

Dominican Republic

29627

Environmental Priorities and Strategic Options Country Environmental Analysis

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**Caribbean Country Management Unit
Environmentally and Socially Sustainable Development
LCR Region**

ACRONYMS

BID	Inter-American Development Bank
BOD	Biological Oxygen Demand
CAASD	Santo Domingo Water Supply and Sanitation Corporation
CAFO	Concentrated Animal Feeding Operation
CAST	Caribbean Alliance for Sustainable Tourism
CEA	Country Environmental Assessment
CORAAMOCA	Moca Water Supply and Sanitation Corporation
CORASAAN	Santiago Water Supply and Sanitation Corporation
DR	Dominican Republic
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization
GEF	Global Environmental Facility
GoDR	Government of the Dominican Republic
GDP	Gross Domestic Product
GNI	Gross National Income
IHEI	International Hotel Environment Initiative
INAPA	National Institute of Potable Water
INDRHI	National Water Resources Institute
LIL	Learning and Innovation Loan
MEMU	Municipal Environmental Management Unit
MDG	Millennium Development Goals
NEC	National Environmental Council
NEC	National Environmental Council
NEF	National Environmental Fund
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
ONAPLAN	National Planning Office
ONAPRES	National Budget Office
OSPP	Planning and Programming Office of SEMARN
PM	Particulate Matter
PUCMM	Pontificia Universidad Católica Madre y Maestra
SEA	Secretariat of Agriculture
SECTUR	Secretariat of Tourism
SEIC	Secretariat of Industry, Energy and Commerce
SEMARN	Secretariat for Environment and Natural Resources
SESPAS	Secretariat of Health
USAID	United States Agency for International Development
WSS	Water Supply and Sanitation

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EXECUTIVE SUMMARY

Rapid economic growth and increased urbanization have affected environmental quality and placed strains on the Dominican Republic's natural resource base. In particular water resources management (water quality, quantity and watershed management) and solid waste collection and disposal have become major environmental concerns. Lack of systematic data limits an accurate and detailed assessment of the scope of the problems.

There is however a consensus that:

- the overall poor quality of surface, groundwater and coastal water resources is the result of a lack of waste water management and agricultural run-off, causing health problems that disproportionately affect the poor.
- water scarcity is a regional problem resulting from poor demand management in irrigation, urban water supply and tourist infrastructure in drier regions.
- weak watershed management leads to soil erosion and amplifies the damage and frequency of flooding.
- the overall lack of solid waste management pollutes water sources, causes disease and is a nuisance for inhabitants and visitors alike.

Emerging environmental issues are air pollution and degradation of coastal ecosystems. Deforestation, which was a major issue a decade ago, has decreased substantially. Protected areas management, however, still remains inadequate. Given the reliance on tourism to fuel economic growth, addressing above environmental problems becomes a national priority.

To rectify the above problems, the country established the Secretariat for the Environment and Natural Resources (SEMARN) in 2000, bringing all public institutions dealing with environmental issues under one roof. The World Bank has supported SEMARN through a Learning and Innovation Loan, and SEMARN has made significant progress since its inception by issuing environmental regulations, standards and impact assessment procedures, among other reforms and improvements.

SEMARN still has important challenges ahead: (i) systematic monitoring of key environmental data in the environmental health and natural resources management sectors; (ii) implementing laws and regulations for balancing the interests of stakeholders in the environment; (iii) developing consensus building mechanisms with the other secretariats, public institutions and the private sector to mainstream environmental management; and (iv) changing the culture of the institutions under its umbrella from development promoters to environmental managers. These challenges can be met through staff training and capacity building, organizational changes, budgetary reallocations, by turning the Environmental Council into an environmental mainstreaming tool and by initiating the Environmental Fund to finance the growing environmental agenda and possible decentralization efforts.

At the sector level, the creation of an integrated water resource management framework and strategy through the approval and implementation of the General Water Law and Water Supply & Sanitation Law is an obvious priority. To improve water quality, water companies could enhance cost recovery mechanisms and improve waste water management and infrastructure. Controls of the distribution of agro-chemicals and training in their application would also reduce water pollution. Resolving the water scarcity issue does require the curbing of demand by reducing irrigation subsidies. Moreover, higher cost recovery in urban areas would enable water companies to replace obsolete water supply systems to reduce losses, while providing affordable, accessible water supply to the poor. Investments in hotels in fragile zones need to take into account water carrying capacity. Watershed management requires collaboration between multiple actors: farmers, foresters, municipalities, industry, tourism operators, waste management companies and civil society. Good upper watershed management would help reduce damages from flooding, but municipalities will also need to implement and enforce zoning regulations to prevent people from settling in lower flood-prone areas.

The solution of the solid waste management problem will require a national solid waste management strategy and improvements in municipal collection and cost recovery mechanisms. But above all, it will need significant municipal investments in the construction and management of sanitary landfills.

Air pollution, coastal degradation, natural disaster mitigation and protected areas management will need specific interventions that are outlined in the paper.

The above program as well as DR's difficult public finance situation calls for SEMARN to set additional priorities and to make hard choices. Budgetary reallocation may provide some initial relief, but the financial needs are larger than the resources now available. All Dominicans will have to become more environmentally aware, and eventually contribute more through service fees and taxes that support the "polluter pays" principle.

The document provides some indicative priority setting the Government could adopt or adjust in function of political and economic factors.

The Bank can help the Dominican Republic by further strengthening and supporting SEMARN for mainstreaming environmental conservation practices. Bank assistance can also facilitate the implementation of proposed policy reforms and provide the Environmental Fund with financial resources to sponsor demand-driven projects and solutions to localized water and solid-waste related environmental problems in municipalities and watersheds. Bank involvement in the agricultural sector could help to implement much-needed policy reforms in water management and crop husbandry practices. GEF grants could complement Bank activities and be used (amongst other) to improve the management of protected areas. Finally, financing for investment operations in solid waste and waste water management could have an immediate environmental pay-off. .

INTRODUCTION

3.7 The Dominican Republic is a Caribbean country with an area of 48,730 km², a population of 8.6 million and a per capita gross national income of US\$2,320 (2002). Sixty-seven percent of the people live in urban areas. The life expectancy at birth is 67 years. About 29% of the people live under the poverty line. The services sector accounts for 55.5 percent of GDP, while industry and agriculture account for 32.7 percent and 11.8 percent respectively. The services sector (including tourism) is the fastest growing sector of the economy.

3.8 Through the 1990's, economic growth in the Dominican Republic (DR) has been remarkable, with average annual GDP reaching 8% from 1995-2000, making the DR one of Latin America and the Caribbean's fastest growing economies. The services sector (trade, construction, tourism and telecommunications) and industry in Free-Trade Zones were the driving forces, accounting for 60% of the country's growth in the latter half of the 1990's. Tourism in particular has been one of the more impressive growth industries, with tourist arrivals increasing eightfold between 1980 and 2000. Currently there are 120 major hotels and resorts, located in eight major tourist zones that receive three million tourists a year. Some selective growth indicators are presented in Table 1.1.

	1970	1980	1990	2000
Population (million people)	4.4	5.7	7.0	8.4
Rural population (million people)	2.6	2.8	2.9	2.9
Urban population (million people)	1.8	2.9	4.1	5.5
GDP (billion US\$1995)	3.9	7.6	9.7	17.2
GDP per capita (US\$1995)	874	1327	1377	2055
Agriculture (value added, million US\$1995)	888	1523	1305	1917
Manufacturing (value added, million US\$1995)	708	1157	1750	2940
Tourism (million of arrivals)	n.a.(1)	0.4	1.3	3.0
Irrigation (thousand hectares)	125	165	225	269 (2)
Fertilizer use (thousand tons)	38	52	92	94
Emissions CO ₂ (million tons)	3.1	6.4	9.4	20.2
Source: World Bank SIMA database Notes: (1) n.a. = not available, (2) data refers to 1999				

3.9 Largely, FTZs and tourism developed in isolation of the country's overall business environment. Special legislation has protected foreign investor's rights, special tax structures have attracted foreign industry entrants and a competitive environment has favored innovation¹. By contrast, traditional industry and agriculture have continued to operate within a framework of strong state intervention that limits competition. The result has been the evolution of an economy that is highly polarized, with dynamic services and FTZ manufacturing on one side and traditional protected agriculture and manufacturing on the other side.

