



Environmental and Social Systems

Emilio Moran

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■ Surface Features

Many people tend to think of the physical or surface features of an environment as largely irrelevant to historical or political developments. However, by looking at the northern portions of Mesoamerica from a geological perspective it is possible to understand why they form one unit, and why the area has been a politically disputed one. The Rio Grande boundary, which separates Mexico from the United States, is merely a river that cuts across a region with fundamentally the same physical environment. The area's mineral and petroleum resources are also important to its history. At one time Spanish America, and later Mexico itself, extended over much of this unified geophysical region, although control of it was eventually lost by occupation and military victory on the part of the expanding United States. That earlier Hispanic settlement of the United States Southwest influences to this day the region's ethnic composition and plays a role in the movement of Mexican workers across a border that is a political fact, but does not express geophysical or ethnic realities. This social and environmental situation helps explain the difficulty of negotiations between Mexico and the United States over illegal migration, water rights, and land use.

At about 20° north latitude this unified geophysical area made up of folded mountain ranges separated by either deep troughs or plateaus gives way to an east-west range system of great instability marked by volcanoes. This is an area of considerable strategic significance since it links two large continental masses and two oceans. The Panama Canal is just one of the most obvious strategic pass-throughs; until recently it was a subject of lively controversy between the United States and Latin American nations. The Caribbean and lower Central America have always been of interest to major powers, beginning with the European colonialists who fought for control of various points there—as witness the French, Dutch, British,

and Spanish holdings in St. Croix, Curaçao, Barbados, and Hispaniola (today's Haiti and Dominican Republic). Given the activities of the colonial powers on both the Atlantic and the Pacific, a pass-through—whether overland or by canal—was of both military and economic value. Such interests played a role in the political divisions to be found in both Central America and the Caribbean.

The South American continent has the least indented coastline of all continental areas. The Andes form the most impressive physical feature of the landscape, although they do not really form a single mountain chain. Rather, they are a continuous mass of interconnecting mountain systems.² There are the permanently snow- and ice-covered uninhabited areas along the Chile–Argentina border; the broad and populated areas of the Bolivian tableland, or *altiplano*; and the densely populated intermontane valleys of Peru, Ecuador, Colombia, and Venezuela. A zone of great aridity sweeps across Peru, Chile, Bolivia, and Argentina, including even the coastal areas of the first two states. Precipitation is profoundly affected by the mountain ranges so that available moisture is very diverse from place to place.

Less dramatic than the Andes but no less significant in shaping the landscape are the Brazilian and Guiana shields. Both shields or plateaus have influenced greatly the occupation of the vast Amazonian lowlands. The plateaus or plains called *llanos* or *campos* are covered in savanna vegetation. The heart of the plateaus is drained by the great Amazon River and its many tributaries. The Brazilian plateau is also drained in a southern direction by the Paraná–Paraguay river system. As the Guiana and Brazilian plateaus drop off into the lowlands, rapids are formed. The presence of these rapids provides the continent with considerable hydroelectric potential that only recently has begun to be tapped. However, in the past and well into the contemporary period, these rapids were obstacles to occupation by European colonists. Settlement of the Amazon Basin by nonaborigines

was largely confined to the first 150 kilometers from the main channel of the Amazon. Only in the past two decades have Latin American nations begun to overcome this physical constraint by building highways above the rapids. By doing so, they are opening up the 95 percent of the basin that had remained the preserve of native Amazonians and small settlements that had only seasonal contact with national institutions.

Climates

Nearly every climate of the world is found in Latin America. Most of Latin America lies in the lower latitudes, the more equatorial zones, where it is broadest in an east-west direction. Where South America's triangular shape narrows, the latitudes are mid to upper and thus characterized by more temperate climates.

The west coasts of Latin America are most influenced by cold ocean streams moving in an equatorial direction—the California Current and the Peru Current. These stabilize the air above them; because they tend to prevent it from rising, they produce very dry conditions. As a result, coastal Peru and the Atacama Desert of northern Chile are among the driest places in Latin America. The desert of coastal Peru, however, is crossed by numerous small rivers coming from the Andes. In pre-Columbian times and into the present, these arid lands have been the object of intensive irrigation agriculture (see chapter 2).

The eastern coasts of South America, by contrast, are bathed by warm currents that bring massive amounts of water vapor into the Amazon Basin and the coastal regions. These areas are characterized by high relative humidities and more moderate temperatures than the dry but hot western coasts. Contrary to common belief, Amazonian temperatures are a relatively even twenty-five to twenty-six degrees centigrade, whereas the hotter areas are found in the Gran Chaco, and in the coastal cities farther south. The high relative humidity, hovering

around 85 percent year round, gives the impression of high temperatures noted by visitors to the Amazon.

Three-quarters of Latin America lies within the tropics, but this fact can be deceptive for a number of reasons. Climates are not just a function of latitude. Altitude plays an important role in shaping microclimates, and the Andean chain and the Mesoamerican highlands claim an important proportion of the Latin American habitat. High-altitude environments are characterized by zonation—in other words, by vertical zones that correspond roughly to latitudinal changes. Thus, within a short distance a mountain can have tropical lowlands, temperate grain-and-tuber-growing areas, alpine pastures, and snow-covered peaks. The configuration of the mountain ranges lead to patchy kinds of soils and changing airflows, which cause variations in humidity that offer many opportunities for exploitation. The populations of Latin American highlands in pre-Columbian times, as in the present, have engaged in complex systems of trade across these vertical zones, assuring themselves of a wide range of resources within relative proximity, whereby they reduced the human cost of obtaining a varied diet and other desired resources.

