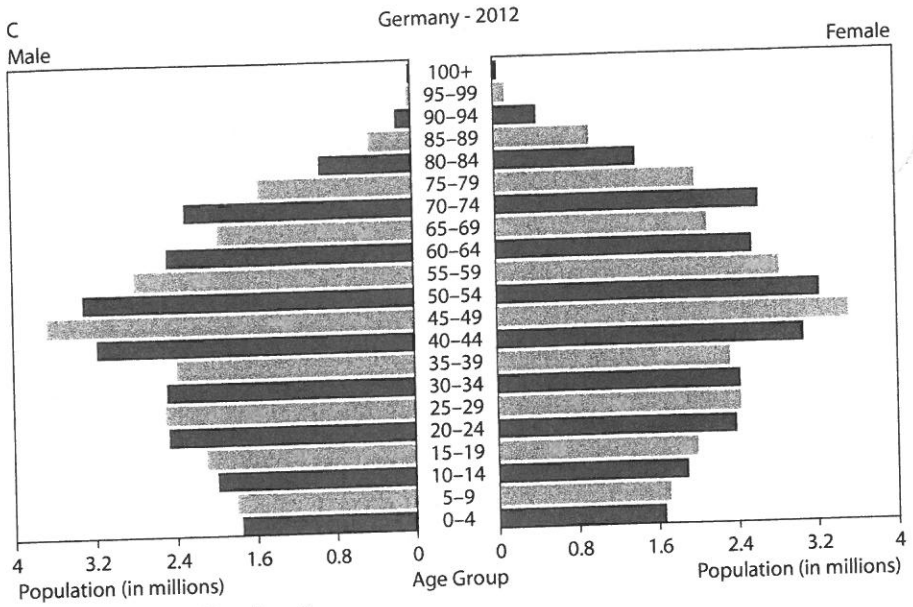


Figure 8–1 A–C *(Continued)*

Because rates of growth are highest in the poorest regions of the world, neo-Malthusian arguments emerged in the late 1960s calling for control of population and conservation of resources. Paul Ehrlich's *The Population Bomb* (1968) attempted to avoid the elitist trappings of Malthus by proposing an equation that measured environmental impact through a combination of population, affluence, and technology ($I = P \times A \times T$). Population (P) reflects the number of people, affluence (A) indicates the level of consumption by those people, and technology (T) reflects the type of technology used by those people. Environmental impact (I) thus varies not only by raw numbers of people but also by their consumption and waste patterns, sometimes now measured as their "**ecological footprint**," or the amount of land necessary to sustain consumption and absorb wastes. Based on higher consumption levels and use of more environmentally damaging technologies, the average North American individual is estimated to have over five times the ecological impact of an African (see Table 8-2). Neo-Malthusians have also expanded on Malthus' attention to food supply to include references to the carrying capacity of a

Table 8–2 Ecological Footprint in Hectares per Person

Africa	1.4 ha
Asia	1.8 ha
Europe	4.7 ha
Latin America and the Caribbean	2.6 ha
North America	7.9 ha

Source: Ewing, Moore, et al., 2010.

geographical unit (for example, an ecosystem, a nation, or the entire planet). The **carrying capacity** represents the total population of any given species (for example, humans) that can be supported in that geographical unit without permanently damaging the ecological systems that support that species. Damages come from extraction of resources from well as pollution added to that geographical unit. Neo-Malthusians generally predict that, unless changes are made in terms of all components of the $I = P \times A \times T$ equation, the carrying capacity of the planet will be reached and famine, disease, war, and, at worst, complete global ecosystemic collapse will follow.