3.10 DR's economic performance began to show weaknesses in 2001-2002 because of a combination of external factors (the global economic slowdown, the events of September 11, 2001 and the oil price increases) and domestic policies. In 2003, the

¹ Dominican Republic Country Assistance Strategy, June 9, 1999.

macroeconomic performance was further worsened by a massive banking crisis that shattered the country's macroeconomic framework and jeopardized its growth prospects. The banking crisis required substantial government intervention, weakening the country's financial position and drastically limiting the possibilities for additional public investment.

Why is environmental management important for the DR

3.11 There are four basic reasons why environmental management is important: (i) the need for a clean environment to ensure sustainable growth, in particular in the tourism sector; (ii) the impact of environmental degradation on the poor; (iii) the relation between environment and health; and (iv) the frequency and strength of floods and natural disasters.

3.12 Environment and tourism. The tourism sector has been a driving force of DR's economic miracle in the 1990s. Worldwide and regional competition for tourism revenues is however steadily increasing. Further tourism growth will depend on the quality of the environment, including safe drinking water, clean beaches, non-degraded coral reefs, and well-managed protected areas. Declining quality of coastal waters and health hazards, products of poor environmental conditions, threaten the established destinations, such as Puerto Plata. New resort developments, such as Punta Cana, are under threat of environmental degradation -- due to unsustainable groundwater management. In addition, ecological degradation will impair the ability of the tourism industry to diversify into high-quality markets. With many destinations to choose from, selective tourists will demand non-degraded coral reefs (for snorkeling), and well-managed landscape and terrestrial protected areas (for daytrips). Therefore, consistent and sound environmental policies may enhance DR's competitive edge.

3.13 Environment and poverty. The poor are often the most at risk of environmental degradation, as households frequently do not have access to clean water, and are unable to pay for safe drinking water, often costing forty times the amount paid by those connected to water service.² Taking into account the lack of access to adequate solid waste collection or water sanitation services, available water in poorer communities often carries water-borne diseases, placing households at greater risk. Table 1.2 explains how only 56 percent of the poor have a connection to public drinking water, 15 percent have no access to sanitation facilities, and only 35 percent have access to garbage collection facilities. The situation in the rural areas is worse than in urban areas.

3.14 The poor are also often disproportionately affected by environmental degradation, given their great reliance on natural resources for their livelihoods and their great vulnerability to natural hazards and floods. Poor households are often located in risk-prone areas, and lacking any mitigating measures or insurance against catastrophes, they are often economically devastated by major floods or hurricanes. Poor fishermen suffer from the over-exploitation and contamination of fisheries, most notably in Semana,

² Current water charges are US\$0.07/m³ for those connected to commercial water service, as opposed to an estimated US\$1.41/m³ paid by those who do not have water service. *Evaluación Global de los Servicios de Agua Potable y Saneamiento 2000 – Informe Analítico República Dominicana* (Abreu, 1999).

where the prawn catch has plummeted in recent years due mainly to high levels of chemical pollutants from non-point sources. Poor small holder farmers in the upper watersheds are negatively affected by poor watershed management and inadequate erosion control practices.

Table 1.2. Access to basic environmental infrastructure services for the poor (percentages)					
	All	Non-poor	Poor	Urban poor	Rural poor
Running water					
Indoor	49	56	27	41	16
Outdoor (<100 m)	30	27	39	44	35
Outdoor (>100 m)	5	4	10	7	12
Public connection to water	72	77	56	74	41
Sanitation services					
Formal connection (sewer/septic)	45	53	20	38	6
Latrine/pit	47	42	66	55	74
No facility	8	6	15	7	21
Garbage collection	54	60	35	67	10

Source: World Bank, 2001. Dominican Republic Poverty Assessment. Washington DC: World Bank

3.15 Environment and health. In regards to health, water and air pollution translate into water-borne and respiratory diseases. In the DR, diarrhea and acute respiratory infections rank first and third respectively among the causes of under five child mortality. The connection between water supply and sanitation and child mortality rates is particularly well-established, with World Bank projections indicating that lack of access to piped water in the DR is one of the major causes for the deaths of 2,400-3,200 young children each year.

3.16 The DR has also experienced a rapid urbanization. Over the past 30 years, the population has doubled and urban population tripled. By 2025, the urban population will reach 85%, placing enormous pressures on cities, increasing demand for basic environmental services of water supply and sanitation, as well as solid waste collection and disposal. Urban air pollution derived from mainly traffic emissions and power generation will also affect the health of an ever growing population.

3.17 The Environment and Natural Disasters. Like the rest of the Caribbean, the DR is regularly exposed to a number of natural hazards, such as hurricanes, floods and droughts. The destructive force of these phenomena can be enormous. The 1998 Hurricane Georges caused in the DR alone an estimated economic loss of US\$2.2 billion (14% of GNI), 235 deaths, and loss of coastal lands and infrastructure, reduced earnings from tourism, and lower levels of fish landings and agricultural production. During the 1990s, flooding has been the most common type of disaster, with the great majority of floods occurring during the rainy season. There is growing evidence that improving the management of the natural resources (watershed and coastal zone management), and the natural environment in a broader sense, can be a vital component to a country's overall disaster mitigation strategy.³ In particular, addressing poor coastal zone management

³ In a recent World Bank study entitled "The Last Straw: Integrating Natural Disaster Mitigation with Environmental Management," the authors examined examples from Dominica, the Dominican

(coral reef protection, protecting mangrove forests, etc.), deforestation and land degradation, and unsustainable agricultural practices can help to reduce vulnerability to erosion, flooding and wave damage caused by hurricanes and severe tropical storms.

The Environment and the Millennium Development Goals (MDG)

3.18 The MDGs related to the environment are: the forest area, the national protected areas, GDP per unit of energy use, CO₂ emissions, access to an improved water source, access to improved sanitation and access to secure tenure. The following table shows the situation of the MDG indicators in comparison with the overall Latin American and Caribbean situation in 2000. According to table 1.3, the DR compares favorable with the LAC average in the subcategories of forest area, national parks, GDP per unit of energy use and access to an improved water source. Progress could be made in the reduction of CO₂ emissions and access to sanitation facilities.

	1990	2000	2000 (LAC)
Forest Area (% of total land area)	28.4	28.4	47.1
National Protected Areas (% of total land area)	12	16	11.5
GDP per unit of energy use (PPP\$ per kg oil equivalent)	5.5	6.3	6.1
Carbon dioxide emissions per capita (metric tons)	1.3	2.8	2.2
Access to improved sanitation facilities (% of population)	66	67	77
Access to improved water source (% of population)	83	86	86

Source: www.developmentgoals.org - Millennium Development Goals – Data in table 1 and 2 do not coincide because of different data collection definitions.

Government Reaction

3.19 Recognizing the importance of protecting the environment and natural resource base, the DR has begun to address some environmental issues. Between 1998 and 2000, key stakeholder groups, including both political parties, held broad-based consensus building activities to consolidate and reform the organizational structure for environmental management, which at the time included more than twenty different public institutions with overlapping responsibilities as well as gaps in managing key environmental issues. Consultations and debate also focused on the country's outdated and inadequate environmental laws and regulations, identifying the need to build a consolidated and modern legal framework to improve environmental management.

3.20 These consultations ultimately facilitated the passage of the Environmental Framework Law in August of 2000. The Law reflects a broad consensus reached within the country on key policy issues and basic principles (e.g. polluter pays principle, payment for environmental services) and the methods and tools to be used to address

Republic and St. Lucia. They concluded that there is growing evidence that natural hazards and disasters are both a symptom and a cause of inadequate natural resource and environmental management. They state that: "Disasters cause direct damage to natural resources and environment, and indirect damage by increasing poverty, which itself leads to the overexploitation (unsustainable use practices) of natural resources and environment. These in turn add to the vulnerability of both natural and human systems, which increases disaster loss." See *The Last Straw: Integrating Natural Disaster Mitigation with Environmental Management*, (Burton & van Alst, 2002).

them (e.g. effluent limits, environmental permits). The Law brought national environmental and natural resource management responsibilities under one roof in the new Secretariat of Environment and Natural Resources (SEMARN). In addition, it prescribed an ambitious reform agenda, with a host of required actions imposed on the newly created SEMARN, other line ministries and local governments.