■ **Soils and Vegetative Cover**

Unlike most regions of the world, Latin America still has many significant areas of forested land. Their distribution varies a great deal from country to country. Tropical forests in the Caribbean and Central America have been much reduced, as have those of lowland and coastal Mexico. By contrast, Brazil has the greatest forest reserves in the world, although current rates of deforestation in the Amazon give cause for some alarm. Why be concerned with the fate of Latin American forests? Besides the important place that forests play in protecting the soil below them, there is growing evidence that the humid forests of the tropics recycle vast amounts of water vapor, portions of which affect rainfall in

North America. In addition, one should ask if the uses of such forested land are appropriate or productive. Much of the tropical forest in Latin America has been converted to low-quality pastures. Is that a suitable form of land use, seen from an environmental or social point of view? Later in this chapter we examine this question.

As Figure 2 indicates, the vegetation of Latin America includes vast areas of forests (both tropical and temperate), shrub and steppe, grasslands, and desert and mountain flora. Considerable research in recent years has changed our views about South American tropical forests. Rather than consider them homogeneous masses of evergreen vegetation, investigators now note the great diversity of vegetation and the need to protect the many distinct floras by a complex system of parks. Likewise, the soils are now known to be as variable as in any other area on earth. Thus the tropical rain forest is a multifaceted resource to be used in a complex balance of conservation and development. Severe deforestation took place in the 1970s because of subsidies for the development of cattle-ranching, but a public outcry led to an end to these subsidies and to a reduced rate of deforestation in the 1980s.³ Much of the tropical moist and rain forest of the Caribbean islands has long been cleared except for steep or mountainous areas that have not been attractive to farmers or plantation owners.

Tropical semideciduous forests are found throughout the West Indies, on the Pacific coast of Central America, and over wide areas of southeastern Brazil and eastern Paraguay (see Figure 2). Many of these have also been eliminated since such areas have been preferred for human occupation and modern urban-industrial development. Tropical thorn forests occur in areas with arid and subhumid climates such as the interior of northeastern Brazil and the northern plateau areas of Mexico. Temperate forests are found in small areas of southern Mexico, southern Brazil, southern Chile, and in mountain areas.

Both tropical and temperate grasslands can

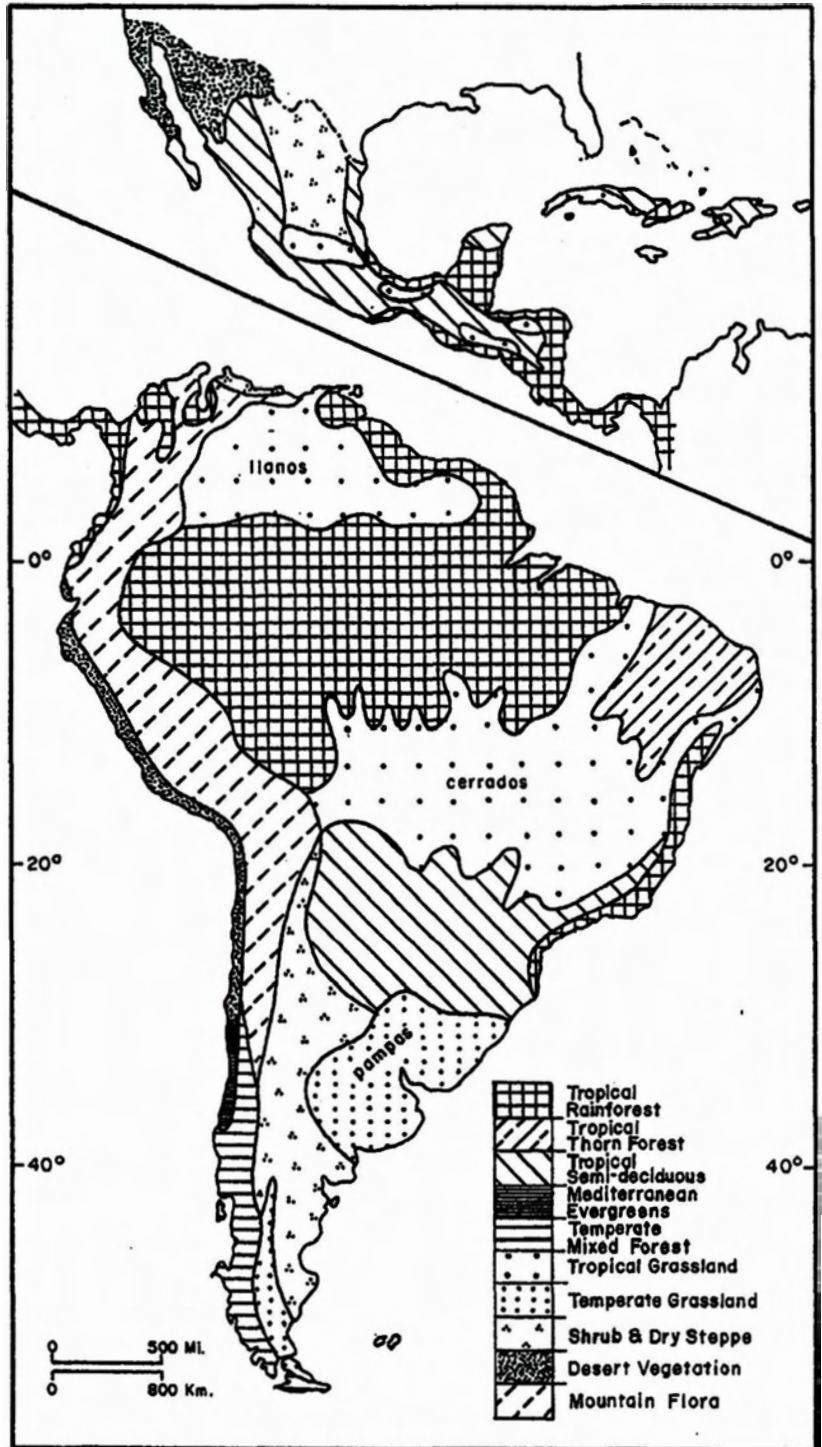
be found in Latin America. Dry savannas occur in both the plains of Venezuela (i.e., the *llanos*) and the plains of Brazil (i.e., the *cerrados*) and are characterized by a marked six-month dry season. Wet savannas are richer in grass species and have fewer tree species than dry savannas. Wet savannas occur in the southwest of Brazil and parts of Paraguay. Temperate grasslands are largely confined to the estuary of the La Plata Basin. Here are the well-known *pampas* of Argentina and Uruguay. The *pampas* are completely treeless except along water courses, unlike the *cerrados* of Brazil. Grasslands supported native animals that were rapidly eliminated by the colonial population. In their place grew a cattle industry that was so successful that Latin Americans have tried to implant cattle raising almost everywhere they have gone in the region.

