



Socialism in Cuba and the Environment

EVEN BEFORE the collapse of socialism, there was considerable concern in the West about the environmental consequences of decades of centrally managed economic policies in the former Soviet Union and Eastern Europe. Concern deepened as environmental issues acquired an increasingly prominent role in the global economic and political agenda and as a growing number of observers began to voice alarm about the general disregard toward the environment of socialist development policies. Environmental deterioration was not supposed to occur under socialism. According to conventional Marxist-Leninist dogma, environmental deterioration was precipitated by the logic of capitalism and its relentless pursuit of profits. Exploiting workers and the natural world were inevitable sequelae of capitalist accumulation. Socialism could only beget environmentally benign economic development policies. Guided by “scientific” principles, socialism’s goal was a classless and bountiful society, populated by men and women living in harmony with each other and the environment.

In reality the socialist environmental record proved to be, as in so many other political and economic realms, far different from the utopian view. The magnitude of the environmental disaster in these countries that became apparent on the fall of socialism surpassed expectations of even the most pessimistic observers. As Murray Feshbach and Alfred Friendly (1992, 1) observed with regard to the Soviet Union: “When historians finally conduct an autopsy of the

Soviet Union and Soviet Communism, they may reach the verdict of death by ecocide. . . . No other great industrial civilization so systematically and so long poisoned its land, air, water, and people. None so loudly proclaiming its efforts to improve public health and protect nature so degraded both. An no advanced society faced such a bleak political and economic reckoning with so few resources to invest toward recovery.”

The situation in Eastern Europe, and the diagnosis of its cause, was very similar: “The legacy of our polluted continent [Europe] can partly be blamed on the policies adopted by the socialist Communist states over the last four decades. The Eastern bloc countries never admitted to pollution problems during the first two decades of the post–Second World War era. In spite of Stalinist and post-Stalinist heavy industrialization policies, pollution of any kind was, according to their propaganda, only to be found in the West where capitalist profit motive was the cause of their environmental degradation problems. Hindsight has now proved the fallacy of such claims, but does not solve the way forward in these countries” (Carter and Turnock 1993, 189).

It would have been surprising if Cuba, a country that eagerly embraced the socialist development model from the early 1960s to the late 1980s, could have escaped unscathed from the systemic environmental failings of socialism. In this book we seek to provide a preliminary overview of the environmental legacy of socialism in Cuba based on the examination of secondary sources, informed by the study of development and environmental trends in other socialist countries as well as in the developing world. Socialist Cuba is a closed society, and independent research within the country is not an option for researchers who reside abroad (such as the authors of this volume) or on the island.¹ Most of our inferences and conclusions have been corroborated in published materials and discussions with scientists who emigrated from Cuba in recent years.²

Any issue related to Cuba is controversial, and the environment is no exception. Witness the following two descriptions of the environmental situation in Cuba made at about the same time, the first by a U.S. professor of environmental law who visited Cuba in the early 1990s and the second by a Cuban scientist who defected from the island in 1992 and currently resides in the United States:

There is an island in the Caribbean where at certain moments you feel that you are wandering through the pages of “Ecotopia,” Ernest Callenbach’s novel about an environmental and egalitarian utopia. There are few cars and no smog. There are no graffiti, no commercial billboards and signs. The streets are cleaned, trash is picked up. Everything is recycled, nothing wasted: the truck that delivers a box of fruit and

vegetables to the hotel restaurant takes away a box of banana peels and vegetable trimmings from the day before. Some communities get electricity from windmills and cow-dung slurries that generate combustion methane. Small dairy herds have been established and new fields planted to make the island self-sufficient in agriculture and break its dependence on cash crops for export. . . . The island is Cuba. (Benson 1992)

The Cuban scientist Dr. José Oro, former Director General of the Department of Natural Resources of Cuba's Ministry of Basic Industry, in contrast, described the situation as grave and deteriorating further. Commenting on references to "Cuba's favorable environmental conditions" by President Fidel Castro at the UN Conference on the Environment and Development, the so-called Earth Summit, in Rio de Janeiro in 1992, Oro said: "It was funny to listen to Castro's speech in Rio. The environmental degradation [in Cuba] is rapid. We have the industrial production of Honduras and the pollution of East Germany" (Dunleavy and Penenberg 1993, 14).

We have made a deliberate effort to avoid extremes in this book. For this reason, we precede our review of socialist environmental trends with a brief examination of the pre-socialist situation. Through these historical reviews, we seek to establish what the environmental conditions in the country were before 1959 so that we can assess the likely environmental consequences of socialist development policies as opposed to conditions that socialist Cuba may have partially or fully inherited from the country's republican past. In Chapter 2 we provide basic information on the natural, demographic, and economic setting essential to provide a context for the discussion that follows.

Our analysis also recognizes that Cuba is a developing country. As such, in its attempt to overcome economic backwardness, it may have adopted economic practices whose long-term environmental consequences may not have been appreciated several decades ago. From this perspective, many of socialist Cuba's developmental policies gave rise to environmental consequences not very different from those observed in other developing countries, whether in the Caribbean, South America, or elsewhere, that followed a capitalist development path.

Conditions that are generally blamed for environmental deterioration in other developing countries, however, were not present in socialist Cuba between the early 1960s and the late 1980s—the period with which we are mostly concerned—and thus Cuba differs from these other countries in crucial respects. Among the most important mediating pathways to environmental decline in

developing countries are population growth, poverty, and unequal access to resources. In addition much blame for environmental deterioration has been placed in recent decades on the introduction of the capital-intensive agricultural technologies associated with the “green revolution” (Vosti and Reardon 1997).

Population growth is regarded as a primary driver of environmental degradation, because it conditions the human–environment relationship by constantly increasing the pressure on the natural resource base (see, among many others, Livernash and Rodenburg 1998). Poverty magnifies the environmental effects of population pressure because “The poor often cannot afford the capital and other nonlabor inputs needed to protect the soil as agricultural intensification proceeds or the off-farm inputs needed to make land improvements not directly associated with intensification” (Vosti and Reardon 1997, 340).