3.21 In addition, a recently completed Bank financed Learning and Innovation Loan (LIL) has helped to create some basic building blocks for environmental management - producing an environmental diagnostic study, training stakeholders groups, and enhancing public awareness, which contributed to the creation of SEMARN and the General Law.

Rationale and Methodology

3.22 The World Bank chose to do a Country Environmental Analysis (CEA) with the view toward identifying environmental priorities, developing recommendations for institutional and policy reforms, and outlining the role for the Bank in supporting SEMARN in reform efforts. The audience of this document is the DR Government, private sector and civil society. Moreover this CEA will serve as an important input to the Bank's 2005-2009 Country Assistance Strategy.

1.17 In the second Chapter the CEA will examine the environmental issues in the DR, focusing primarily on some priority areas such as water quality, water quantity, watershed management, and solid waste. Other issues will be identified but not discussed at length. A third chapter will provide a diagnostic of the institutional framework for environmental management in the DR. The fourth chapter will make a series of recommendations for strengthening environmental institutions, as well as a series of recommended actions to address priority environmental areas. Finally, the fifth chapter will briefly outline where the Bank could support the DR's ongoing environmental reforms.

1.18 Analysis in the CEA has been drawn from: (a) a desktop literature review, which included studies from the recently closed National Environmental Policy Reform Learning and Innovation Loan; (b) a two-week Bank mission to the DR that included field visits to various sites in the country by specialists in the areas of: water resource management, agriculture, forestry, economic development, institutional capacity for environmental management, and decentralization; and (c) a stakeholder workshop. SEMARN and the World Bank organized in April, 2003 in Santo Domingo this national stakeholder workshop aimed at identifying the main environmental issues and priorities. A wide array of stakeholders was invited to participate, and as a result, representatives from nine government agencies, six private sector organizations, five civil society organizations, three academic institutions, and six donors attended the workshop. Preliminary results of this work were discussed with the Minister of Environment during a visit to the World Bank in June 2003.

CHAPTER II. ANALYSIS OF ENVIRONMENTAL ISSUES

2.1 This chapter provides an analysis of the environmental issues in the DR. It reviews the state of the environment, the development impacts of environmental degradation, and the impacts of current policies on environmental quality. There are very few hard data on environmental quality and therefore it is difficult to pinpoint real priorities. The NEAP and Environmental Diagnostic prepared under the National Environmental Policy Reform LIL reflect this shortcoming. Moreover environmental issues are complexly interlinked, and parceling them risks oversimplification.

2.2 During the April 2003 workshop participants identified four criteria for identifying environmental priorities, attached relative weights, and ranked environmental problems according to those criteria.⁴ The workshop attendees identified water quality and solid waste management as the most important and urgent environmental issues, followed by water scarcity and watershed/land degradation.

2.3 Environmental issues and priorities differ across locations, as the DR concentrates in a small territory a large variety of ecological and human settings. In urban areas, the main environmental challenges identified are: water pollution, solid waste, and flood plain management. In rural areas, watershed degradation and access to water and sanitation top the list, while priority issues in coastal areas include coastal water pollution and groundwater resources. But within each type of area, priorities also differ. For instance, the tourist areas of the northern coast suffer from degraded coastal quality, while those on the east coast are under threat mainly from groundwater overdrawn. The relevance of the spatial dimension underscores the need for spatial land use planning.

2.4 Besides the results of the workshop, the analysis of the existing (but limited) evidence of the impact of environmental degradation on economic growth, health, poverty, and ecological integrity also leads to the conclusion that water quality, water scarcity, and watershed management (including flood protection) are very important environmental concerns. In addition, solid waste, which has a strong connection to water quality, is a self-standing environmental problem. A second tier of environmental topics includes urban air pollution, coastal degradation beyond water quality and the management of protected areas. For the sake of uniformity and clarity, this chapter will first treat water issues, secondly problems around solid waste and the other issues will be dealt with less intensively at the end of the chapter.

WATER QUALITY

2.5 **Water quality is a central item on the environmental agenda.** Although few studies on water quality have been carried out over the last two decades, and there is a crucial lack of adequate and consistent monitoring, scattered evidence suggests that the

⁴ The criteria and attached weights are as follows: (i) impact on economic growth (high weight), (ii) impact on biodiversity and ecosystems (high weight), (iii) impact on human health (medium weight), and (iv) poverty impacts (low weight), and ranked environmental problems according to those criteria.

levels of nutrients, organic matter, and bacteriological contamination in water are high. For example, the proportion of samples with coliforms in aqueducts served by INAPA (the main water company, supplying 40 percent of the population) increased from 17 percent in 1994 to 23 percent in 1998. This is particularly striking because according to DR standards, presence of coliforms in over 5 percent of samples indicates that water is no longer potable. In some cases, high salinity, pesticides and other pollutants are present in waters close to agricultural, urban, and industrial areas that receive crude, untreated effluents. Downstream of metal mining, flows of effluents also show high levels of cadmium, chrome and other heavy metals – high levels of mercury have been found in the waters of Samana Bay and the presence of pesticides and persistent organic pollutants (such as DDT and PCBs) in estuary mollusks has also been reported⁵. The fact that the country consumes more than one million cubic meters of bottled water per year⁶ is yet another indicator of overall deficiencies in water quality.

2.6 Water pollution has significant impacts on human health, the poor and the tourism industry. Waterborne diseases, driven by poor water quality and the absence of adequate supply and sanitation services, represent a large share of the total burden of disease in the DR. Indeed, diarrhea is the first cause of under-five mortality nationwide. Box 2.1 briefly analyzes the state of water supply and sanitation services in the country and their health impacts. Water pollution has a higher impact on the poor, as they are more likely to be exposed to polluted water (see table 2) and have fewer resources to cope with disease. Furthermore, buying bottled water reduces their disposable incomes more than those of non-poor households.⁷

2.7 Given the importance of tourism for the economy, and the dependence of this industry on the quality of coastal ecosystems, the impact of environmental degradation in tourist areas is difficult to understate. For example, the number of British tourists dropped by 20 percent in 1998 after reported cases in the British press of sickness due to contaminated water.⁸ Water pollution originating upstream and in the cities surrounding the more mature tourist poles (such as Sosua-Puerto Plata or Boca Chica) is one of the main causes of environmental degradation in those areas⁹, and has led to a reduction of tourism numbers. For example, in 2000 a 240-room hotel located in Sosua spent nearly 2 percent of its revenues to transport guests to cleaner beaches, before shutting down the following year. It is important to note also that water pollution reduces the effective water availability, limiting overall supply for tourism centers that rely on aquifers.

⁵ Simas J. 2003. Water Resources Management in the Dominican Republic – Issues and Policy Options. Washington DC: World Bank (processed).

⁶ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

⁷ Assuming that three-quarters of bottled water is consumed due to health concerns, it is estimated that Dominican households spend in excess of US\$40 million per year in bottled water to prevent waterborne diseases.

⁸ Segnestam L and Hamilton K. 1999. Environmental Input to the DR CAS. Washington DC: World Bank (processed)

⁹ The growth of the pre-existing human settlements, fueled by the tourism boom, leads to solid waste and wastewater management problems, ultimately affecting beach quality.

Box 2.1 Environmental health in the DR: safe drinking water and sanitation

Improving access to safe drinking water will be key to achieve the fourth MDG: *Reduce child mortality* in the DR. Although estimated access to piped water is relatively high (94.3 percent in urban areas and 65.1 percent in rural areas, for a national average of 84 percent), over 50 percent of households (most in rural areas, and many in urban areas) do not have indoor connections and must walk to a public standpipe. In addition, chlorination is not widespread so piped water is not consistently safe – only 58 percent of aqueducts chlorinated drinking water in 1998. Although 89 percent of the population is covered by some kind of sanitation facility, only 20 percent is connected to a sewerage system, posing a danger of contamination of drinking water sources and threatening general environmental quality. The under-five mortality rate, at 47 deaths per 1000 live births in 2001, is high when compared to regional and income group averages (34 and 41 respectively)¹⁰. The link between lack of access to water supply and sanitation and under-five mortality rates is well known. World Bank projections based on reported 2000 under-five mortality rates suggest that lack of access to piped water and sanitation would be co-responsible for the deaths of 2,400-3,200 young children each year in the DR¹¹.