The desert areas of Latin America vary considerably in vegetative cover. The semiarid areas of Mexico and northwest Argentina are covered in a scrub forest of stunted dwarf trees. The Atacama Desert is almost completely devoid of vegetation, as is the Pacific coastal margin of Peru and northern Chile. However, even along these extremely dry desert areas, vegetation exists along the west-flowing rivers and streams. These river valleys formed the basis for many complex Andean civilizations of pre-Columbian times. The Sonoran Desert of Mexico is less harsh, and broad-leaved shrubs and succulents may be found. Semidesert conditions prevail in many intermontane Andean plateaus covered in patchy grass and scattered herbaceous growth.

The soils of Latin America are extremely varied, despite their proverbial lack of nutrients, their high acidity, and their potential of turning irreversibly into hardpans. Rich soils may be found along the highlands of Central America and Mexico, the productive agricultural areas of São Paulo and Paraná in Brazil, the coastal zone of northeastern Brazil, and in the *pampas* of Argentina and Uruguay. These areas are rich for different reasons, the *pampas* because of their temperate grass cover with deep organic layers

FIGURE 2

Natural Vegetation of Latin America



Source: Harry Robinson, *Latin America: A Geographical Survey* (New York: Praeger, 1967), p. 32.

built up over time. The São Paulo-Paraná *terras roxas* (red clay soils), also found in the Amazon in Rondônia and in portions of Altamira, Pará, result from diabase outcroppings and are of high to medium fertility. The *massape* soils of coastal Brazil, black soils rich in clay and organic matter, are derived from decomposition of Cretaceous limestones that supported ancient and now gone forests. The rich soils of the Mexican and Central American highlands originate from volcanic activity and the exposure of basic rocks (i.e., diabase outcroppings, as above) by weathering. Many of Latin America's floodplains are also rich in soil resources that can provide a bountiful agriculture. The Amazon floodplain, although composed of only 2 percent of the total basin, is an area comparable in size to that of many European countries in total land area. Many other river valleys and deltas also support dense populations and still harbor considerable agronomic potential.

■ Human Use of Soil Resources

Most of the best soils of Latin America are already under cultivation, except for some in tropical forest regions only recently incorporated into national economic life. This is not to say that they have always been well managed. The Latin American economy since Columbus has been influenced by a preference for export agriculture over staple food production. This has meant that most of the best soils have been controlled by a few individuals who exploit only small areas of their total estates (about 19 percent in these vast estates or *latifundia*) and then in monocultures that tend to deplete the soil. The rural population has been forced into tiny plots or *minifundia* located on less productive, and sometimes steeper, land wherein forests that previously had been important sources of game and protection for soil resources were cleared.

The use of soil resources of Latin America cannot be judged in isolation from the systems of production imposed by pre-Columbian, colonial, and then national political systems. In

most cases, Latin American land use remains dominated by the *latifundia*/*minifundia* dichotomy and its associated poverty for the rural masses. The agrarian question in Latin America remains: How might the rural sector be restructured so that national economic goals are achieved and the disenfranchised masses secure greater access to basic resources? Latin American elites have long favored cattle ranches and pasture land as land use systems. Such systems of extensive land use lead to greater deforestation than output of the land justifies, limit access to productive land, and lead even small and mid-size landholders to imitate them, still further compounding the problem. Cattle ranching thus appears to be a strategy not so much appropriate to the Latin American landscape and soil resources as it is a strategy to maintain economic and political control over the all-important rural labor force.

The populations of Latin America have made use of their plant and soil resources in ingenious ways. The main constraint of the lowland soils is now known to be chemical—i.e., nutrients. Native populations cultivated them by clearing forested land, burning the forest, and making use of the substantial amounts of nutrients deposited in the form of ash to grow crops (i.e. swidden agriculture). In areas of volcanic origin, cultivators gave priority to the maize-bean complex with its greater demands upon soil nutrient resources, whereas in the lowlands of the Amazon, often of granitic origin and poorer in exchangeable bases, less demanding root crops dominated, with manioc as the major staple; cowpeas were also grown. Swidden agriculture when population density is low is an effective and economical means to exploit a forested environment. Similar practices could be found in forests along riverbanks in areas surrounded by either savanna or desert conditions.

Pre-Columbian people also adjusted to their own growing population. In areas of Mayan civilization and along the floodplains, recent research has uncovered complex systems of intensive cultivation that involved raised fields,

chinampas or floating islands created by heaping muck from waterways, and other forms of concentrating organic soil matter in order to increase yield per unit of land.⁴ Such techniques were used not only by the lowland classic Maya. Studies have uncovered raised fields in north-eastern Bolivia, northwestern Colombia, the Rio Guayas Basin of Ecuador, the Lake Titicaca Basin of Peru and Bolivia, in the Llanos de Mojos of Bolivia, along the Rio Candelaria in western Campeche, Mexico, large areas in the Petén region of Guatemala and in Belize, in Veracruz, and in the upper Mantaro Valley of Peru.