Unequal access to resources is generally a concomitant of poverty and environmental deterioration since it leads to competition for limited resources among the poorest who, in their struggle for survival, and while prevented from gaining access to productive farm land, are often forced to abuse the natural resource base while disregarding the long-term consequences of their actions. More often than not, population growth, poverty, and unequal access to resources interact in a perverse cycle with agricultural modernization; as the introduction of capital-intensive technologies by the wealthiest landowners further deepens rural poverty (by reducing labor demand and blocking the access of peasants to farm land), environmental pressures intensify. William Durham (1979), in his study of the poverty-inequality-environment links in El Salvador, vividly illustrates what has come to be accepted as a classic paradigm.

The socioeconomic changes brought about by the 1959 Cuban Revolution essentially did away with extreme poverty—whether in rural or urban areas—for over a quarter of a century, first, through a radical redistribution of the country’s wealth and, second, by the design of employment and income policies that for most of this period resulted in one of the most equitable income distribution regimes in the world. Furthermore, the rural structural transformations brought about by the revolutionary regime in the late 1950s and early 1960s obliterated the traditional “latifundio–minifundio” dichotomy found in much of Latin America that often acts as the nexus of the poverty–unequal access to resources–environment crucible. The Cuban peasantry became proletarianized (except for a small peasant sector that was grudgingly allowed to survive, and that accounted for less than 10 percent of the rural work force) as employees of mechanized large-scale farms in which they worked for a salary and were provided with basic social services (e.g., health, education, social security), often in urbanized rural communities expressly built for that purpose. Moreover, by the

late 1960s Cuba was following a demographic trajectory that in a few years would lead the country's population into below-replacement fertility, thus mitigating the population–environment connection, a tendency accentuated by the emigration of close to 10 percent of the country's population and continued urbanization. Already by the early 1970s, the absolute size of Cuba's rural population was on the decline.

Absent several of the foremost determinants of environmental decline in rural areas of developing countries, the only remaining explanation for environmental deterioration is agricultural intensification and in particular the capital-intensive practices associated with the socialist agricultural development model that incorporated most elements of the green revolution. And contrary to the situation in other countries in which the consequences of agricultural modernization are compounded by rural poverty and inequality, in Cuba the environmental effects of capital-intensive agriculture can be viewed in isolation. We contend, therefore, that environmental deterioration in Cuba over more than three decades of socialist rule responded to specific conditions not usually found in developing countries—in fact, some of the standard preconditions were absent—but were present in the former Soviet Union and the former Eastern European socialist countries. In Cuba, as in other socialist countries, central planning was oblivious to local environmental circumstances, lack of ownership rights led to the improper use and neglect of natural resources, the all-powerful state did not allow for citizenship involvement in decision making, and the manner in which rewards for individual managers was determined depended on complying with leadership directives, regardless of results. These systemic problems of socialism, together with centralization of political power, were aggravated in Cuba by Castro's personalistic governing style, his utter control over decision making, his whim to follow whatever technological fads he fancied, and his meddling in Cuba's development policies, which in many instances have led to the implementation of poorly assessed economic initiatives with adverse environmental consequences. In Chapter 3 we describe Cuba's legal structure of environmental protection and the harsh reality of poor implementation.

Not to be ignored either was Cuba's wasteful use of vast amounts of Soviet foreign assistance. A significant share of these resources was allocated to mega public works projects, particularly in agriculture, to achieve, in Soviet parlance, the "rapid and inexorable transformation of a backward economy." In other words, in Cuba's environmental realm, the systemic failings of socialism were compounded by its inefficient use of considerable investment resources and a personalistic style of government in which most major decisions ultimately were the responsibility of an infallible "maximum leader," capable of meddling in all

facets of political, economic, and social life, and who is not known to shy away from difficult decisions, whether or not he is technically qualified to make them.

We have been equally cognizant of the fact that from a technological perspective, the socialist development model did not differ radically from the model pursued in capitalist countries, or that in capitalist countries, until very recently, environmental consequences were largely ignored in the selection and application of industrial and agricultural technologies. Global environmental deterioration has largely resulted from this disregard for environmental consequences, giving rise to ecological disasters of the magnitude of Love Canal in the United States, Miamata Bay in Japan, and other environmental calamities in Western Europe.

In agriculture, for example, socialist practices were inspired by North American agricultural methods at the turn of the century that were greatly admired by Lenin. For much of the twentieth century, capitalist and socialist agriculture have shared common features such as extensive mechanization, large-scale application of chemical inputs, and widespread irrigation, often with comparable detrimental environmental consequences. What we learned from the Soviet Union's experience is that the systemic characteristics of socialism aggravated the environmental consequences of modern capital-intensive agriculture. The Cuban experience simply serves to corroborate what many other researchers have found in their analyses of socialist agriculture. The same applies to industrial pollution, where the issue is not solely technological, since it is mediated by the economic framework and institutions in which the technologies are applied and by their detrimental effect on the environment.

Cuba's Environmental Ideological Discourse

In Cuba, as in the other former socialist countries, the dominant ideological discourse tended to minimize the adverse environmental consequences of socialist development policies, while claiming that capitalism is at the root of the global environmental deterioration. A representative example of this view was expressed by President Fidel Castro:

Among the greatest harm that capitalism has inflicted on humanity . . . is the deterioration of nature, the destruction of the environment, the mismanagement of forests and soils, the contamination of seas and the atmosphere. Capitalism has created the problems with the ozone layer and the greenhouse effect, which many scientists believe is irreversible. . . . In barely 100 years, capitalism has exhausted most of the

fossils fuels on earth, coal and oil, and sometime in the future humanity will remember with horror these 100 years of capitalist development and how it has mistreated nature, how it has poisoned everything and has created situations in which deserts are expanding, agricultural land is shrinking, soils are being affected by salinization, and natural resources are scarce. (Castro 1992, 13–14)

With the fall of socialism, the nature of the discourse metamorphosed somewhat. Since then, the distinction is no longer between capitalist and socialist societies, but rather between consumer societies and the Third World. President Fidel Castro, in remarks at the 1992 Earth Summit, for example, did not point to capitalism directly for causing environmental deterioration, but instead attributed it more vaguely to “consumer societies” (which may or may not include the former Soviet Union and the industrialized Eastern European socialist countries), while drawing a clear distinction between the Third World and industrialized countries (Ministerio de Ciencia 1995, i).³ According to this revisionist view, the Third World is blameless, since developing countries were colonies whose exploitation continues today under an unfair world economic order. Castro noted “that consumer societies are fundamentally responsible for the abject destruction of the natural environment. They arose out of the old colonial metropolises and imperial policies that, in turn, engender the backwardness and poverty that today afflict the vast majority of mankind.” This same viewpoint is echoed by Cuban scholars writing on this topic (González 1992; Alvarez 1992).