Source: World Bank staff, World Development Indicators, Wang and others (2003)

2.8 Water pollution is largely the product of poor urban wastewater management¹². Recent estimates indicate that liquid effluents from municipal sources are the main culprits of organic pollution (see table 2.1). Municipal sources, excluding solid waste, would be responsible for half of the organic-pollution (measured as Biological Oxygen Demand, BOD) and one third of the nitrogen-pollution. Proper municipal wastewater management is almost non-existent. There is some wastewater treatment in tourist areas, but very little in the capital and other metropolitan areas¹³. The Santo Domingo Water Supply and Sanitation Corporation (CAASD, second largest water provider serving 34 percent of DR's population¹⁴) treats only 1 percent of wastewater and dumps the remaining 99 percent in an inappropriate way into the ocean.

2.9 But solid waste and agriculture are also water polluters. Solid waste contributes some 25 percent of BOD-pollution. Agriculture and livestock activities are also responsible for a sizable amount of pollution. For example, agriculture contributes around 35 percent of water nitrogen-pollution in the Ozama and Yuna watersheds, and animal farming contributes over 20 percent of BOD-pollution in the Yaque del Norte and Yuna watersheds. Agricultural policies affect water pollution in two ways: by promoting the use of agrochemicals (through credit subsidies for inputs) and by encouraging water consumption (through water subsidies: high use of irrigation water reduces base flows and increases concentration of pollutants). Incorrect use of agrochemicals (for example,

¹⁰ World Bank. 2003. Little Green Data Book. Washington DC: World Bank.

¹¹ Wang L, Bolt K, Hamilton K. (forthcoming). Lives Saved from Improved Environmental Conditions: A Projection. Washington DC: World Bank.

¹² Waste water can be dumped without immediate harm at certain depths into the sea after having been screened for solid waste. Where such dumping is not cost-effective (far from the sea), waste water should be treated to reduce pollutants.

¹³ A notable exception is Santiago (the second largest city, with 6 percent of the national population), where the Santiago Water Supply and Sanitation Corporation (CORAASAN) provides sewerage to 86 percent of the city's population and treats 94 percent of the collected wastewater.

¹⁴ In addition to CORAASAN and CAASD, the water supply sector is formed by the National Institute of Potable Water (INAPA), the Moca Water Supply and Sanitation Corporation (CORAAMOCA), and the Puerto Plata Water Supply and Sanitation Corporation (CORAAPLATA)

in the tomato fields in the Constanza area) is made possible by inadequate product regulations and enforcement, and poor extension services. Integrated pest management is almost totally absent, while use of internationally forbidden agrochemicals has been reported. In addition, as with solid waste disposal sites (see section 2.36), the location of high-polluting livestock farms does not take into account hydro-geological conditions, increasing the risks of aquifer contamination.

2.10 Industry does not seem to be a major contributor to organic pollution (less than 10 percent of BOD-pollution would be due to industrial sources), but its contribution to inorganic pollution (by toxics and metals) is unknown, as is that of metallic mining. Less than 10 percent of industrial effluents are treated. The Plan Estrategico de Santiago estimates that over 200 industries discharge pollution loads in the Yaque del Norte, with an impact equivalent to that of a population of one million¹⁵.

Source of pollution	Watersheds			Weighted average
	Ozama	Yaque del Norte	Yuna	
Liquid effluents	63	45	28	48
Urban run-off	1	1	1	1
Industrial effluents	11	6	4	8
Animal farming	7	22	29	17
Solid waste	18	26	38	26

Source: Adapted from Abt Associates. 2002. Diagnostico Ambiental de la Republica Dominicana. Santo Domingo, Dominican Republic: Proyecto de Reforma de Políticas Ambientales (processed).

2.11 **Current wastewater policy does not take into account environmental considerations.** Providing potable water without adequate wastewater management worsens the impact on water bodies, as they receive higher levels of polluted water. New hotels have to build wastewater treatment plants and SEMARN has focused the first phase of its Environmental Impact Assessment (EIA) system on monitoring hotels. But since the main culprits of water pollution are urban sources, improving water quality requires more investment in adequate wastewater disposal by water companies. Enforced implementation of effluent standards and charges would provide a strong incentive for those companies to invest in wastewater treatment and disposal infrastructure¹⁶.

2.12 Inadequate wastewater management is also the result of inefficient operational and financial arrangements in the water supply sector. Past large investments in the water supply sector¹⁷ did not take into account efficiency, financial viability or sustainability. Water charges and collection rates are low, and the companies rely largely on transfers from the central budget to operate. Tariffs currently cover only about one-third of the full cost of service, and are inadequate to cover operating costs.¹⁸ Currently

¹⁵ Plan Estratégico de Santiago. 2003. Pg. 138

¹⁶ The same applies to industrial companies

¹⁷ Averaging about 1.5 percent of GDP in the early 1990's

¹⁸ The central government subsidizes the difference, with a result that over the period 1990 – 2000 subsidies amounted to DR\$13.3 billion, or about 75 percent of the full cost of services. In 2000, the subsidy was more than DR\$1 billion (representing about 2 percent of public expenditures and 0.3 percent

the water companies have very small investment budgets – the DR invested only US\$1 million per year in 1990-98 in potable water and sewerage infrastructure.¹⁹ The scarcity of funding determines that most investments are directed to potable water supply, much less to sewerage, and almost none to wastewater management.

WATER SCARCITY

2.13 **A second major environmental concern is water scarcity.** With surface water resources of 20 billion m³ per year, and groundwater resources of 1.5 billion, water resources in the DR could be considered abundant. But irregular spatial and seasonal distribution, coupled with high consumption in irrigation and urban water supply, translates into water scarcity. Current water demand of 10 billion m³ represents 44 percent of total available freshwater resources (a ratio of over 10 percent indicates problems in water resources management).²⁰ Water scarcity is reflected in increasing competition for surface water allocation and unsustainable groundwater abstraction. As a consequence there is little water to meet future demands in certain regions.

2.14 Irregular spatial and seasonal distribution shape water scarcity. Water scarcity has a strong spatial dimension – some areas receive much less precipitation than others (from 700mm to 2,400mm per year), while others have few groundwater resources (the center and north of the country) or host a larger share of human activity and attendant demand. Water scarcity has also an important seasonal dimension. Rain is relatively abundant but not regular throughout the year, causing regulation and expensive storage problems. As a consequence, some regions experience water deficits and others water excess.

2.15 **The DR is experiencing increasing competition for water resources.** In keeping up with the country's overall population and economic growth, water use has increased fourfold in the last 20 years. The main water-consuming sector is agriculture, currently representing around 80 percent of water use (see figure 2.1). Requirements for agriculture, driven mainly by the expansion of irrigation, have increased threefold to almost 8 billion m³ per year. Water used for tourism has also risen in response to the growth of recreation activities in hotels, resorts, and golf courses. But the fastest growing sector is domestic use, where water use has risen sevenfold to more than 1.45 billion m³ per year. Household demand will continue to increase with new water connections, as the DR still has low connection rates. Indeed, the National Water Resources Institute (INDRHI) has projected that, if no efficiency measures are taken, household use 2015 will reach 2.3 billion m³.²¹

of GDP). In addition, commercial losses are prevalent, largely due to obsolete cadastres, poor collection performance, theft, and the periodic forgiveness of delinquent bills. Until recently only CORAASAN had extensive metering.

¹⁹ Simas J. 2003. Water Resources Management in the Dominican Republic – Issues and Policy Options. Washington DC: World Bank (processed).

²⁰ In the Latin America and Caribbean region, only Barbados, the DR, Mexico, and Peru exceed the 10 percent threshold. BID, 1998 in Abt Ch.5

²¹ Abt Ch. 5

2.16 The effects of increasing competition are becoming evident, and will worsen in the future. Many local communities suffered supply problems as a consequence during the drought that affected a large cross-section of the country in 2001.²² Moreover, INDRHI projections indicate that key watersheds, such as the Ozama and Yaque del Norte, are characterized by clear deficit trends that put future water supply at risk. Ensuing discussions on how to allocate water have impacted the drafting of the new Water Supply Law – with proposals for making human consumption as the priority water use and allocating the remaining water in function of the economic value of its use.