Raised fields appear as the most important form of pre-Columbian hydraulic agriculture, whereby water and soil were carefully managed to make nutrient-poor or poorly drained soils contribute to the feeding of populations. Use of these methods seems associated with high population densities. In the highlands, terracing and gravity irrigation seem far more important because the problem there is not so much poor soils as it is their shallowness and lack of water. Complex systems of hillside terracing near water sources put into production land that otherwise would have been too steep to cultivate. Even to this day many areas that were under intensive production in the highlands and lowlands of Latin America before 1492 have not been returned to cultivation because of the demographic disaster that followed the European arrival and the imposition by Europeans of systems of production oriented toward export crops not necessarily suited to the forms of land intensive agriculture practiced by native populations. A number of countries, among them Mexico, Venezuela, Peru, and others of considerable economic strength appear unable to feed their burgeoning populations—yet they seem to ignore the recent evidence for systems of intensive agriculture capable of cultivating otherwise marginal lands. Instead, countries seem bent on cutting all their forests and maintaining systems of agriculture that are impressive only by their mediocre output when natural conditions are not ideal.

At high altitude, where conditions varied

along an altitudinal gradient, native peoples developed systems of terracing and irrigation of considerable sophistication that required enormous labor investment. At high altitude the constraints on cultivation tend to involve soil depth and moisture rather than nutrients. Terracing provided a growing medium of greater depth than that of the natural slope of the land and protected the soil from wind and water erosion. In addition, the terraces were interconnected to water springs so that moisture levels could be maintained that allowed plants to develop properly. At the peak of Andean pre-Columbian civilization, slopes as steep as 60 percent were under cultivation. Many of these were allowed to go into disuse because of the depopulation following European occupation and imported disease. In short, over large areas of Latin America to this day, people rely on ancient systems of land use that reflect conservation-oriented approaches to land management. The erosion problems noted by many scholars have resulted from systems of land use that have overlooked the value of traditional systems or their inappropriateness to levels of population density well above pre-Columbian systems.

These conservation-minded approaches are practiced more often than not by people somewhat isolated from the national economies of Latin America. As noted above, where national priorities govern, the tendency is to favor extensive cattle ranching or export monoculture. Latin American agriculture in most cases has had stagnant productivity. It has kept up with population growth not so much by increasing efficiency but by increasing the amount of land in cultivation. Only in isolated pockets has Latin American agriculture achieved high productivity per unit of land, and then primarily in export crops such as bananas, coffee, soybeans, and oranges.

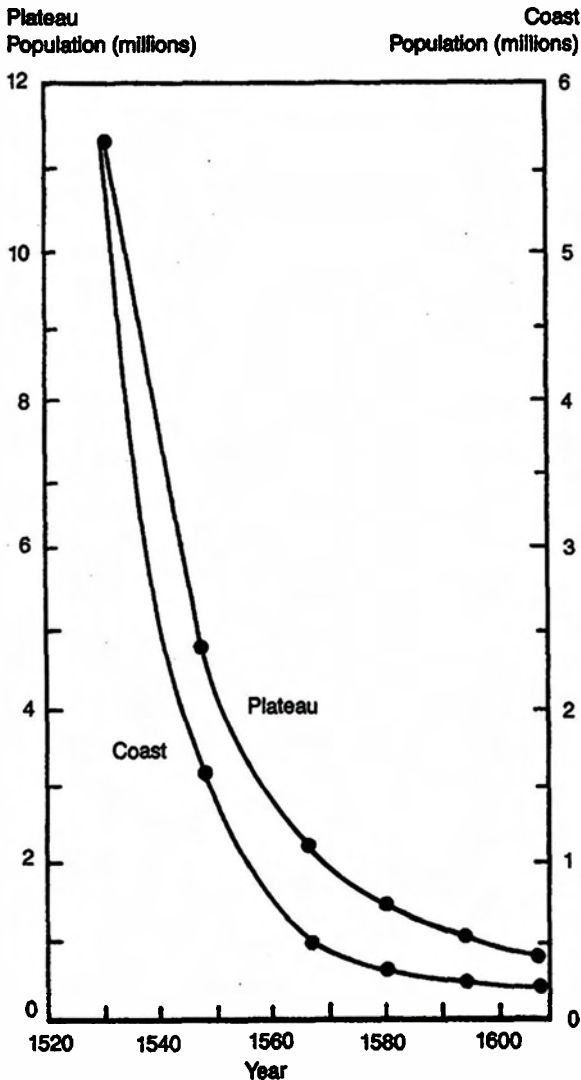
Population

Three major issues dominate studies of the Latin American population: racial mixing or *mestizaje*, slavery, and the explosive rates of growth since

World War II. It is hard to discuss Latin American society without considering the rapid racial mixing that took place in the New World between Iberians and Amerindians, and later with the Africans brought over as slaves. The imposition of a slave-based plantation economy on

Figure 3

Population of Plateau and Coastal Areas of Central Mexico



Source: Sánchez-Albornoz, *The Population of Latin America*, trans. W. Richardson (Berkeley: University of California Press, 1974), 49.

most of Latin America has also been understood to have shaped the region and to help explain the rift between classes that persists to this day. A more contemporary issue has been the rapid population growth in the past three decades. This increase results from a drop in the death rate, especially among infants (see Table 1), and from significant improvements in many Latin American economies.

It is impossible to discuss the evolution of Latin American populations without taking note of the demographic disaster that accompanied the Spanish Conquest (see Figure 3 for a glimpse of the scale of the disaster). The arrival of Europeans in the New World brought diseases to which Amerindians had no resistance, and which in large part explain the ease with which a relatively small band of Iberians was able to subdue the complex militaristic kingdoms of the Incas and Aztecs. Historians vary considerably about the size of the pre-Columbian populations. Estimates suggest that mortality in the first century from this biological contact was between 45 and 90 percent. These estimates are in accord with the better-documented mortality rates of native Amazonians in the past decade—populations that had managed to remain relatively isolated from national systems and are now reached by development projects into the Amazon.⁵

Latin America recovered gradually from the demographic calamity of the sixteenth century. In the aggregate at least, the per annum growth rate between the seventeenth century and the third decade of the twentieth century is estimated at between 0.8 percent and 1.3 percent.⁶ These figures compare to those of Europe. Indigenous communities appear to have stabilized overall, although decimation due to famine and disease has continued in localized areas. The most significant impact on population since the seventeenth century was from slavery, which brought millions of Africans to the New World. Estimates of the volume of forced migration of Africans vary greatly, partly because of the destruction of importation records in Brazil soon after the abolition of slavery in 1888 and creation