Responding to these concerns, population policy became an integral part of most nations' development plans. The West has reviled China's one-child policy for encouraging sex-selective abortions and female infanticide, but China's population growth rate has dropped significantly, from 1.9 annually in 1955 to 0.7 in 2005 (see Table 8-3; also review the age structure in Fig. 8-1B). Unable to institute a policy like China's, India sent mobile sterilization teams into its rural areas to reduce its population growth rate, although these successful programs have also been criticized for sterilizing men and women based on quotas rather than the actual wishes of the people being sterilized. Funding from European and North American sources allowed for greater distribution of birth control and family planning technologies to developing countries in the 1960s and 1970s but came under increasing pressure from parties as disparate as the Roman Catholic Church, the U.S. government, and Muslim clerics, who argued against women's access to birth control and abortion. Even this debate could not stifle the excitement surrounding the United Nations Population and Development Conference in Cairo in 1994, where the links between controlling population growth and sustainable development were made explicit (see Lesson 20). In addition to their focus on population control, the UN's Decade of the Woman, from 1985 to 1995, highlighted women's education, economic security, and health as a means for reducing birth and infant mortality rates. Women in Development programs rely on the assumption that women who have opportunities outside of motherhood and who can depend on the survival of their children will have fewer children. Whether due to this global effort or to other changes in the global social system, population growth rates have slowed somewhat since the 1980s (see Table 8-3).

Table 8–3 Annual Population Growth Rates, 1955–2005 (selected countries)

	1955	1965	1975	1985	1995	2005
China	1.9	2.1	2.2	1.4	1.1	0.7
India	2.0	2.3	2.2	2.1	1.9	1.6
Kenya	2.8	3.2	3.6	3.8	3.0	2.2
Mexico	2.7	3.1	3.2	2.2	1.9	1.3
United States	1.6	1.4	0.9	1.0	1.1	1.0
Italy	0.6	0.8	0.6	0.1	0.2	0.1

Source: United Nations Statistics Division 2007.

POPULATION AS A STRAW DOLL: MARX, FAMINE, AND XENOPHOBIA

Karl Marx called Malthus' 1798 *Essay* a "lampoon" that was popularized entirely because it legitimated the partisan interests of the English elite. Apart from this ideological component, Malthus was criticized by contemporaries and later social theorists for methodological weaknesses, notably his assumption of linear, arithmetic growth rates in food production, which apparently had no empirical foundation and was rendered inaccurate by the green revolution. Likewise, modernization theories involving food production and population dynamics have shown empirical and ideological weaknesses.

The main critiques of Malthusian, neo-Malthusian, and modernization theories about population growth point to the lack of discussion about the distribution of people and resources. A neo-Marxist critique of Malthus has been cogently and convincingly argued elsewhere by John Bellamy Foster. Foster has also drawn from Marx's work to call attention to the importance of population in terms of concentration in cities, where people have become dependent on industrial agriculture to produce food and organic waste is disposed in landfills instead of returned to agriculture. The "**metabolic rift**" that has developed between human food production and waste has overburdened rural natural systems by irrigation, fertilizer, and pesticide contamination and created pollution and health risks in urban areas. Given the rural population displacement and urban growth associated with the green revolution, this metabolic rift has created massive pollution problems in all regions of the world.

Critics also point to the lack of distributive concerns by neo-Malthusians. Responding directly to the assumptions of modernization theory, Amartya Sen's life work has sought to emphasize how the famines and poverty in places like sub-Saharan Africa and South Asia reflect the inhumane distribution of resources rather than any absolute shortage of food. Sen describes a world where the powerful use food as a weapon and famines reveal more about local and global inequalities than about food production. A well-known example of this from history involves the Irish potato famine; between 1845 and 1851, nearly 1 million Irish died of starvation or starvation-related illnesses and another million emigrated to escape the famine, while the English continued to grow and export tons of wheat from manor lands in Ireland. In contemporary times, the persistent violence in the Sudan has forced hundreds of thousands (if not millions) of small farmers to abandon their agricultural land and flee to refugee camps. Stripped of their ability to produce their own food, these refugees rely on food aid shipments. However, the delivery of these shipments is controlled by warlords who demand loyalty from the refugees and camp personnel. These examples demonstrate Sen's key concern that famines represent less of a shortage of food or (as neo-Malthusians may suggest) population exceeding its ecological carrying

capacity than a manifestation of vast power differences between groups of people. When people interpret famines as examples of a population exceeding its carrying capacity, they ignore the human agents that cause famines and blame the victims for their own misery.