2.17 **Aquifer supply threatened.** Currently coastal limestone aquifers are over-drafted and seawater intrusion already reaches inland 20 to 50 km from the seashore. Although coastal limestone aquifers contain only about 4 percent of the available groundwater reserves, human activities in the southeast of the country (from Santo Domingo to La Romana and Punta Cana) are heavily dependent on them – for example, some 30 percent of Santo Domingo’s water supply comes from underground sources.²³ Many coastal aquifers are at risk of contamination from agrochemicals and poorly located solid waste disposal, contributing to water scarcity by making resources unavailable.

2.18 **Impending water scarcity will translate into high costs.** Given the reliance of the southeast on groundwater, aquifer overdraft and pollution are bound to translate into very high costs in the near future. Particularly noteworthy is the overdrawing of the aquifers in the Bavaro-Punta Cana area, which threatens the sustainability of this fast growing tourism area. Rising competition over water between agricultural, industrial, tourism, and urban users will necessarily translate in trade-offs, as some of these activities will suffer water shortages. New wells are being excavated at increasing costs, but ultimately, if there is no control of demand, the DR may have to turn to desalinization of seawater, which is an expensive solution. Water scarcity also has ecological costs – reduction in dry season river flows due to diversion of water for irrigation reduces and degrades the habitat available to freshwater aquatic life.

2.19 **Water scarcity is largely the result of uncontrolled demand.** Although the DR has a low per capita endowment of fresh water (about 1,500 m³ per capita per year), this should be enough to meet present and future demands. But current levels of water use by the different sectors are excessive.

2.20 Urban demand will continue to grow rapidly. This is due to both the explosive urban population growth (estimated to reach 85% of total population by 2025), as well as service and pricing inefficiencies. In the water supply sector, the volume of potable water produced is about 700 liters per capita per day (lcd), when less than 250 lcd should be sufficient to ensure adequate provision. Lack of adequate water supply maintenance and system controls and wastage due to inadequate demand management have led to a high level of both distribution losses and consumption. For example, CORAAMOCA experiences physical losses of 60 percent, and real consumption of non-metered users of CORAASAN is estimated at 319 lcd, versus 225 lcd of metered users. Furthermore,

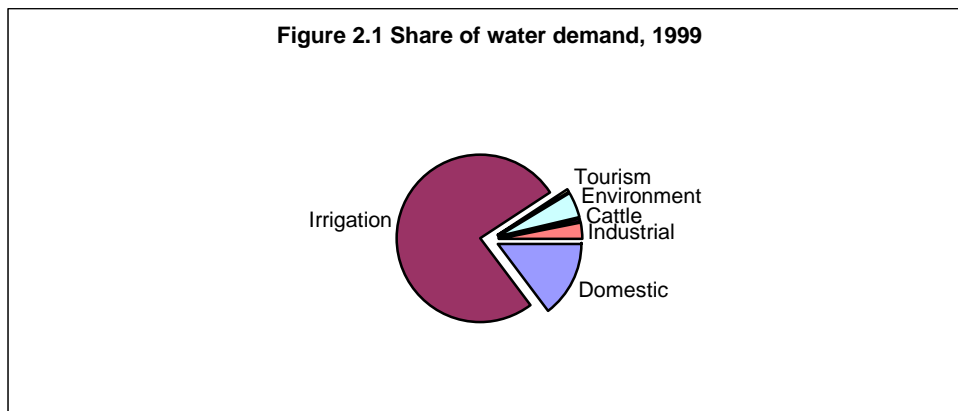
²² Abt Ch.5

²³ Abt Ch.5

current water supply charges do not allow for cost recovery, as most service providers charge minimally for water supply and do not charge for water sanitation services.

2.21 As urban demand increases, demand for irrigation water will have to decrease. Water efficiency in agriculture is estimated to be a low 18-25 percent and a lot of irrigation water is therefore wasted. Irrigation subsidies are promoting unsustainable levels of water consumption. As a consequence, the price that farmers pay for water does not reflect the economic value of its use. In addition, inadequate water pricing impedes the gains in water-efficiency required for expansion of irrigated land. Irrigation subsidies, in addition to a protective trade policy, have fueled the expansion of rice cultivation (a thirsty crop currently representing about 70 percent of irrigation water demand). Expansion of rice fields has led to the loss of main wetlands in the lower Yuna and the north coast. Salinization has also become a serious problem in areas of intensive irrigation. Some 10,000 hectares (3 percent) of the best farmland are now out of production, and over 50 percent of irrigated land is degraded²⁴ (in a single watershed over 55 percent of 112,609 hectares were found to be saline in 1993²⁵).

2.22 Although promotion of water user associations (irrigation farmers) is having positive results in terms of water fee collection rates, the level of the fees is not yet covering 25 percent of the cost of operation and maintenance of irrigation infrastructure. Moreover, the cost of water is only 0.5 percent of the overall cost structure of heavily protected crops such as rice. Increasing the contribution of farmers to operation and maintenance is therefore more a political hurdle than an economic one. Nevertheless, achieving operation and maintenance cost recovery is a necessary first step if more ambitious systems of payments for environmental services are to be implemented.



Source: USAID CEP Report 2001

2.23 Tourism policies do not take into account water quantity constraints. Current tourism policy is largely geared towards increasing the number of tourists, without taking into account the carrying capacity of the natural resource base. The case of the Bavaro-

²⁴ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed). ???

²⁵ Cherrett I. 2003. Watershed Management in the Dominican Republic – Scoping Mission Report. Santiago, Chile: FAO (processed).

Punta Cana area, where tourism planning has not taken into account the availability of water resources, is a case in point. In the 1980s, INDRHI estimated water availability in the East to serve a maximum of 20,000 rooms, but the planned new developments will largely overcome the initial estimates.

2.24 Under DR's active tourism incentive policy (including fiscal exemptions to investments), hotels have been recovering investments in as little as five years, having no rationale to incorporate in decision-making the longer term impacts of environmental degradation. The planned growth for Samana and the pressures to develop Bahia de las Aguilas are further examples of a "slash and burn" tourism model by which new areas are developed as the old ones become degraded. If Bavaro-Punta Cana is to continue as a successful tourist development, and if other areas are going to be developed and sustainably managed, water resources management will have to be factored into tourism planning and decision-making.

WATERSHED MANAGEMENT

2.25 **A third distinctive dimension of the water agenda relates to watershed management.** Watershed management in the DR confronts two distinctive problems: degradation of the upper watersheds, and occupation of the lower watersheds – particularly the urban floodplains.

2.26 **Upper watershed degradation has significant downstream impacts.** Watershed degradation comes primarily from the downstream impacts of soil erosion. Erosion rates have been estimated at four times those of 1980.²⁶ Across the DR sedimentation has reduced dam capacity by some 10-25 percent²⁷, with important economic impacts for the hydropower industry (see box 2.2). In addition, watershed degradation increases the costs of maintaining other water systems, such as irrigation channels and water supply infrastructure, and it affects coastal water quality. High turbidity from land-based sediments prevents reefs from forming in most of the Dominican coast.

Box 2.2 Economic costs of watershed degradation: the problem of dam siltation

Surface water allocation is a key issue in five main river basins (Yaque del Norte, Yaque del Sur, Ozama-Izabela, Yuna and Nizao) where most of the economic activities of the country (other than tourism) are located, and where bulk surface water resources are regularized through major dams. By reducing the lifespan of the dams and hydropower equipment, soil erosion in the upper watersheds represents real costs for the Dominican economy. For example, at a cost of US\$670 million, the Nizao river dams represent the largest infrastructure investment in the history of the DR²⁸. Assuming a loss of hydropower generation of a mere 20 percent, the cost of dam siltation only in hydropower generation lost would exceed US\$10 million per year. Source: Nagle (2001), World Bank staff

²⁶ Simas J. 2003. Water Resources Management in the Dominican Republic – Issues and Policy Options. Washington DC: World Bank (processed).