TABLE 1

Infant Mortality Rate in Nine Countries, 1920-1967 (per thousand live births)

| | 1920-24 | 1930-34 | 1940-44 | 1950-54 | 1967 |
|------------|---------|---------|---------|---------|-----------------|
| Argentina | 100 | 82 | 74 | 65 | 58 |
| Cuba | 135 | 78 | 61 | — | 44 ^a |
| Panama | 110 | 101 | 81 | 60 | 43 |
| Costa Rica | 174 | 160 | 131 | 88 | 62 |
| Guatemala | 142 | 125 | 127 | 110 | 94 ^b |
| Mexico | 178 | 142 | 105 | 92 | 63 |
| Venezuela | 153 | 130 | 120 | 88 | 41 |
| Colombia | 159 | 155 | 143 | 125 | 78 |
| Chile | 250 | 212 | 170 | 119 | 92 |

^a1966. ^b1968.

Source: Sánchez-Albornoz 1974, 200.

of the republic in 1889. The great majority of slaves went to Brazil and Cuba, the last countries to abolish slavery as a system. Between 1761 and 1860, viewed by many as the peak of the slave trade,⁷ an estimated 1.7 million slaves were imported into Brazil, Cuba, and Puerto Rico. Total figures for the colonial period and early national period vary around 4 million. In Mexico, Central America, and the Andean nations, the labor in the plantations came from the remnants of the complex societies that inhabited these areas and that were able to survive only by force of their initial numbers. In Cuba, Puerto Rico, and the coast/interior of Brazil, aboriginal societies were less dense and less able to cope with the depopulation. Plantation owners were forced to go to African markets for their labor.

Sharing the ideology of Europeans, Latin American elites in the nineteenth century began to explain the poor condition of their economies by the racial composition of their population. Thus most governments promoted European immigration in order to get "more advanced people" into their countries to stimulate the economy. The greatest number went to Brazil, followed by Argentina, Chile, and Uruguay. However, because of their much smaller populations, the impact of the immigrants was most felt in Argentina, Uruguay, and Chile. "The net in-

flow into Argentine ports between 1881 and 1935 amounted to 3,400,000."⁸ Not all who came stayed. In the period just before World War I there was almost as much return migration to Europe as there was migration to Latin America. The millions who went to Argentina and Uruguay were enough to populate both the countryside and the cities. In both Brazil and Argentina the greatest proportion of immigrants came from the Iberian Peninsula and Italy. Brazil is unusual because of the large numbers of Germans and Japanese that it allowed in. A greater proportion of the Japanese appear to have stayed as immigrants than most other nationalities, and their impact is significant in contemporary Brazil.

The massive influx of Europeans and Japanese into Latin America speeded up the growth of countries that received them, changed the geographic dispersion of population, and began the pattern of dynamic population increase that had already begun in southern Europe and Japan. Per annum growth rates in Latin America went from the moderate 0.8 to 1.3 percent of the previous two centuries to the range of 2.0 to 2.3 percent in the 1930-50 period. Uruguay's population increased sixfold in a fifty-year period, due in large part to immigration. During this period only Paraguay experi-

enced a population decline because of the War of the Triple Alliance, which decimated its male population. Brazil increased at a rapid rate, as did Colombia. On the other hand, Venezuela, Ecuador, Peru, Bolivia, and Mexico experienced relatively slow growth (see Table 2).

Following the Great Depression of the 1930s, Latin American population took off. Between 1940 and 1970 the population of Latin America increased from 126 to 277 million. Rates increased in each decade from 1.9 percent in 1940 to 2.3 percent in 1950 to 2.7 percent in 1960 and to 2.8 percent in the 1970s. No area of this size had ever grown at such rates before in recorded history—although Africa has surpassed these rates in the past and current decade. Central America has had the highest rates of growth,

reaching 3.3 percent annually in the 1960s. On the other hand, the rates of increase in Argentina, Chile, and Uruguay have been a more moderate 1.8 percent per annum (see Table 3). In the 1970s, to the surprise of many demographers, Latin American countries as a whole reduced their rate of population growth, except for some countries who were late in developing their economies and in introducing the modernization of public health services responsible for the drop in infant mortality.

The high rates of growth in societies then dominated by a traditional agrarian sector, wherein land was in control of a few, could not be supported without major change. The change in question was not a restructuring of the land distribution system, but massive migra-

TABLE 2
Birthrate (B) and Death Rate (D) in Ten Latin American Countries

| | | 1900-1904 | 1910-1914 | 1920-1924 | 1930-1934 | 1940-1944 | 1950-1954 |
|------------|---|-----------|-----------|-----------|-----------|-----------|-----------|
| Uruguay | B | 38.9 | 36.5 | 30.1 | 25.8 | 21.6 | 21.2 |
| | D | 13.7 | 13.5 | 12.6 | 11.5 | 10.3 | 8.5 |
| Argentina | B | 44.3 | 40.3 | 35.0 | 30.9 | 26.1 | 26.1 |
| | D | 20.0 | 15.6 | 13.8 | 12.2 | 10.5 | 8.8 |
| Cuba | B | 44.6 | 44.7 | 36.7 | 31.3 | 31.9 | 30.4 |
| | D | 23.7 | 21.4 | 19.3 | 13.3 | 10.9 | 11.3 |
| Panama | B | 40.3 | 42.0 | 40.0 | 37.4 | 39.5 | 38.5 |
| | D | 21.0 | 19.0 | 17.3 | 15.1 | 12.7 | 9.1 |
| Costa Rica | B | 46.9 | 48.9 | 44.9 | 44.6 | 42.8 | 45.0 |
| | D | 28.8 | 27.2 | 25.2 | 21.5 | 17.4 | 10.7 |
| Guatemala | B | 45.8 | 46.6 | 48.3 | 46.2 | 45.2 | 50.9 |
| | D | 35.4 | 33.0 | 33.7 | 31.7 | 28.5 | 23.4 |
| Mexico | B | 46.5 | 43.2 | 45.3 | 44.1 | 43.8 | 45.0 |
| | D | 33.4 | 46.6 | 28.4 | 26.7 | 21.8 | 15.4 |
| Venezuela | B | 41.8 | 44.5 | 41.2 | 39.9 | 41.5 | 44.2 |
| | D | 29.1 | 28.3 | 26.0 | 21.9 | 18.8 | 12.3 |
| Colombia | B | 43.0 | 44.1 | 44.6 | 43.3 | 42.2 | 44.0 |
| | D | 26.6 | 26.0 | 23.7 | 22.5 | 20.3 | 18.4 |
| Chile | B | 44.7 | 44.4 | 42.2 | 40.2 | 38.3 | 37.0 |
| | D | 31.6 | 31.5 | 31.3 | 24.5 | 20.1 | 13.7 |