Apart from famines, local and global inequality directly determines how much food is available to people. A considerable portion of agricultural land worldwide is dedicated to export and luxury crops rather than basic food crops; often, these crops occupy the most productive agricultural land. I personally have seen extensive tea plantations in Kenya, coconut plantations in northeast Brazil (see Fig. 8-2), banana plantations in Guatemala, citrus plantations in Mexico, strawberry plantations in Florida, and artichoke plantations in California, while the workers on these plantations may suffer from basic health and malnutrition problems. Moreover, immense rangelands as well as oceans of grain (such as corn in the American Midwest and soy in the Brazilian south) feed cattle instead of humans (see Lesson 4). Only more affluent consumers include meats, especially beef, in their staple diets. Since the 1980s, poorer nations have experienced strong economic pressure to continue to produce luxury and export crops as these represent some of the few means to generate hard currency used to repay national debts and eventually expand local markets, social services, and infrastructure. However, world trade has generally seen a decline in the value of agricultural exports relative to manufacturing and high-tech exports; countries that rely on agricultural production for foreign exchange (like Ecuador, which sells flowers and bananas) guarantee themselves a subordinate position in the global hierarchy.

A focus on population growth in the Global South may also reflect social fears in the Global North more than real population concerns. Increased immigration from the Global South to the Global North has contributed to

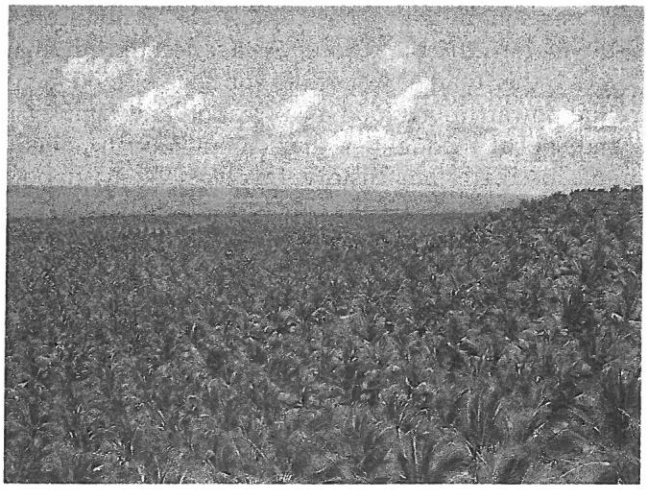


Figure 8–2 Coconut plantation in northeastern Brazil.
Source: Diane C. Bates.

xenophobic, ideological beliefs about population growth in poorer countries, particularly where immigrant newcomers are socially distant from natives, as with northern Africans in the Paris suburbs, Latin Americans in the U.S. border states, South Asians in the north of England, and Asians in Australia. Workers in the Global South (agricultural and otherwise) are aware of the limits to advancement in their local economies and increasingly migrate to North America, Europe, East Asia, and the Middle East in search of better-paid work. This process of migration, in fact, has contributed greatly to the population growth rates in the Global North, where some countries (such as Germany and Italy) would register negative population growth rates were it not for immigration. Regardless of the relative size of these groups and the economic importance of immigrants in their host countries, many see the influx of newcomers as a population "problem" couched in environmental language as strain on local resources in receiving countries and an effect of "overpopulation" in sending countries. Nativism has bubbled up all over the Global North. Sociologists Lisa Sun-Hee Park and David Naguib Pellow examine this process in detail in their case study of Aspen, Colorado (2011). Wealthy Aspenites passed local ordinances against immigration from Latin America, with the logic that increased immigration threatened the regional environment. Without reflecting on their own consumption of extravagant second homes and recreational skiing, Aspenites were able to scapegoat immigrants as the true threat to nature, and to link this to national nativist narratives widespread among large North American environmental organizations. U.S. environmental groups like the Sierra Club and Zero Population Growth have expressed neo-Malthusian concerns about population; without attention to the social complexity behind population dynamics indicated above, they risk reproducing elitist and xenophobic agendas.