²⁷ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

²⁸ Nagle G. 2001. Los efectos de un huracán sobre la pérdida de suelos de parcelas cultivadas en una cuenca tropical montañosas. Santo Domingo, Dominican Republic: Proyecto de Reforma de Políticas Ambientales (processed)

2.27 Upper watershed degradation is the product of multiple factors. As in other tropical settings, natural disasters linked to frequent hurricanes and storms such as David (1979) and Georges (1998) are the major contributors to long-term erosion. Inappropriate road and pylon construction in hillside and mountain areas is causing large destruction of trees and scarred hills. And, although the regulatory framework for aggregates extraction is rapidly improving, riverbeds still suffer from illegal extraction of aggregates – driven by a very dynamic construction sector that has caused demand for aggregates to double in five years.

2.28 Agricultural practices also contribute to watershed degradation. Although the agricultural frontier has stabilized, erosion-prone hillside agriculture and extensive cattle ranching continue to expand. Smallholder farmers on the hillside practice slash-and-burn subsistence production with low yields and limited adoption of soil conservation techniques. Consequently as fertile topsoil erodes, soil productivity declines, farmers have to work harder for lower yields and harvests become increasingly vulnerable to droughts, floods, and hurricanes.

2.29 **Deforestation.** In 1994, a Bank environmental assessment singled out deforestation as the top environmental priority. In the last ten years, net deforestation seems to have decreased or even halted, thanks to a combination of heavy-handed anti-deforestation policy, subsidies to liquefied petroleum gas, migration to urban areas and reforestation efforts. The consequences of past deforestation, however, are still felt today. Large tracts of land are vulnerable to erosion from hurricanes due to lack of forest cover.

2.30 Current forest management has a number of shortcomings. While reforestation rates are increasing considerably (between 1990 and 1999, some 10,600 hectares of forest plantations were certified, and the number grew to some 16,000 between 2000 and 2002²⁹), the real impact of reforestation campaigns has been questioned. In particular, reforestation efforts have concentrated on planting exotic species (70 percent), which has arguably reduced overall biodiversity and not increased the quality of soils or helped to control run-off.³⁰ Agro-forestry is limited to the planting of a very small range of fruit trees. Furthermore, a very low proportion of native forested land is under management plans – less than 2,000 hectares. Broadleaf forests in particular are a ‘forgotten’ resource (see table 2.2). Despite its forestry potential, DR is a net importer of wood products, for a value of some US\$50 million per year. Improved forest management and more effective managed secondary growth would boost forestry as an economic sector, and provide sustainable livelihoods.

²⁹ Eckelman C. 2003. A Rapid Assessment of the Forestry Sector in the Dominican Republic. Barbados: FAO (processed).

³⁰ Cherrett I. 2003. Watershed Management in the Dominican Republic – Scoping Mission Report. Santiago, Chile: FAO (processed).

	Forest in protected areas	Forest outside protected areas		Total	Under management plans
		Production forests	Forest with management restrictions		
Conifer forest	176.9	90.7	34.9	302.5	0.9%
Humid broadleaf forest	158.0	253.3	108.8	520.1	0.1%
Cloud forest	71.6	0.0	38.9	110.5	--
Dry forest	70.4	20.1	89.2	367.7	0.8%
Total native forest	476.9	552.1	271.8	1,300.8	1.8%
Plantation forest	0.0	36.0	12.3	48.3	

Source: Eckelman C. 2003. A Rapid Assessment of the Forestry Sector in the Dominican Republic. Barbados: FAO (processed).

2.31 Urban floodplain management. Growing occupation of floodplains and riverbanks and riverbeds of major cities is one of the most serious threats to the urban environment. The largest cities and metropolitan areas are located in estuary areas or in major valleys, and the irregular occupation of flood-prone areas and riverbeds by poor squatters makes flood problems and damages a regular occurrence. In Santo Domingo, over 300,000 people, mostly poor, live in the flood-prone and polluted riverbanks of the Ozama. These problems are aggravated by tropical storms and hurricanes that regularly affect the Caribbean. A major hurricane hits the DR every decade – the latest one, hurricane Georges, affected more than 170,000 people in 1998, most of which were poor people living in flood-prone areas. The absence of flood mitigation measures and the location of the poor in risk-prone areas help to explain the devastating impacts of catastrophic events.

2.32 While a wide array of agencies have a role in urban development and housing issues, strong urban population growth has not been matched by a commensurate policy response. Urban development is not guided by spatial land use planning, and is not stopping the occupation of flood plains by poor settlers. Titling issues, including the lack of a cadastre, represent a constraint to the emergence of a modern urban development policy. The recent division of Santo Domingo into four municipalities contributes to aggravate urban development problems, as the municipalities with larger problems are the ones with fewer resources. And, as housing subsidies are largely captured by the middle-class, there are few resources directed to poor people living in risk-prone areas. Although the EU is funding an important urban upgrading project, it is unclear that this, rather than re-settlement, is the best course of action.³¹

³¹ Jose Simas, 2003, pers.comm.

Box 2.3 The DR is increasingly vulnerable to natural hazards

The DR is exposed to a number of natural hazards, such as hurricanes, storms, floods, drought, earthquakes, and fires. The destructive force of these phenomena can be enormous - in 1998 Hurricane Georges caused economic losses estimated at US\$2,193 (14 percent of GNI), and 235 deaths. In particular, climate shocks have included a dramatic increase in the frequency of major weather events over the past forty years, with 491 recorded major weather events during the previous decade, as compared to 126 from 1960-1969. Flooding has emerged as the most common recorded disaster during the 1990's, replacing fires for the first time in nearly fifty years. Alarming, flooding is mostly due to non-extreme weather events. Out of the recorded 464 major flooding events between 1966-2000, only 33 were caused by hurricanes or tropical storms, while the overwhelming majority of flooding was caused by precipitation during the rainy season. Global climate change is expected to induce permanent climate shocks to the Caribbean region, which will include sea level rise, higher surface air and sea temperatures, extreme weather events (such as tropical storms and hurricanes), increased rainfall intensity (leading to both more frequent and severe flooding) and more frequent and more severe "El Niño-like" conditions. Demographic growth, accelerated environmental degradation, deforestation, and lack of mitigation measures will intensify the impact of disasters in the future. Source: World Bank staff, *Breve Diagnostico de las Areas Geograficas mas Expuestas a Fenomenos Naturales y sus Características*, Ing. Valentin Cordero (October 2000); *Los Desastres Ocurridos en la República Dominicana 1966-2000*, Omar Dario Cardona A. Ingeniar Ltda. (October 2001).

SOLID WASTE

2.33 Low collection and inadequate disposal have made solid waste management a nationwide problem. Rapid economic development and urbanization have altered the composition and level of solid waste generation. The generation of solid waste doubled in Santo Domingo from 1,700 tons of solid waste per day in 1994 to 3,500 tons in 1998-2000.³² The share of organic wastes decreased from 80 percent to 52 percent between 1980-2000. Nationally, less than 2 percent of solid waste is recycled.³³ Despite municipalities' focus on collection, less than 60 percent of the population has access to garbage collection. Poor collection means that much of the waste ends up in waterways where it threatens drinking water. Along the coast, litter and poor collection have significant impacts on the tourism industry.

2.34 Risks of uncontrolled disposal are multiplied by inadequate location of the sites and management practices. Approximately 98 percent of the solid waste collected is deposited in open, unlined dumps.³⁴ La Duquesa, in Santo Domingo, is officially the only sanitary landfill in the whole country, but current management practices mean that it works more like a semi-controlled disposal site. The effects of open-air disposal are well documented: proliferation of pathogens and vectors, aesthetic degradation of the landscape, odors, and emission of biogas and lixiviates. In addition, in the DR, norms relating to hydrogeology and distance to water courses and population centers are

³² IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

³³ SESPAS. 2001. Situacion de Salud y Ambiente. Santo Domingo, Republica Dominicana: SESPAS (processed).

³⁴ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

regularly ignored – a recent study found that 10 out of the 12 municipal disposal sites analyzed were located in inappropriate areas.³⁵ As a consequence, lixiviates are polluting underground waters, while solid waste burning (which has become a normal procedure for solid waste elimination) contributes almost 20 percent of urban air pollution. Another worrying fact is that toxic wastes from hospitals and other sources are not separated for special treatment.