Cuba’s Environmental Problems

While denying responsibility, and arguing that “concern for protection and conservation of resources, considered the property of all the people, began in Cuba with the revolutionary victory of 1959” (Castro 1993, 44), the Cuban leadership admits that Cuba faces some environmental problems. Cuba’s self-congratulatory report to the 1992 Earth Summit (COMARNA 1992), was very scant in terms of identifying environmental problems in the country, a fact duly noted by the UN staff in their compilation of national reports (United Nations 1992b, 118). However, Fidel Castro’s long statement prepared for the conference, which emphasized the Cuban socialist government’s commitment to preserving the environment and natural resources, made brief reference to some pressing environmental problems. He highlighted the following: (1) pollution of bays; (2) soil erosion and degradation, particularly in mining areas; (3) pollution of surface

waters by waste products of the sugar industry; and (4) erosion of beaches and coastal areas and salinization of low-lying coastal lands (Castro, 1993, 46).

These problems were also implicit in Cuba's Programa Nacional sobre Medio Ambiente y Desarrollo (PNMAD, National Program on Environment and Development), a very lengthy document prepared by Cuba in 1993 containing 214 objectives and 816 actions to protect the environment and promote the rational use of natural resources (Vinculación 1993) and in a report presented by Cuba in 1994 to the UN Committee on Sustainable Development (Informe de Cuba 1994). Cuba's report to the Fifth Session of the UN Commission on Sustainable Development (Aplicación del Programa 1997), which met in New York in April 1997, and an Estrategia Ambiental Nacional (EAN, National Environmental Strategy), released in June 1997 (Ministerio de Ciencia 1997a) to coincide with a review session of the UN Conference on Environment and Development, also touch on environmental problems and steps taken by the Cuban government to address them. An environmental education strategy issued at the same time as the EAN spells out steps to enhance public consciousness of environmental problems, relying on formal education programs and informal approaches through the use of mass organizations (Ministerio de Ciencia 1997b).

The June 1997 EAN, although claiming some important achievements, provides a rather somber assessment of the country's environmental situation. Among the achievements cited are the eradication of extreme poverty; improvements in the population's environmental situation and in their quality of life within a social equity framework; increases in the country's forested land area; establishment of protected natural preserves and formulation of a proposal for integrating them into a national system; the systematic assessment of the national territory and environmental evaluation of priority investments; the application of scientific criteria for the assessment and development of technologies to address environmental problems; the gradual introduction of the environmental dimension in the national education system; and the overall strengthening of environmental concerns in the life of the nation (Ministerio de Ciencia 1997a, 1).

The causes for environmental problems are said to be insufficient awareness, knowledge, and education about environmental matters; poor management; limits in the introduction and broad application of science and environmental technology; inadequate attention to the environment in the design and implementation of development policies and plans; and the absence of a juridical system capable of integrating environmental controls in a coherent fashion. Furthermore, the scarcity of financial and material resources interfered with Cuba's ability to attain higher standards of environmental protection, a situation aggra-

vated in the last few years by its economic situation following the loss of commercial relations with the former socialist camp and the sustained and strengthened economic “blockade” by the United States (Ministerio de Ciencia 1997a, 1). The principal environmental problems faced by Cuba, according to this document, were: soil degradation (such as erosion, poor drainage, salinity, acidity, and compaction); worsening of sanitary and environmental conditions in human settlements; contamination of terrestrial and marine waters; deforestation; and loss of biological diversity (9).

This list generally corresponds with the environmental problems we document in Chapters 4 to 9 of this book and testifies to the grave concerns emerging in Cuba regarding the country’s environmental situation. Some of these environmental stresses were inherited from the past, but, as we show, some arose or were intensified by sectoral development strategies pursued by the socialist government. Urban pollution, for instance, could be partly traced to Cuba’s extreme reliance on inefficient and highly contaminating factories and vehicles imported from the Soviet Union and Eastern Europe. In the agricultural sector a practice that resulted in environmental damage was the promotion of the Soviet-style, large-scale state farm production model (farm gigantism) based on widespread mechanization, heavy chemical inputs (e.g., fertilizers and herbicides), and extensive irrigation. The effect of large-scale mechanization on the compaction of soils has been reported as severe. The pollution of streams and coastal areas by organic waste discharges from the sugar industry has been a major concern for years. By the late 1980s, when sugar production was at its peak, the problem was considered so serious that to lower discharge rates, measures were instituted in more than ninety mills to fertilize sugarcane fields with organic waste.

Some of Cuba’s bays became severely polluted because of human, industrial, and agricultural discharges but also by the runoffs associated with the deforestation from strip mining (e.g., in Moa). By the late 1970s, the UN Development Program was providing financial and technical assistance to the Cuban government to arrest the growing contamination of the Bay of La Habana. High levels of chemical and organic pollution were also present in the bays of Nipe, Chaparra, and Puerto Padre and more recently the Bay of Cienfuegos.

Numerous instances of soil salinization and erosion can be traced to water-logging caused by poor irrigation and drainage practices, to excessive water extraction rates from coastal aquifers, and to schemes that led to the damming of low-volume streams and rivers that dried out during the dry season months. It is estimated that one million hectares, or about 14 percent of the country’s agricultural surface, have excessive salt deposits. Of these, about 600,000 hectares are deemed to be affected by light to modest salinization levels and the rest by heavy

salinization. The regions with the heaviest levels of salinization are in Guantánamo and the Cauto Valley.