Sources: Sánchez-Albornoz 1974, 171, 189.

TABLE 3

Recent Statistics Concerning Birth-, Death, and Growth Rates
(Annual rates 1965-1970 according to CELADE estimates)

| | Births | Deaths | Growth |
|--------------------|--------|--------|--------|
| Argentina | 23.0 | 8.7 | 15.4 |
| Bolivia | 43.8 | 19.0 | 23.7 |
| Brazil | 37.7 | 9.5 | 28.2 |
| Chile | 33.2 | 10.0 | 23.2 |
| Colombia | 44.6 | 10.6 | 34.0 |
| Costa Rica | 37.3 | 7.4 | 22.9 |
| Cuba | 27.3 | 7.5 | 19.8 |
| Dominican Republic | 48.5 | 14.7 | 33.8 |
| Ecuador | 44.9 | 11.4 | 33.5 |
| Guatemala | 43.5 | 15.1 | 28.4 |
| Haiti | 43.5 | 19.7 | 24.2 |
| Honduras | 49.0 | 16.9 | 33.6 |
| Mexico | 43.2 | 8.9 | 34.3 |
| Nicaragua | 46.0 | 16.7 | 29.3 |
| Panama | 40.5 | 8.4 | 32.1 |
| Paraguay | 44.6 | 10.7 | 33.9 |
| Peru | 41.8 | 11.1 | 30.7 |
| Puerto Rico | 26.7 | 6.6 | 15.4 |
| Salvador (El) | 46.9 | 12.9 | 32.9 |
| Uruguay | 21.2 | 9.0 | 12.2 |
| Venezuela | 40.9 | 7.8 | 33.1 |

Source: Sánchez-Albormoz 1974, p. 189.

tion to the cities, where the concentration of resources promised greater chances of upward mobility and economic well-being than the stagnant agrarian sector, with its low wages and restricted opportunity of access. The movement, too, has taken population from the highlands and coastal areas to the interior and the lowlands in the form of both government-directed and spontaneous colonization. Such movements have not absorbed that much population, but they have bought time for an eventual solution that still remains to be implemented.

Central America and the Caribbean, where some of the highest and most recent high rates of increase have been taking place, have turned to international migration for solutions, given the scarcity of unopened lands in their seaboard or latifundia-bound countries. However,

worldwide economic slowdowns have led to restrictive immigration laws that have reduced the effectiveness of migration as an escape valve.

Latin American cities and the developed world no longer offer the opportunity that they once did. While the concentration of resources in primate cities like Mexico City and Caracas continue to fuel rural-to-urban migration and to justify the hope of the millions who migrate each year, the level of competition for increasingly scarce jobs has become an explosive problem for urban dwellers. However, there is little evidence that the low quality of life in the rural areas (i.e., lack of schools and teachers, services, and health care) or the concentration of wealth in the hands of a few, motives behind the migration, are being addressed by most countries.

The population of Latin America in the next two decades can be expected to reduce its rates of growth because of drops in fertility, the stabilization in the death rate, and absence of major immigration across national boundaries or into the region as a whole. However, because of the relative youth of the Latin American population resulting from the high rates of annual growth between 1960-80, it can be expected to continue to grow at a rapid rate in absolute terms well into the twenty-first century. More of the population will be living in overcrowded cities. The quality of life in rural areas will depend on what changes take place in the decades ahead in land redistribution and productivity gains. The current evidence is very diverse: major gains in productivity in southern Brazil, side by side with low productivity elsewhere in that country. Mexico and Venezuela have increased productivity in one or two commodities, but their food production is behind population growth. Cuba has improved its sugar productivity after a devastating decline in the 1960s, but this was done by giving up on the original plan to diversify the economy from its traditional dependence on sugar. In short, Latin America's food/population balance depends on what happens in the international markets, in the political systems' re-

sponse to population needs, and in the adoption of systems of production capable of yielding more per unit of land and per unit of labor. Capital-intensive production, as Venezuela and Mexico well attest, have not proven adequate solutions to the needs for food and fiber of Latin American peoples.

Human Adjustment to the Environmental Conditions

What significance might one find in these environmental features of Latin America? While it is risky to attempt to make correlations between environmental features and social features, human occupants of Latin America have had to adjust to the habitat, or they have had to pay a heavy price for ignoring it. Human occupation of the high Andes (above three thousand meters) requires both physiological and cultural adjustments to the stresses posed by high-altitude hypoxia (from oxygen deficiency), cold, and low biological productivity. Over time, native Andean populations developed forms of adjustment that permitted them to exploit those regions, to reproduce successfully, and to build impressive civilizations at high altitudes.⁹

When the Spaniards arrived, they brought their cultural habits and physical adjustments to lower altitudes. Within a few decades, the Spanish moved their capital city from Cuzco to Lima on the lowlands, explicitly because both cattle and women had a high rate of fetal loss due to oxygen deprivation.¹⁰ Thus, the integrity of Andean cultures over the centuries of Spanish occupation can be attributed not only to their value and endurance, but also to their relative isolation because of Spanish preference for denser settlement at lower altitudes.