2.35 There is no coherent national policy on solid waste management. While by law municipalities are responsible for solid waste management services, they lack both the financial and technical capacity to provide them. In this context, the norms issued by the Ministry of Environment and Natural Resources (SEMARN) regulating operation of disposal sites are not enforceable. Legal responsibility for developing disposal sites has yet to be established and the legal and institutional framework to promote the development of financially viable regional sites has not been formulated. Another gap is the absence of public awareness and education campaigns to create demand and willingness-to-pay for improved services.

2.36 The solid waste sector is characterized by inefficient operations and inadequate financial arrangements. By law, solid waste management is the responsibility of the municipalities. Other than the meager revenues that they may collect for solid waste services, they depend almost entirely on resource transfers from the central government. Financial management capacity and accountability varies between municipalities. Private provision of collection services is increasingly taking place, but contract design issues (such as failing to consider penalties for non-performance and a role for micro-enterprises) have led in some cases to low collection rates. In addition, there are no environmental regulations appropriate for different markets, nor is there effective enforcement capacity. In general, although municipalities have recently received a higher share of government spending, they start from very low levels, and will not be able to finance sanitary landfill construction and operation in the near future. Without inter-municipal cooperation to reach regional solutions, improving solid waste disposal nationwide will be very difficult.

OTHER ENVIRONMENTAL ISSUES

2.37 A second tier of environmental issues includes urban air quality, coastal degradation, over-fishing and biodiversity. This is not surprising, given the strong urbanization of the DR and the close links between the tourism industry and coastal environmental quality. Concerns with fisheries management and terrestrial biodiversity conservation are also real, but lower in the scale of priorities.

2.38 Urban air quality is becoming a major issue, as a growing population is exposed to increasing levels of pollutants. Although air pollution has not been traditionally a major environmental concern, concentrations of fine particulate matter (PM2.5, PM10) are worrisome. Results from monitoring campaigns in Santo Domingo,

³⁵ Maribel Chalas. 2002 Diagnostico Ambiental Municipal. Residuos Solidos: Caracterizacion de Vertederos Municipales). SEMARN/PAHO/University of Belgium (processed).

Haina, and Santiago show that concentrations of carbon monoxide, nitrogen dioxide, sulfur dioxide, and ozone only occasionally exceed standards (thanks largely to the favorable air circulation conditions that DR enjoys), and concentrations of fine particulate matter are high - particularly in Santo Domingo. While the DR does not have a standard for PM2.5, monitored concentrations exceed USEPA standards. Indeed, estimations that make use of monitored concentrations put the health costs of fine particulate matter (PM2.5) pollution just for the Santo Domingo-Haina area at over US\$190 million in 2001³⁶. By the same token, the health benefits of a reduction of 5 percent in PM2.5 concentration would add up to some US\$9 million per year. The costs of such reduction could not be estimated.

2.39 Transport and electricity generation are the major culprits of urban air pollution. As reflected in table 2.4, fine particulate matter pollution derives mostly from diesel engines used in transport and electricity generation. The diesel-powered public transportation system in DR is old - for example, over 90 percent of Santiago's public transport vehicles are over 16 years old and heavily polluting. At the same time, the unreliability of the electricity network has led to a high concentration of private diesel-powered generators in the DR. These generators are located in the heart of the cities rather than in lower-impact outlying locations, as is normally the case with generators feeding the network. The burning of solid waste is also a significant contributor.

	Santo Domingo-Haina	Santiago
Gasoline-powered vehicles	14	17
Diesel-powered vehicles	46	61
Electricity generation	19	Not included
Industry	3	3
Solid waste burning	18	19

Source: Abt, 2002.
Note: it does not include pollution from private electricity generators.

2.40 **Significant degradation of coastal ecosystems is taking place.** Increasing human populations, economic development with associated sedimentation, sewage, and other terrestrial pollution from agriculture, mining, industry, shipping and tourism continue to put pressure on beaches, coral reefs, and fisheries.

2.41 The status of coral reefs in the DR is particularly worrying. Broad coastal shallow platforms with barrier reefs can be found in the eastern and northwestern coasts, but high turbidity from land-based sediments prevent reefs from forming on the rest of the coast – data from the Parque del Este Protected Area indicates a decline in average coral cover from 20 percent in 1996 to 11 percent in 2001.³⁷ Harvesting of black corals, hermit crabs, ornamental reef fishes, and starfish for the souvenir industry regularly takes

³⁶ Abt Associates. 2002. Diagnostico Ambiental de la Republica Dominicana. Santo Domingo, Dominican Republic: Proyecto de Reforma de Políticas Ambientales (processed).

³⁷ Linton and others. 2002. Status of Coral Reefs in the Northern Caribbean and Atlantic Node of the GCRMN. In Wilkinson C. (ed.). Status of Coral Reefs of the World. Townsville, Australia: Australian Institute of Marine Science.

place, and the use of chemical poisons (such as bleach) affect corals and other non-targeted species. The planned development of transshipment ports will also result in more reef destruction.

2.42 Tourism operations put significant pressure on coastal ecosystems. Upstream water pollution and watershed degradation are major contributors to coastal degradation, but local pressures from the tourism industry are also significant. Existing regulations establish the protection of ecosystems, but they are rarely enforced. Tourism development is taking place in fragile ecological areas. As a result, large areas of the coast have been damaged, including reconditioning of beaches, which in turn causes sediment damage. Hotel infrastructures have systematically been built in violation of the limits established by law (such as construction within 60 meters from the shore,) or in filled wetlands. Coral removal for hotel construction has been observed in Puerto Plata and Samana. In recent years, however, claims from the tourism sector have triggered high-profile government interventions, suggesting a potential role for the private sector in the protection of coastal ecosystems.

2.43 **Overfishing appears locally important.** Degradation (overexploitation and contamination) of fisheries is poorly understood, but it is likely to be taking place. The IDB estimated in 1981 the maximum sustainable yield at 10.5 million tons – a level that was amply exceeded from 1992-1997 before a rapid decline in 1998 and 1999. According to a recent assessment,³⁸ all commercially important species are depleted due to artisanal over-fishing. There is also evidence that poor fishermen suffer from overexploitation and contamination of fisheries. For instance, the bay of Samana has experienced a decline in the catches of prawn, on which poor communities heavily depend. The decrease in catch is largely blamed on high levels of chemical pollution due to upstream agriculture, high levels of heavy metals pollution originating in the mining industry, and sedimentation caused by the canalization works of the Yuna river.³⁹ Fifteen thousand families depend on fisheries for their livelihoods.

2.44 **Pressures on terrestrial biodiversity have been reduced but still exist.** The Dominican Republic is endowed with a rich biodiversity characterized by high levels of endemism (1,800 plant species, 2 mammals, 26 birds, 138 reptiles and 63 amphibians) and rich ecosystems that support a wide range of terrestrial and marine life. Island biodiversity tends to be endemic and highly vulnerable, and the DR is no exception. The disappearance of native habitats in Haiti reinforces the importance of biodiversity conservation in the DR. Since 1981, at least 10 percent of all of the species in the country – and perhaps one-third of the vertebrates – have become endangered.⁴⁰ The decline in terrestrial biodiversity is associated principally with the reduction of forest habitat during the 1980s. Although stabilization of the country's forests in the last

³⁸ Linton and others. 2002. Status of Coral Reefs in the Northern Caribbean and Atlantic Node of the GCRMN. In Wilkinson C. (ed.). Status of Coral Reefs of the World. Townsville, Australia: Australian Institute of Marine Science.

³⁹ Ruta G. 2003. Coastal Zone Management and Tourism in the DR. Washington DC: World Bank (processed)

⁴⁰ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

decade is apparently easing the rate of biodiversity loss, threats to biodiversity continue. The main ones include: (i) the continuing degradation of some forest habitats by land-clearing, human-caused forest fires, and mining; (ii) the illegal hunting and capture of certain species for the pet trade (birds, reptiles); and (iii) the introduction of alien species that are particularly harmful to island environments.⁴¹

2.45 In response, the Government has created over 70 protected areas (up from 9 in 1980) that constitute some 16% of the country's total land mass. As required under Law 64-00, SEMARN has drafted a Biodiversity and Protected Areas Law and submitted it to Congress. SEMARN has also made efforts to develop a National System of Protected Areas - issuing economic evaluations, building monitoring and control programs, developing visitation infrastructure and park ranger program, building capacity. Table 2.3 below reflects the current size and status of protected areas.