POPULATION AND TROPICAL FORESTS IN ECUADOR: A DEMOGRAPHIC CASE STUDY

This final section uses a case study to explore the complex relationship between population growth and tropical deforestation in the South American nation of Ecuador. Ecuador stretches from the Pacific coast over the Andes and into the upper reaches of the Amazon basin, containing about 14.6 million inhabitants. North–south mountain chains divide the small country into three distinct social and environmental regions: the Pacific coast, the Andean highlands and valleys (the Sierra), and the Amazonian lowlands (the Oriente). Prior to European contact, most of the population in what is now Ecuador lived in the temperate Andean highlands and valleys, where they were able to take advantage of how altitude created small variations in climate. These microclimates allowed pre-Columbian farmers to produce a wide variety of agricultural products, ranging from tropical fruits like the papaya to temperate staples like potatoes. The rich volcanic soils of the Sierra

allowed for relatively intensive agriculture and relatively dense populations. In contrast, nearly impenetrable tropical rain forests flanked the Andes in the west (the coastal region) and the east (the Oriente). These forests prevented the expansion of agriculture from the Andes because the terrain was difficult to traverse, fast-moving rivers prevented navigation, and Andean migrants faced both tropical diseases and hostile indigenous people in the lowlands.

European colonization dramatically changed the relationship of people to Ecuador's forests, starting trends that continue into current times. The Spanish created plantation-like manor farms (*latifundia*) in the richest and most productive Sierra land, while obliging the indigenous highland people to perform labor and assimilate to Spanish customs. Because the best land was occupied by plantations, subsistence farmers planted their fields further onto steep mountainsides, contributing to alpine deforestation and erosion. Today, valley lands remain concentrated in large farms that produce commercial goods, such as dairy products and cut flowers. On the Pacific coast, the Spanish recognized the protected harbor at Guayaquil and the nearby stands of tropical timber suitable for shipbuilding. As the port city of Guayaquil grew, the Spanish also cleared forests for plantations of cacao, from which chocolate is derived, and later bananas, which remain Ecuador's most important agricultural export crop today. In order to attract labor from the Sierra, coastal plantation owners set aside nearby land for workers and their families. The growth of export-oriented plantations and associated urban economies has attracted many people from the Andean region, and more Ecuadorians now live in coastal provinces than in the Sierra. Only in the Oriente, with its poor access to population centers in the Sierra and worse access to the international trade networks offered through Pacific ports, have forests remained largely intact. This situation changed only since the latter half of the 20th century after oil was discovered, providing an incentive and funds to build roads deep into the northern Oriente. The Ecuadorian government in the 1950s and 1960s also used oil revenues to develop colonization programs that made land available to poor farmers who were willing to migrate to remote coastal and Oriente forests to develop new agricultural land.

The relationship between population growth and deforestation in Ecuador appears to be a fairly simple one: As population grew, forests were removed from the country's landscape (Fig. 8-3). However, Figure 8-3 obscures a more complex relationship between the use of forest resources and human activities. The coastal population has grown most, although the Oriente surpassed the Sierra in regional population early in the 21st century (Fig. 8-4). Over 76% of forests on the coast have been cleared, leaving only about 2 million hectares, while just over a quarter (26%) of the Oriente has been deforested and over 7 million hectares remain; two thirds of the forests in the Sierra have already vanished, with only 3 million hectares remaining. A simplistic, neo-Malthusian explanation of these data would predict the following: Population growth has declined in the Sierra relative to the Oriente and the coast, so pressure on forests will decrease in the Andes. Population growth will eliminate