The Cuban sugar industry, which controls the bulk of the industrial stock and the largest industrial enterprises in the island, is an important source of pollution. Sugar production generates very large amounts of air emissions and liquid industrial wastes. By-products of sugar production—especially torula yeast—emit toxic waste products that contaminate streams and eventually coastal areas as they are flushed out to the sea.

The Cuban nonsugar industrial sector is also a heavy polluter, discharging polluting agents into the atmosphere, the sea, or other ecological systems. Among the chief pollutants in the nonsugar industrial sector are: (1) the cement industry, a heavy generator of dust and smoke; (2) the chemical and metallurgical industries, producers of acid steams, smoke, and soot; (3) the steel and non-ferrous alloy industries, also heavy producers of smoke and soot; (4) the sugarcane derivative industry, consisting of plants producing torula yeast, bagasse boards, paper, and so on, and generating a variety of air pollutants and solid wastes; and (5) the mining industry, especially nickel mining, which launches extremely large amounts of dust into the atmosphere and releases by-products into streams and the sea.

Who Is to Blame for Cuba's Environmental Problems?

While claiming that the source of some of these problems is Cuba's capitalist past and its exploitation by advanced industrial countries, especially the United States, Castro and some of his associates have recently been quite explicit in extending the blame for many of the country's most serious environmental concerns to the Soviet Union, Cuba's former socialist patron. A particularly clear instance of this line of reasoning was provided by Lionel Soto, former vice president of Cuba's Council of Ministers and ambassador to Moscow, when he declared in an interview—recorded in the Russian press—that the former Soviet Union had incurred a "debt" to Cuba of \$20–25 billion (an amount roughly equal to Cuba's estimated financial debt to Russia) by exploiting its natural resources and contaminating its environment (Bai 1995). The implication is that the socialist development policies embraced by Cuba, presumably at the behest of the Soviet Union and its former Eastern European allies, are very much responsible for the environmental deterioration suffered by the country over the last several decades.

In a recent book a Cuban environmentalist associated with the University of La Habana observes that "It is a given that Cuba, with the assistance of the for-

mer socialist countries, increased the use of chemical fertilizers, pesticides, mechanization of cultivation and harvesting for example in the sugar industry, and irrigation, among others. This could be accomplished because the conditions had been created so that these advances could be incorporated into the educational system, and science, technology, and education worked closely. There is no exact estimate of the high economic-social cost of such ‘advances’ (Cabrera Trimiño 1997, 182–83).

While the specific features of the socialist development model varied from place to place according to political, cultural, and national circumstances, the basic blueprint was inspired by the Soviet Union’s historical experience. The essential characteristics of the agricultural organization model that emerged in the Soviet Union and was later adopted by other socialist countries, including Cuba, were the following:

- ▶ *Large-scale production units:* Farming units in the Soviet Union tended to be very large, presumably because large size facilitated the introduction of modern production techniques and maximized returns from mechanization; but, according to Nove (1965, 3), they also emerged because of administrative convenience. This pattern of large agricultural units has been referred to by Lazar Volin (1962, 254) as “farm gigantism.” The Soviet proclivity toward large-scale operations, which extended to industry, has also been referred to as “gigantomania” (Gregory and Stuart 1974, 246).
- ▶ *Extensive cultivation:* With no rent charged for land use, it was sound decision making by farm managers to increase production by expanding the size of the farm units rather than by more intensely cultivating existing units (Raup 1990, 101). Examples of this tendency are the “virgin lands program” of the 1950s that brought large tracts of lands in Siberia and Kazakstan under cultivation. Much of the new lands brought under cultivation were marginal in terms of soil quality and, more important, subject to severe climatic conditions—dry, hot winds that blew into the virgin lands from the Central Asian desert, coupled with Arctic winds that brought snow as early as August and uneven rainfall (Willett 1962, 101).
- ▶ *Mechanization:* Lenin’s “unbounded enthusiasm” for American tractors, coupled with the belief in the superiority of large-scale production in agriculture as well as in industry, made mechanization a critical part of the Soviet agricultural model (Volin 1962, 250). A large share of investment in the agricultural sector was devoted to the procurement of agricultural machinery and equipment.
- ▶ *Technological interventions:* Soviet authorities had a proclivity for relying on

scientific and technological solutions to bottlenecks arising in the agricultural sector. The view that science and technology could “conquer” the problems of soil quality and unsuitable climate spread the myth of the unlimited agricultural resources of the Soviet Union and diverted attention from the management and incentives problems that were at the core of the agricultural production quagmire. Among the best documented of these technological interventions were the so-called Stalin Plan for the Transformation of Nature in the 1940s consisting of planting shelter belts and reforestation, crop rotations with perennial grasses and construction of ponds and reservoirs (Timoshenko 1953, 254), and a massive project designed to turn the semiarid lands of central Asia into a cotton-producing area through an irrigation scheme in the Aral Sea basin that drew water from the Syr Darya and Amu Darya Rivers, two of the main feeders of the Aral Sea (Akiner 1993, 256).

- ▶ *Use of agricultural inputs:* Faced with stagnating agricultural production, Nikita Khrushchev coined a new version of Lenin’s slogan by declaring that “Communism is Soviet rule, plus electrification of the whole country plus ‘chemicalization’ of the economy” (Novak-Decker 1965, 193). Demand for chemical fertilizers and pesticides grew rapidly in the 1950s as a result of the expansion of land under cultivation pursuant to the virgin lands program. The drive to cultivate land more intensively and efficiently resulted in even higher usage of fertilizers and pesticides in collective and state farms.

While shifting the blame to others for development policies that increasingly appear to have taken a major environmental toll is a politically convenient rationale, it is not supported by the historical record. A question of considerable interest is whether Cuba could have avoided the environmental pitfalls that we now associate with socialism. Our conclusion is that this would have been unlikely.