Among the adjustments made by high-altitude natives one finds developmental, acclimatory, and behavioral-cultural changes. People born or living above three thousand meters during childhood (under age eleven) appear to have a denser capillary bed in the lower extremities and greater lung volume to process

more of the low-oxygen air. Other changes result from prolonged residence at high altitude, such as greater red blood cell production to increase the blood's capacity for carrying oxygen to tissues. Behavioral and cultural adjustments address more of the other stresses of high altitude such as cold, aridity, and low productivity. High-altitude populations in the Andes control small plots in various parts of the highlands, giving them access to a variety of plant-growing conditions and crops. This access is guaranteed by intermarriage and trade. Efforts to consolidate landholdings in the Andes and other highland areas of Latin America or to redirect trade to the cities and away from other highland zones is likely to result in the breakdown of many settlements. This would further fuel the rural exodus to the cities. Misinformed urban planners have made, and continue to make, efforts to enhance the marketing of highland goods to the major cities. Once these systems of intramountain trade are disrupted, bound as they are by marriage and regularity of exchange, they may not be easily rebuilt.

Isolation has helped certain Latin American peoples to survive. The survival of many lowland Amazonians is explainable by the difficulty of access created by the rapids of the Brazilian and Guiana plateaus. Many indigenous peoples fled to the areas above the rapids during the sixteenth century to escape enslavement and disease. Portuguese settlements were thus confined below the rapids, and their impact on native people was lessened well into the late nineteenth and early twentieth centuries. The reduced economic value of these inaccessible areas to Portuguese and Brazilian colonists gave native Amazonians several centuries of relief from cultural and biological destruction. Unfortunately, the devastating effort of progress has resumed in the past decade as national economies reach deep into their Amazonian territories for land and mineral resources.

The interplay between environmental and social systems points out the importance of understanding the present in the light of past

physical and socioeconomic realities. Current regional developments that often baffle the reader of news from Latin America can be understood in this holistic perspective. It is very hard to explain Latin American preference for coastal settlement without an understanding of the mercantilistic and export-oriented economies that have dominated the region. It is difficult to explain why European settlers who migrated to Latin America during the nineteenth century preferred to go to southern Brazil, Argentina, and Chile unless one understands the oppressive presence of slavery over most of northern and southeast Brazil up to its abolition in 1888 and the poverty of the population of these Latifundia-dominated areas. Concentration of European immigrants in the southern regions provided the human conditions needed to develop systems of production different from the paternalism and large estates dominant in northeastern Brazil and transferred to the center-east. Many Europeans brought to Latin America a preference for urban settlement, for cottage industries, and for intensive production using mixed systems that Brazil and most of Latin America lacked until the late nineteenth century. Despite the presence of these mixed farmers operating successful farms of small to medium size, their example was not followed because elites continued to conform to the earlier pattern of extensive control over land, cattle ranching, and an impoverished rural work force living as subsistence tenants.

Latin America can be treated as a whole, but for clarity its lands must be divided into socioenvironmental systems with varying resources. For example, northeastern Brazil cannot be understood if treated as a whole. Rather, northeastern Brazil must be understood as made up, minimally, of three human ecological systems: the wet coast, the *agreste* (an irrigated area), and the *sertão*, a semiarid interior. The coast is an area of rich soils with abundant rainfall and semideciduous tropical forests. The forests laid down rich soils that supported a thriving sugar plantation economy for well over two

hundred years. The region was so specialized in sugar production that a separate area had to be found to produce staple crops and meat. Such an area was the semiarid interior of the north-east. Thus two distinct and interconnected types of human settlement developed with quite a different environmental impact: the extensive plantation with settlement clustered around the manor house, and the isolated homes of the *sertanejos* (or natives of the semiarid region) who herded cattle through a scrubby, spiny, arid flora (xerophytic) suited to an area where rainfall was unpredictable. The terms of trade were usually unfavorable for the *sertanejo*, yet the area provided anonymity to many escaped slaves and to others seeking better opportunities than those provided by a slave-owning society.

The *agreste*, an intermediate zone between the coast and the interior, grew into a significant agricultural region only in the nineteenth century with the development of irrigation and the exploitation of river valleys that cut through it. The neglect of these valleys speaks to the single-mindedness of the Portuguese and postindependence Brazilians in viewing the northeast as coastal and sugar-producing—rather than containing the environmental conditions for a productive agriculture geared to annual and staple crops. Even today, national investment in the *agreste* and in the irrigation of the interior pales in comparison to the investments made in other regions and sectors of the economy.

The northeast has one of the lowest per capita income levels in the world, although Brazil has one of the highest per capita incomes in Latin America and already the tenth-largest GNP in the world. The northeast is hampered by its recurrent droughts, by land concentration in the hands of a few, by limited investment in staple food production, and by unfavorable terms of trade that have in the past drained the profits of its agricultural sector to finance the industrial development of southern Brazil.

Thus the conditions of the northeast are a product of environmental and social processes

that reflect the alliance of vested interests in northeastern Brazil with national interests in economic development in areas with the greatest competitive advantage. Land taxes in northeastern Brazil are less than one dollar per square mile per year, and such a low tax provides no incentive to put land into production.¹¹ Thus the northeast is unlikely to improve its condition until the nation sees fit to overlook the initial economic disadvantages of investment in that region and is willing to restructure access to land resources so that it is used by those willing to work it.

The occupation of Andean South America was profoundly affected by the location of native peoples and the presence of ancient human settlements near important resources. During the early occupation of Latin America the most important resource to be controlled was land—and the labor to exploit it. Thus the early European settlers sought control over native labor in order to extract the natural resources of the New World. In the Andes such a task was easy, since the complex, stratified kingdoms there had already identified many of the resource-rich areas of the region, giving the Spaniards a ready way to locate and to control both land and labor. This structure, as texts on Latin America have often noted, helps to explain why a handful of Spaniards were able to subdue the might of the Incas and the Aztecs. Not only did the native populations believe in a myth of a returning white-skinned god, and not only did confusion arise from epidemic disease, but the Spaniards simply replaced the top of the pyramid of classes, maintaining many of the existing control structures. Thus the many forms of class-based control of labor remained largely unchanged.