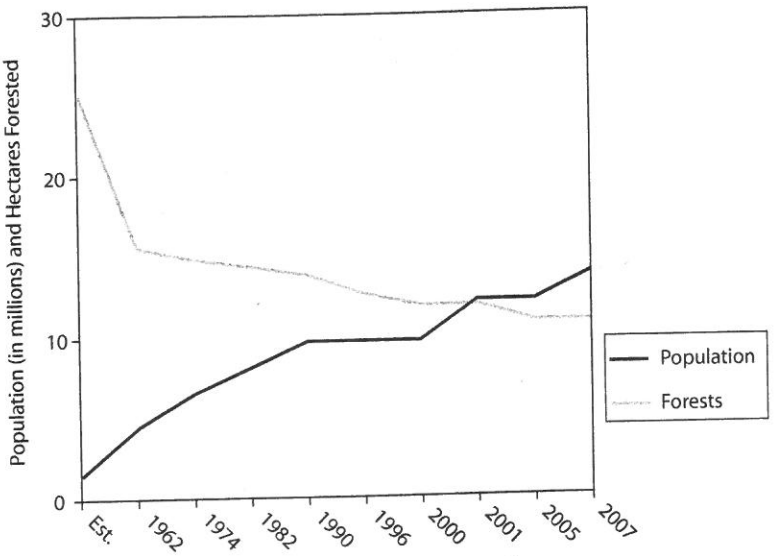


Figure 8–3 Ecuadorian population and forests over time.

Note: Original population estimate is based on 1889; original forest cover was estimated by the Food and Agriculture Organization of the United Nations (2001:120–122). Because comparable dates were not available for forest cover and population estimates, data are smoothed by adding or subtracting average annual increases or decreases between known data points.

Sources: Minnesota Population Center 2007; Central Intelligence Agency 2007; Food and Agriculture Organization of the United Nations 2001, 2005.

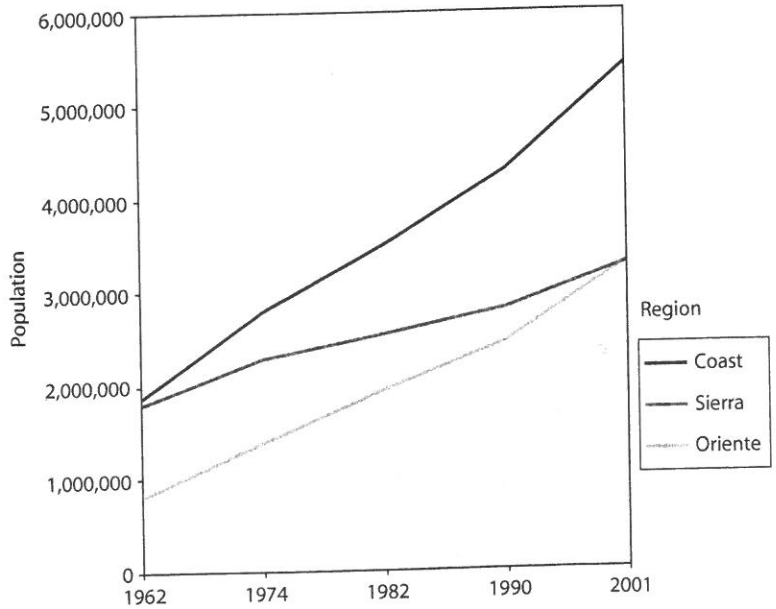


Figure 8–4 Population growth in Ecuador by region.

Source: Minnesota Population Center 2007.

remaining coastal forests and significantly reduce the size of forests in the Oriente. A more sophisticated analysis forecasts an entirely different outcome that is borne out empirically. Limited to data from the most recent years available, Figure 8-5 shows that in recent years rates of population growth were highest in the Oriente and lowest on the coast, while rates of deforestation have been highest in the Sierra and lowest in the Oriente. How can an area with the highest rates of population growth have the lowest rates of deforestation?