During the 1960s, when the revolutionary leadership enthusiastically embraced the socialist development path, Cuban leaders and planners were in awe of the almost superhuman development plans envisioned by the Soviet Union and other socialist countries. In the water sector, for example, where great publicity was being given during the 1960s to the Soviet Union’s plans to expand the amount of irrigated land, Cuban technical journals (and the media) published glowing accounts of what was to be achieved. According to one article, by the senior Soviet hydraulic advisor working in Cuba, in the 1965–1975 decade, the Soviet Union intended to increase the amount of irrigated land by 250 percent, or from 15 million hectares to 37–39 million hectares (Drovidech 1966, 48). Cuba was not to be left behind. In 1969 President Castro announced that in five

years, thanks to Cuba's vast investments, 50 percent of Cuba's agricultural land would be irrigated (Nuevos cientos 1969, 2). This would have amounted to an extraordinary expansion in the amount of land irrigated (in the order of over 1,000 percent), since prior to the 1959 revolution, less than 4 percent of Cuba's agricultural land was irrigated. These claims were being made despite overwhelming evidence that the water reservoir and irrigation projects were running into major difficulties due to inadequate feasibility studies and poor construction practices.⁴

Conquering Nature

Even a cursory examination of the historical record suggests that the Cuban socialist leadership, since the early days of the revolution, eagerly promoted policies that in retrospect could only have had adverse environmental consequences.⁵ In fairness many of the policies embraced were consistent with then-current thinking in developed capitalist and socialist countries (e.g., an agricultural development model that emphasized the widespread use of mechanization and chemical inputs to increase yields and large-scale hydraulic projects such as dams), but it would be disingenuous to claim that Cuba was pressured by the former Soviet Union to adopt such policies. Further, as in most of the world, including other socialist countries and the Soviet Union in particular, the thinking in Cuban leadership circles in the 1960s was dominated by the belief that nature could be conquered to serve humanity's needs. In a speech in 1966 Castro put the issue in near-epic terms: "We will struggle against the difficulties created by nature because, in the end, thus has been the story of mankind; to struggle to overcome the laws of nature, to struggle to dominate nature and to have it serve mankind. This is also part of the struggle of our people" (Castro 1992, 71).

The bigger the development projects, the better. This meant not only the establishment of immense, centrally managed state farms, but also the conceptualization and frequently the development of large-scale infrastructure projects that could not be justified in economic or environmental terms. The "gigantism" mentality, particularly in agriculture, coupled with a tendency to look at projects on a sectorial basis, are major factors behind environmental disruptions in Cuba (Coyula Cowley 1997, 59).

Some Cuban agricultural scientists and officials have recently claimed that they were victims of the imposition of a foreign development model. Two U.S. experts describe the line of argument put forth by these individuals:

The Classical Model of conventional agriculture that developed during the first 30 years of the revolution was a model imposed from outside. They express resentment toward Soviet and other socialist bloc

advisors who were responsible for technology transfer to Cuba, and they are self-critical for having had a “colonized mentality.” They believe that while the conventional model might be appropriate for Europe—where all of the expensive inputs are produced within each nation—for a developing country like Cuba it makes little sense because of the extreme dependency and external vulnerability that it promotes. (Rosset and Benjamin 1993, 22)

This claim belies the historical evidence and tracks with the tendency of Cuban officials to transfer blame to others, even more so if the erroneous policies emanated from the top leadership. The Cuban leadership, including Fidel Castro himself, eagerly embraced the socialist conception of how to bring about economic growth, whether in agriculture or industry. This was in keeping with Marxist-Leninist notions of the role nature ought to play in human development and the conviction that people could dominate it to serve their ends through technology. This view regarding the ability of the new socialist man to dominate nature paralleled the naive economic development perspective in vogue during the early days of the socialist revolution; it assumed that industrializing the country’s economy in a few years would be a simple matter as long as the “capitalist” and “imperialist” yokes strangling Cuba were removed.

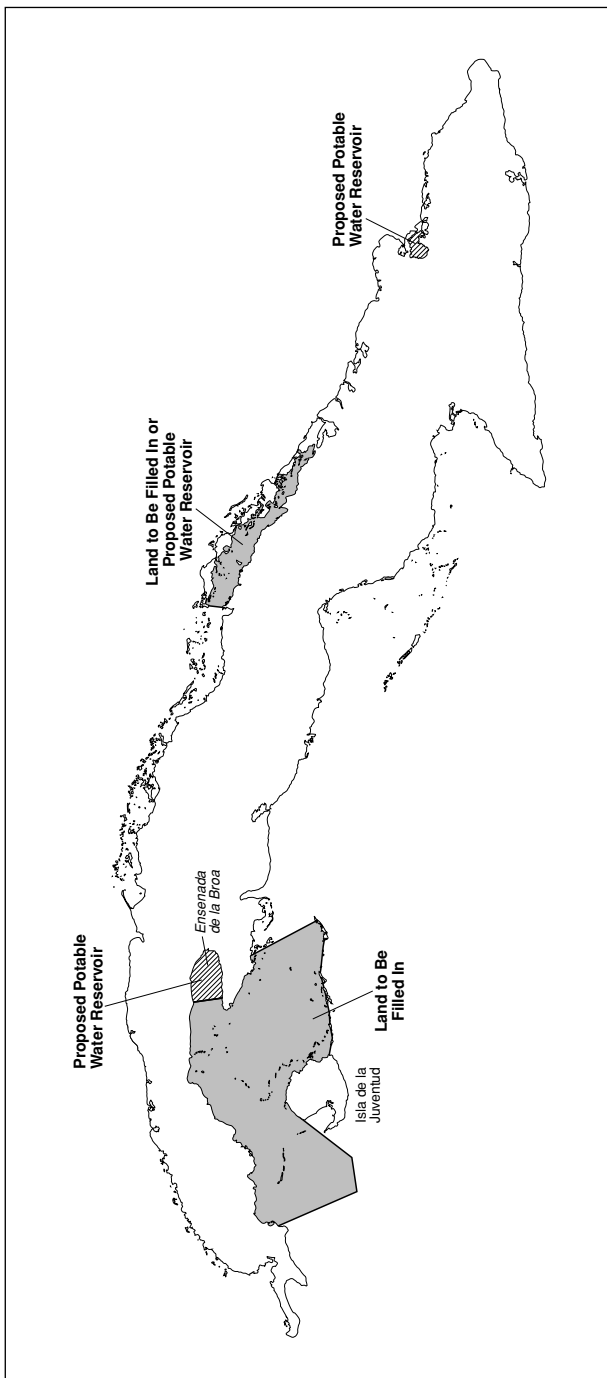
A lengthy quote from the leading geography textbook used to instruct generations of Cuban high school students, first published in the early 1960s and written by Antonio Núñez Jiménez (one of the country’s most influential government officials, intellectuals, and members of the scientific community,⁶ with close ties to President Fidel Castro), illustrates the leadership’s conviction that under socialism Cuba was prepared to go to any lengths to conquer nature:

The Cuban [man] of socialism and communism not only restores the devastated forests, but also creates new ones; not only stops erosion, but creates new soils, terracing the sides of mountains to better manage the yield of the forests; other mountains will be demolished and their rocks taken to the depths of the seas to build dikes to transform these seas into productive soils; no river or subterranean stream will carry a single drop of potable water to the ocean; dams are being built to stop water courses, while longitudinal canals along the coasts capture waters from rivers to carry them where they are more needed; the endless energy of the sun will be used to desalinate sea waters; the winds will be trapped in powerful engines, and Cubans will dominate marine currents; the internal heat of the planet will be extracted through deeply dug perforations to power our industries of the future; to accomplish a

profound transformation of nature, we will build atomic power plants as we construct powerful wind engines; we will learn to cultivate the bottoms of the sea, taking from submerged prairies cattle feed, edible algae, ultimately developing submarine agriculture; we will learn how to dominate hurricanes to capture their enormous energy; we will purify all industrial waters and recycle them; we will change and correct the course of rivers; we will control our variable climate, taking energy from the sun to temper it; we will create clouds and make rain according to agricultural needs. . . . Ultimately, the greatest challenge of man in communist society is to engage in a bloodless battle to transform nature. (Núñez Jiménez 1972, 289–90)

Núñez Jiménez described plans to build enormous dikes between mainland Cuba and nearby islets and cays to block the entry of seawater, remove the remaining water, and thus create new agricultural land. The magnitude of what was being envisioned can best be appreciated by studying the sketches reproduced in Map 1.1. The plans included not only constructing the dikes, but also draining the shallow sea area bound by them and filling the area with earth taken from Cuba's Zapata Swamp and other regions, or developing enormous potable water reservoirs, as was proposed at La Broa, next to the northwestern edge of Zapata Swamp in the southern part of the country, and in one of the arms of Nipe Bay in northeastern Cuba. One of these projects, draining the shallow waters between mainland Cuba and Isla de Pinos (currently called Isla de la Juventud), was claimed to have the potential to add 16,000 square kilometers (or 1.6 million hectares) of agricultural land to the country, constituting Cuba's own virgin lands program and increasing the land area by about 15 percent. In 1967 Castro himself, while recognizing the still hypothetical character of these ideas, revealed in one of his many speeches that National Academy of Sciences and School of Engineering staff were already at work on the project (Núñez Jiménez 1972, 299–300).

Plans were also being developed to change the natural course of the Toa River in eastern Cuba (Núñez Jiménez 1972, 302–303). One of the alternatives being discussed was to divert part of the Toa's flow to the arid Sabanalamar area in the Guantánamo region of southern Oriente Province. This would entail channeling much of the river's water away from its natural east-to-west flow, by connecting the Toa River through a tunnel or canal to the headwaters of the Sabanalamar River, five kilometers away. The engineering would have to take into account the rough topography of the region and the fact that the headwaters of the Sabanalamar were fifty meters below the bed of the Toa. Another option being contemplated by the Instituto Nacional de Recursos Hidráulicos



Map 1.1. Proposed projects to reclaim land from the sea

was to channel the Toa River to the Yateras River, which in turn was to have been redirected to the area of Guantánamo.

These projects, of course, never got off the ground, suffering the same fate as others that proposed, among other ideas, desiccating parts of the Zapata Swamp, Cuba's largest wetlands and a virtual natural treasure due to its biological diversity; this project, like many others, was obviously at variance with the avowed environmental preservation principles that many have suggested were at the heart of the development policies of the socialist government. A pilot project conducted at considerable cost led to the conclusion that this, like many other plans, was unfeasible or uneconomical, or both, and was quietly abandoned. Other grandiose projects, particularly in the agricultural sector, did proceed. Their detrimental environmental consequences, discussed in this volume, are just beginning to be appreciated. Suffice it to say at this point that the Cuban socialist discourse took pride in the endless repetition of slogans, most coined by Castro himself, which implied socialist Cuba's will (indeed, the phrase *voluntad hidráulica* or "hydraulic will" was coined by Castro to refer to the country's water policies⁷) to conquer nature: for example, "that not an inch of land should be left unused"; "that not a single drop of water be lost, that not a drop of water reach the sea . . . that not a single stream or river not be dammed." Speaking in 1970, President Castro (1992, 71) stated that the work ahead was "to complete the task of conquering rivers, complete the task of conquering floods, conquer nature. Unless we conquer nature, nature will conquer us."

This mentality has endured. As late as 1991, when the world was already well aware of the disastrous environmental consequences of socialist attempts to tamper with nature, the Cuban press continued to describe in glowing terms other ambitious hydraulic projects, such as the proposed Cauto–El Paso dam. This dam was said to be the "Baikal of Granma Province," an unfortunate reference to the once-pristine Russian lake that has been polluted by a pulp and paper plant and other industrial activities (En Cauto–El Paso 1991). Tourist development complexes, either recently completed or currently under construction, are further evidence of the same mentality, since there is a willingness to sacrifice the natural ecosystems if necessary to achieve pressing economic objectives.