In short, the Europeans who colonized Latin America adopted socially stratified systems of control wherever they existed and used them to exploit minerals and other resources. In those areas, like the Amazon lowlands, where political systems were less centralized and control weaker, they sought to concentrate labor into missions and plantations. There they imposed

systems of production brought over from southern Spain and Portugal—areas dominated by large properties rather than small, mixed peasant agriculture typical of these countries' northern regions. The initial goal was to extract maximum profit from the new land in the shortest amount of time. Later the aim was to maintain control over the land and the labor force to exploit it, as the settlers made the region their home and abandoned thoughts of returning to the Iberian peninsula.

In recent years Latin American food production as a whole has kept up with population, but there are exceptions to the rule. Mexico and Venezuela, in particular, have had great difficulty because of the abandonment of the countryside by those who are responsible for staple food production. Most capital-intensive food production in Latin America on larger farms is geared to export crops rather than staples. Political figures of every ideological persuasion have given priority to a cheap staple food policy that has depressed production. It simply has not paid to produce staples in most countries because of price controls. At the same time, available credit has been absorbed primarily by the largest operators, leaving very little long-term financing for the small farmer who produces for the domestic consumer. The end result has been less and less food per capita in a number of countries and more urban consumers as the farmers become urban migrants.

Latin American environmental and social systems have changed a great deal since colonial times, yet much remains the same. After World War II Latin America came to have the world's highest rates of population growth. Such growth exacerbated social inequities in most of the countries and brought about considerable ferment and revolutionary stirrings. Many Latin Americans are fully aware of the inequities of their systems. The elites, however, retain a paternalistic outlook resulting from their long-standing control over resources: They hope to maintain the status quo and prevent a loss of power to others.

The masses hold a considerable range of views, depending on relative social status. In countries like El Salvador, where population pressure and land maldistribution prevents significant numbers from eking out even a minimal standard of living, many have little to lose by the overthrow of existing regimes. Larger countries like Brazil have a greater range of opportunities and greater resources to exploit, so there the potential for radical change is considerably reduced. What is most striking about Latin American social and environmental systems is the predictability of the social systems. Time and again their beneficiaries fail to recognize the great diversity of environmental resources possessed by most Latin American countries or to incorporate the vast majority of the population—through education and participation—into a common effort from which all, rather than a tiny elite, benefit. Latin Americans crave such an opportunity, but four centuries of inappropriate systems of land use and labor exploitation, coupled with elites more allied to external capital than to their own people, provide a poor basis for significant restructuring of Latin American social and environmental systems.

■ Notes

1. My description of Latin America is based on H. Robinson, *Latin America* (London: MacDonald and Evans, Ltd., 1961), 2 and James Preston, *Introduction to Latin America* (New York: Odyssey Press, 1964), 23 and 25.
2. Kempton Webb, *Geography of Latin America: A Regional Analysis* (Englewood Cliffs, N.J.: Prentice-Hall, 1972), 33.

3. Emilio F. Moran, ed., *The Dilemma of Amazonian Development* (Boulder, Colo.: Westview Press, 1983).
4. W. Denevan, "Development and the Imminent Demise of the Amazon Rain Forest," *Professional Geographer* 25 no. 2 (1973): 130–35.
5. *Ibid.*
6. N. Sánchez-Albornoz, *The Population of Latin America*, trans. W. Richardson (Berkeley: University of California Press, 1974), 86.
7. P. Curtin, *The Atlantic Slave Trade: A Census* (Madison: University of Wisconsin Press, 1979).
8. Sánchez-Albornoz, *op. cit.*, 154.
9. P. Baker and M. Little, eds., *Man in the Andes* (Stroudsburg, Pa.: Dowden, Hutchinson and Ross, 1976), Emilio F. Moran, *Human Adaptability* (Boulder, Colo.: Westview Press, 1982).
10. C. Monge, *Acclimatization in the Andes* (Baltimore, Md.: Johns Hopkins University Press, 1948).
11. Webb, *op. cit.*, 97.

■ Suggested Readings

- Baker, P., and M. Little, eds. *Man in the Andes*. Stroudsburg, Pa.: Dowden, Hutchinson and Ross, 1976.
- Butland, Gilbert. *Latin America: A Regional Geography*. New York: Wiley and Sons, 1960.
- Freyre, Gilberto. *The Masters and the Slaves*. New York: Knopf, 1946.
- James, Preston. *Introduction to Latin America*. New York: Odyssey Press, 1964.
- Moran, Emilio. *Human Adaptability*. Boulder, Colo.: Westview Press, 1982.
- . ed. *The Dilemma of Amazonian Development*. Boulder, Colo.: Westview Press, 1983.
- Webb, Kempton. *Geography of Latin America: A Regional Analysis*. Englewood Cliffs, N. J.: Prentice-Hall, 1972.

ACT Publications 1997

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No. 97-02

Moran, E.F. 1997. "Utilisation des connaissances des populations indigènes dans la gestion des ressources: des divers écosystèmes amazoniens." In *L'alimentation en forêt tropicale. Vol. 2.* C.M. Hladik et al. Paris: UNESCO. Pp. 1193-1208.

No. 97-03

Brondizio, E.S., and A.D. Siqueira (1997) "From Extractivists to Forest Farmers: Changing Concepts of Agricultural Intensification and Peasantry in the Amazon Estuary." *Research in Economic Anthropology*, 18:233-279.

No. 97-04

Brondizio E.S., and W.A. Neves. A percepção do ambiente natural por parte de populações Caboclas do Estuário do Amazonas: Uma experiência piloto através do método de trilhas pré-fixadas. In C.Pavan (ed.) *Uma estratégia Latino Americana para Amazônia*, Vol. I, pp. 167-182. Editora UNESP, São Paulo.