The simple answer is that the relationship between population growth and environmental quality is not the same from place to place, even in a country as geographically small as Ecuador. Ecuador's coast has seen high levels of absolute population growth but the lowest rates of growth in the country. Deforestation rates appear high but reflect the relatively small size of the coastal forests remaining in 1996. Sociologist Thomas K. Rudel classified Ecuador's Pacific coastal forests as similar to those in Central America and the Caribbean, where most primary forests were cleared early in the process of European colonization to make way for export agriculture, leaving only remnant forests in relatively inaccessible locations. The coastal economy today remains centered around export-oriented agriculture but with large urban centers and tourist zones. Deforestation still occurs when

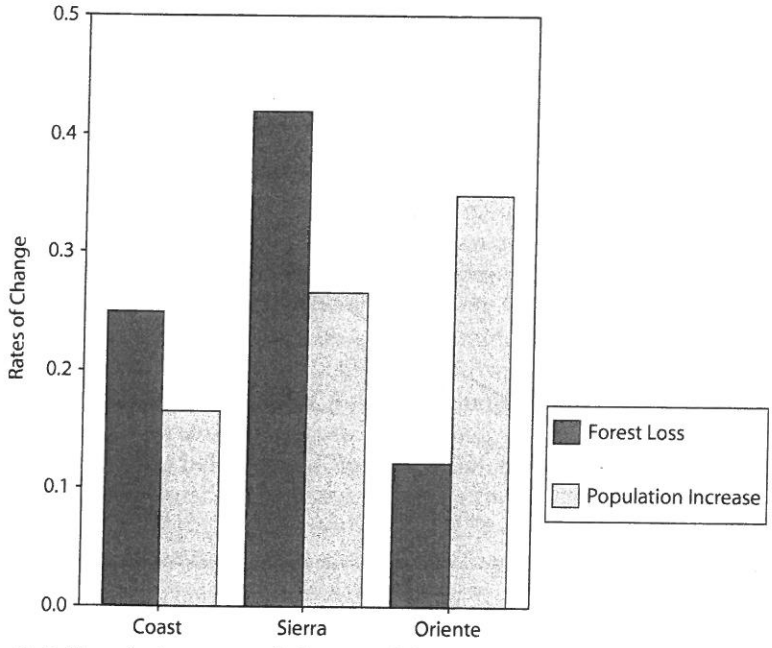


Figure 8–5 Ecuadorian rates of change of forest loss (1996–2000) and population growth (1990–2001).

Sources: Minnesota Population Center 2007; Food and Agriculture Organization of the United Nations 2005.

small farmers clear marginal forests to meet urban demand for food or create shrimp ponds in mangrove forests; however, plantations replaced most of the region's forests generations ago, and urban residents increasingly consume food produced elsewhere. The remnant forests that still exist are now located only in those areas most inhospitable to agricultural expansion; thus, the actual threat of population growth on remaining coastal forests is limited. Rudel even suggests that places like Ecuador's coast are excellent for promoting ecotourism (see Lesson 20) and environmentally certified agricultural products because urban and international consumers and tourists can exert great pressure on the quality of goods they purchase and relatively few locals depend directly on the forest for their livelihoods.