The Cuban Experience Compared to That of Other Socialist Countries

To be sure, the environmental consequences of socialism in Cuba appear to differ in several important respects from those of the former Soviet Union and Eastern European socialist countries, although they share common systemic roots. One of the factors contributing to the divergent environmental paths

between Cuba and the former Soviet Union and European socialist world was Cuba's initially weak industrial base and its assigned role within the global socialist division of labor: a producer of primary goods for the more industrialized economies. Thus, when one speaks about the environmental legacy of socialism in Cuba, attention immediately turns to agriculture and mining, sectors whose development strategy was guided by Cuba's natural resource endowment and place in the socialist international division of labor.

The most significant environmental legacy of socialism in Cuba will be in the agricultural sector. This should not come as a surprise since Cuba was, and still is, primarily an agricultural country. The zeal with which capital-intensive agriculture was implemented in socialist Cuba is widely believed to have led to the degradation of many of Cuba's soils. The socialist capital-intensive agricultural development model, with its mammoth-sized farms and great reliance on heavy equipment to work them, has led to soil compaction, and the excessive application of chemical inputs has contributed to a litany of maladies, ranging from contamination of soils and water bodies to problems with secondary pest infestations. There are alarming reports of widespread erosion, but assessing its extent, severity, and consequences must wait for carefully conducted studies of soil conditions in different Cuban regions. Chapter 4 includes a review of environmental concerns associated with agriculture. In Chapter 10 we discuss the alternative agricultural development model that began to be implemented in Cuba in the early 1990s partly in response to the inability to import foreign agricultural production inputs. This new agricultural model largely rests on the reintroduction of traditional peasant practices while giving added emphasis to modern organic farming methods.

The attempt to harness nature and increase agricultural yields—by constructing hundreds of large and small dams for irrigation—drove an ambitious water development program that has contributed to the salinization of the country's soils. Major culprits were inattention to proper drainage of irrigated fields, saltwater intrusions due to the excessive extraction of subterranean waters from aquifers, and tampering with the natural flow of rivers and streams. In some of Cuba's rivers, seawater reaches the walls of inland dams. Pollution is a major source of concern in many of Cuba's rivers and aquifers. There is also concern about the long-term consequences of some of the water development projects, since it has been posited that they could accentuate the destructive effects of natural disasters, like hurricanes.

Because the book is structured according to natural resource, some overlap occurs in the discussion of the relationship between water and environmental deterioration. A perspective of the environmental nexus of water and agriculture

is provided in Chapter 4, and Chapter 5 focuses on broader water policies and their environmental impact, inclusive of some of their consequences in the countryside.

Cuba has been fortunate not to experience the monumental levels of industrial pollution recorded in many parts of the Soviet Union and Eastern Europe. Nevertheless, the bulk of the industrial infrastructure (e.g., plants that produce sugar derivatives, cement, and chemicals) that Cuba acquired under the tutelage of its socialist mentors exhibited an inattention to environmental matters not unlike industrial plants in socialist Europe. This disregard for the environmental consequences of development projects was also manifested and continues to be seen in some of the country's largest mining projects, especially in Eastern Cuba. In Chapter 7 we offer an overview of the environmental consequences of the Soviet-supplied industrial equipment and of open-pit mining practices initiated before the revolution, continued under socialism, and intensified today in partnership with foreign mining interests.

In some instances the differences in environmental outcomes between the former socialist countries and Cuba were the result of timing considerations and in others were accentuated by divergent paths in social policy. That Cuba managed to avoid (at least temporarily) the environmental threat posed by electricity-producing nuclear power plants has been largely fortuitous and caused by the country's inability to implement on schedule an ambitious nuclear energy program begun in the 1970s that called for the construction of three nuclear power plant complexes. When the Soviet Union collapsed, Cuba was nearing completion of its first nuclear facility at Juraguá, in south-central Cuba. The yet-to-be completed plant has been mothballed since 1992 because of Cuba's inability to obtain international financing for the remaining construction and equipment. In early 1997 President Castro announced that plans for completing the Juraguá plant had been indefinitely postponed. If the Juraguá plant is never completed, as now appears to be the case, it will become one of the largest failed development projects in the developing world, a white elephant in which Cuba wasted over one billion pesos. We discuss issues associated with Cuba's plans to develop nuclear power for electricity generation in Chapter 8.

Cuba also appears to differ from the former socialist bloc countries, especially the Soviet Union, regarding a posited cause-and-effect relationship between environmental deterioration and declining health standards. Numerous studies (see, for a review, Feshbach and Friendly 1992, 181–203) discovered a higher incidence of morbidity, rising infant and child mortality rates, and declining life expectancies in Soviet cities subjected to exceptionally high levels of air pollution. Many of these adverse morbidity and mortality trends have also been

attributed to a contaminated supply of food and drinking water as well as to major problems supplying and managing the national public health sector. The evidence conclusively indicates that the Soviet Union grossly neglected the public health needs of its population.

For reasons noted earlier, Cuba managed to avoid the most egregious consequences of Soviet-led industrial development policies and allocated an inordinate amount of national resources to the health sector. National health care policy initiatives, subsidized by Soviet transfers and supported by equipment and medicine imports from the West, allowed Cuban health authorities to improve the health standards of the nation, at least up to the early 1990s, when the national economic crisis affected every sector of the national economy. A big question remains regarding the potentially adverse health effects that socialist development policies, particularly the use of chemical inputs in agriculture, may have had in contaminating the national water supply and through this on the nation's health. Recent health statistics and epidemiological studies are not available to assess potentially adverse trends (although some limited datasets suggest a deterioration of health trends). As will be shown, there is evidence that water pollution levels in the country are high enough to warrant the suspicion that they could be having a negative impact on the health of the Cuban people. These issues are addressed in Chapter 5, where we discuss water policies of the socialist government, as well as in Chapter 10, where we review the environmental consequences of the economic crisis of the 1990s.

While socialism's most lasting environmental legacy will be in the rural sector, some of the most visible and tangible manifestations of environmental decay are currently seen in urban Cuba, as reviewed in Chapter 9. La Habana, in particular, is a crumbling and environmentally aggrieved city, whose deterioration can be directly blamed on the leadership's decision not to allocate sufficient resources to maintain its housing stock and physical infrastructure and to control pollution, in order to promote a more balanced pattern of regional development. Its bay and surrounding beaches are heavily polluted, as are rivers and streams flowing through the metropolitan area. While visitors are appalled at the disrepair of the city's housing stock, they are much less aware of the chaotic conditions of La Habana's water distribution and sewerage systems. The city suffers from a severe shortage of potable water, mostly because of leaks in poorly maintained and obsolete distribution systems, and industrial and human effluents contaminate water resources. Industrial pollution is a major problem as well. The evidence suggests that the environmental situation in other large Cuban cities is as dismal as in La Habana.

Positive Environmental Trends Under Socialism

From an environmental perspective, not all socialist trends have been negative, however. Cuba's demographic growth has declined considerably, with the population currently growing at an annual rate well below 1 percent, and is rapidly approaching stabilization, if not population size decline. The economic crisis of the 1990s has further contributed to the long-term trend of fertility decline. Population size is expected to stabilize (or begin to decline) at fewer than 12 million people within the next few years, Cuba being the first Latin American country to achieve this distinction. If current fertility and emigration trends continue, Cuba's population will begin to contract by the early twenty-first century. Population density is likely to stabilize at around one hundred inhabitants per square kilometer, twice as high as in 1950 (when it had fifty-three inhabitants per square kilometer). Although this population density is well above the Latin American average, it is lower than for the smaller Caribbean island countries.

Socialist Cuba has also reversed a deforestation trend that had plagued the country throughout its modern history. Although it is apparent that the amount of land area covered by forests has expanded as a result of more than three decades of reforestation efforts, it is difficult to determine how successful these efforts have been from a broader environmental perspective, since they have not been sensitive to preserving biological diversity or conserving endemic species. There is also concern that some of the gains of nearly thirty-five years of reforestation policies may be lost as Cubans are forced to turn to the forests for lumber, firewood, and charcoal to address basic needs under the economic exigencies of the "special period," the label used by the socialist government to refer to the emergency economic policies implemented since 1990 following the collapse of the socialist world. We examine the forestry policies of the socialist government in Chapter 6.

The Special Period and Beyond

As we discuss in Chapter 10, the economic crisis of the 1990s has had major environmental consequences partly because Cuba has been forced to abandon many of the development policies it implemented under Soviet tutelage. With the financial support provided by Soviet subsidies and secure markets for its exports with the socialist bloc, Cuba for several decades pursued development policies characterized by the inefficient use of energy and other production inputs—particularly chemicals—in agriculture as well as in other sectors. With

the disappearance of Soviet subsidies, Cuba has had no choice but to idle many of its inefficient industries because of its inability to purchase energy and other inputs and to reverse the course of three decades of mechanized and chemically dependent agriculture. Our assessment leads us to conclude that these changes, at least over the short term, will have beneficial environmental impacts since they have forced the reversal of many development policies that had, or could potentially have had, adverse environmental impacts. Their economic costs have been staggering, however, with levels of production in practically all sectors of the economy declining precipitously. Obvious examples of positive interactions between the special period and the environment are the partial abandonment of the capital-intensive agricultural development model and the mothballing of the Juraguá nuclear power plant.

On the other hand, the emergency economic policies instituted by the leadership to cope with the economic crisis pose other environmental challenges that have yet to be fully appreciated or studied. The most obvious policies, noted by some observers, have to do with the crash programs to develop the tourism sector that have been launched primarily in association with foreign investors. Some of the newer tourist projects have been sited in formerly pristine coastal locations that until now, and primarily because of the leadership's decision in the 1960s to limit the development of the international tourist industry, had remained largely in their natural state. There is evidence that in at least some of the tourism sites, environmental concerns have been sacrificed to economic expediency. There is also fear that the mining activities currently being encouraged, including off-shore oil exploration, may result in the further contamination of land or coastal areas.

Although revolutionary Cuba has developed an extensive legal infrastructure presumably designed to protect the environment (described in Chapter 3), our review of the evidence leads us to believe that there is a lack of vigor in implementing environmental laws and regulations, particularly during the special period. Some observers believe that the government lacks, in the face of a dire economic situation, the political will to rigorously enforce regulatory standards.

Perhaps more ominous is that under the current economic and political circumstances Cuba simply does not have access to the levels of financial resources that would be needed to implement aggressive restoration projects to reverse decades of environmentally damaging development policies. In the early 1980s Cuba defaulted on its loans to Western banks and official credit institutions, shutting off access to new funds; Cuba is not a member of the international financial institutions (e.g., International Monetary Fund, World Bank, Interna-

tional Finance Corporation, and Inter-American Development Bank) and therefore cannot draw on these sources of funds to finance environmental remediation. As long as U.S.-Cuban relations continue to be strained, this situation is not likely to change. For example, under Section 104 of the Helms-Burton Law, the United States is directed to vote against Cuba's admission to the international financial institutions, which are major potential sources of funding for environmental protection and restoration projects (Roy 1997, 82).

Particular areas of concern are related to the salinization of Cuba's soils and underground water resources, many of which resulted from the implementation of hydraulic development projects neglectful of complementary drainage infrastructure, and that may have for many decades changed the balance between surface and underground water sources. No less disturbing is the enormous waste of financial resources associated with the acquisition over several decades of an industrial and transportation infrastructure that proved to be as environmentally unfriendly as it was uneconomical to operate. These considerations suggest that over the short and medium term, priority should be assigned to preventing further damage to the environment, with environmental remediation to be tackled as financial resources become available.

Thanks to the educational policies pursued under socialism, which were in turn made possible by the generous economic subsidies and the scholarships awarded by the Soviet Union and other former European socialist states, socialist Cuba managed to train a large pool of professionals. This cadre of professionally trained personnel possesses the essential human capital to assess, under the right political and economic circumstances, Cuba's environmental situation and to design and implement appropriate remediation initiatives. This has yet to occur, however, since Cuba's socialist government continues to disregard technical advice, and political and economic priorities generally override environmental concerns.