In contrast, Ecuador's Amazonian region shows relatively high rates of population growth but relatively low rates of deforestation, although these figures are also somewhat distorted by the region's relatively small population and large forest in 1996. Most of the Amazon basin was too remote and inaccessible to be converted to plantation crops; distance continues to limit the profitability of farms except along main transportation corridors. As is true elsewhere in the Amazon basin, these geographical obstacles have also concentrated populations in cities, while rural areas face chronic shortages of labor. Urban population growth, measured either absolutely or as a rate, affects forest conversion in two ways. The demand for agricultural products in Amazonian cities has led to forest clearing on transportation corridors and has encouraged land-extensive ranching adjacent to these corridors. Since the region's fast-growing cities absorb excess labor, farmers utilize land-extensive, rather than labor-intensive, strategies to make their farms productive. After initial clearing, small-scale cattle ranching requires little human labor, which can often be performed by women and children. In this way, a single household can clear and maintain farms of 100 hectares or more, with intensive agricultural activities concentrated nearest the transportation corridors and ranching beyond. Dramatic as this sort of deforestation may appear from roads, little deforestation occurs outside these corridors. As a consequence, inaccessibility will likely continue to protect large blocks of Amazonian forest, as demonstrated by the relatively low rates of deforestation displayed in Figure 8-5. Ecuador has also established indigenous reserves and national parks in the less populous regions of the Oriente, which may provide the institutional infrastructure necessary to protect these large forests over time.

Positive environmental outcomes seem less likely in the Sierra, which has seen the highest rates of deforestation recently and only moderate rates of population growth (see Figs. 8-4 and 8-5). Pre-Columbian and plantation agriculture had converted most valley and gently sloped land to agriculture long ago, leaving only remnant alpine forests. Temperate climates in Andean valleys and tenuous access to coastal ports limited the development of export-oriented agriculture, although greenhouses for cut flowers have provided some access to global markets in the past two decades. Most deforestation in the Sierra today reflects the removal of forests upslope from the

region's growing cities, where poor migrants clear land to provide housing, fuel, and subsistence for their families and sell whatever surplus they may produce. In this case, population growth has a direct effect on forest cover: More people trying to live in and from these forests leads to more degradation. Thus, although population growth in the Sierra has been slow when compared to the coast and the Oriente, this growth has had a direct negative effect on the region's forests. The loss of remnant forest buffers in the mountains that cradle Ecuador's cities creates additional environmental problems for these cities, including erosion, degradation of water sources, and poorer air quality. Forest conservation and management in this context are hampered by the increasing numbers of squatters, their inability to meet their immediate needs except by extracting short-term gains from the forest, and the absence of control over access to these forests. In the Sierra, even slow population growth will likely have major negative effects on the region's environment.

This foray into Ecuador's forests underscores the complexity of the relationship between human populations and the nonhuman environment. At the regional level, human populations can expand while creating the conditions for environmental protection (as in Amazonian parks) or conservation (as with coastal ecotourism). However, growth in the number of people who are directly dependent on the environment (like squatters in the Sierra) does tend to degrade the local environment. Ecuador also demonstrates that the relationship between food production and population growth makes no sense on national and subnational scales; global food commodity chains and urban markets have freed human populations from their local food sources. Plantations in the Sierra and coastal regions have removed the best land from production of food for local populations, while small farmers in Amazonia clear forests mainly for urban markets. Both situations transfer the reason for food production from supporting human populations to supporting human economies. Consumer preferences for greener products may thus have a greater effect on environmental quality than population control. Finally, demographic trends are best understood within their social and historical contexts. Slow population growth in the Sierra does more damage to that region's forests than faster population growth in the coastal and Amazonian regions. To understand this situation requires more than a statistical representation of population growth; a sociological and historical perspective illuminates the patterns of resource use and inequality that shape this relationship.

CONCLUSION

Ecuador represents a tiny fraction of the world's growing human population, but sociologists must consider population dynamics and the demographic profiles of affected communities, whether considering environmental issues

on a local, national, or global scale. How many people live in an area, their characteristics, and how that population changes in time determine how they interact with their environment. We don't yet understand the full implications of 7 billion people for the global ecosystem, but with more people, rising levels of consumption, and more damaging technologies, global environmental problems such as climate change and atmospheric ozone thinning point toward more serious concerns for the future. Moreover, the uneven distribution of resources, ranging from food to stop famines to political power to compel remediation of contaminated sites, underscores the importance of understanding not just population growth but contextualized demography as an element in environmental sociology.

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