2.46 Despite these efforts, several issues remain problematic that could be addressed. Primary among these, and one that may be difficult to achieve in the short term, is the lack of clear boundaries and proper titles for the protected areas. Another issue, as demonstrated in the table below, is the lack of Management Plans for many of the protected areas, despite the requirement under Law 64-00 for management plans for all protected areas. This will entail, among other activities, increasing efforts to collect and assess data. Finally, despite efforts to properly staff and manage the new protected areas, many of the parks remain "paper parks" only, and suffer from infrastructure, equipment, human resources and effective management shortfalls.

Table 2.3: Size and Status of Protected Areas by Category

Management Category	No. of areas	Total area (km ²)	Area (km ²)		Areas with mgmt plans	Areas with visitor facilities	Areas with mgmt. infrastructure	Park guards	Personnel
			Land	Marine					
Scientific reserves	6	222.7	128.7	94.0	2	3	4	51	4
Biological reserves	4	383.8	383.8	-	1	1	1	10	1
National parks	22	8776.8	6650.8	2126.0	8	11	13	361	15
Natural monuments	9	248.9	150.9	98.0	-	4	5	32	5
Wildlife refuges	7	2553.9	211.4	2342.5	-	3	3	15	3
Panoramic byways	10	229.5	229.5	-	-	1	1	-	1
Ecological corridors	6	82.0	82.0	-	-	1	-	-	-
Anthropological Reserves	2	10.5	10.5	-	1	2	1	8	1
National recreational areas	3	43.7	43.7	-	-	2	1	-	2
Green belts	1	140.0	-	-	1	1	-	-	-
Total	70	12,691.8	8031.3	4660.5	13	29	29	477	32

Abt. Associates Inc. Environmental Diagnostic: Protected Areas (Chapter 8); October 2002.

⁴¹ IRG. 2001. Dominican Republic Environmental Assessment. Santo Domingo, Dominican Republic: USAID (processed).

CHAPTER III: LEGAL, INSTITUTIONal and POLICY framework

3.1 This chapter provides an analysis of the legal and institutional framework for environmental management in the DR. It reviews the framework's recent evolution and analyzes the capacity of the SEMARN and other line ministries to address the agenda outlined in Chapter II. Additional analysis examines cross-cutting institutional issues and policies while paying special attention to the difficulties that institutions have dealt with in addressing environmental priority issues. The chapter closes with a brief treatment of environmental financing issues.

LEGAL FRAMEWORK

3.2 The 2000 Environment Framework Law (Law 64-00) establishes a modern institutional framework and provides guidelines and instruments for environmental management. Law 64-00 also brings national environmental and natural resource management responsibilities under one roof in SEMARN. The Law provides a coherent framework to guide future legislation and regulations and establishes the environmental functions of SEMARN and the sector ministries. It also introduces new tools for environmental management, including a national system of protected areas, a national system of environmental information, mechanisms for monitoring and inspection, environmental education and public disclosure, scientific and technological development, the introduction of environmental prizes, certification and other economic incentives.

3.3 This legal and institutional framework needs further consolidation and fine-tuning to successfully address environmental priorities. Future law-making efforts could be approached in phases, maximizing the impact of legal efforts on environmental priorities. In addition, the drafting of new framework laws for key sectors (i.e. water resources and solid waste) offers an opportunity to revisit traditional lawmaking in the DR from a prescriptive approach to a more flexible legal framework that leaves details to regulations and norms.

3.4 Reforming the legal framework for the water sector is the major short-term agenda. While drafts have been completed for a General Water Law and a Water Supply and Sanitation Law, additional work will ensure that both water laws outline an appropriate institutional framework separating service provider functions from policymaking and regulatory functions. With regards to current draft of the General Water Law, there are additional concerns that it remains over-regulatory, neglects to include measures to govern spatial planning and the management of aquifers, and fails to fully outline a water-pricing scheme that will allow for cost recovery. The Water Supply and Sanitation Law will benefit from more work in: (i) coordinating key sections with the General Water Law; (ii) pricing methods; and (iii) transition clauses allowing for a gradual shift to private service provision.

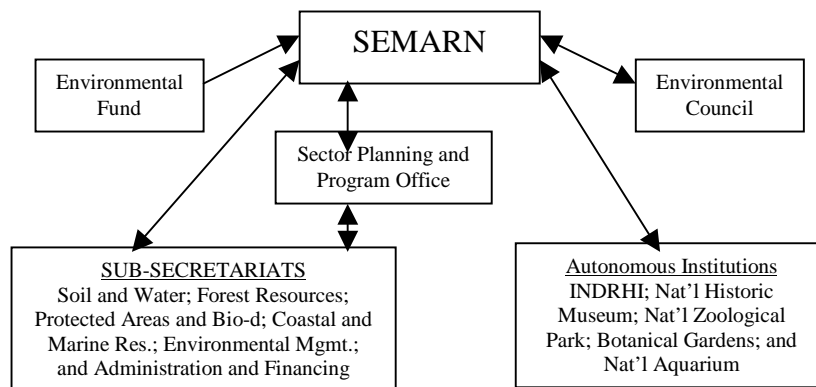
INSTITUTIONAL ANALYSIS

3.5 Through Law 64-00, national environmental and natural resource management responsibilities have been consolidated under SEMARN. The law has also created the National Council for the Environment and Natural Resources (to promote interaction of environmental agencies with other institutions and private sector) and the National Fund for the Environment and Natural Resources (to finance programs, research and education). Some municipalities have created Municipal Environmental Management Units. Private sector institutions and water supply institutions are not analyzed.

SECRETARIAT FOR THE ENVIRONMENT AND NATURAL RESOURCES

3.6 SEMARN is now integrated by the Sector Planning and Program Office, reporting directly to the Secretary, and six Sub-Secretariats: Soil and Water, Forest Resources, Protected Areas and Biodiversity, Coastal and Marine Resources, Environmental Management, and Administration and Financing. In addition, a number of autonomous institutions (the Dominican Water Resource Institute – INDRHI, the National Historic Museum, the National Zoological Park, the Botanical Gardens and the National Aquarium) have been assigned to the Secretariat. The Secretary is the administrative authority integrating the above institutions and presides their boards of directors.

INSTITUTIONAL ORGANIGRAM



3.7 Efficient environmental institutions such as SEMARN are those capable of (i) detecting and monitoring environmental problems; (ii) balancing the interests of those actors involved in creating the problems and those capable of resolving them; and (iii) implementing and enforcing negotiated agreements between actors and instruments⁴². Therefore, to grow into an efficient institution SEMARN could focus on: (i) environmental monitoring to detect the problems early on; (ii) becoming a cohesive and technically competent institution while changing the culture of its agencies moving away from resource development to environmental management; (iii) fostering consensus building across stakeholder groups; and (iv) implementing and enforcing its environmental toolkit while broadening the use of environmental policy instruments.

⁴² World Bank 2003 Word Development Report on Sustainable Development, Chapter III.

A. Environmental Monitoring

3.8 **Lack of reliable and up-to-date environmental information is a major constraint to good environmental policy-making and management.** Establishing and maintaining (integrated) environmental information systems is a real challenge in terms of technical capacity and financial resources. SEMARN has developed some capacity to produce environmental data, in particular for natural resources management. Cartographic information is available, protected areas have been surveyed with satellite imagery, and wildlife data banks have been completed. JICA has financed air pollution monitoring equipment and training. But for key issues, such as water, monitoring capabilities are clearly inadequate, and monitoring efforts depend on unsystematic external demand and support.⁴³

3.9 Water quality monitoring developed by both INDRHI and the Environmental Norms Directorate has not been adequate enough to support policy making and regulation enforcement. Results of monitoring campaigns have not been fully processed, thus impeding the identification of water pollution causes or production of regular water quality statistics. Poor institutional arrangements, in particular between the Environmental Management Sub-secretariat (an institution mandated with water quality monitoring) and INDRHI, have limited efficient sharing of data. Furthermore, a general lack of resources has hindered the continuous implementation of water quality monitoring in priority river basins and beaches.⁴⁴

B. Consolidating and integrating environmental institutions while moving away from resource development to highly competent environmental management

3.10 By bringing together several disconnected agencies with environmental responsibilities, SEMARN represents an important improvement to the institutional map, but also creates huge challenges. The main one for SEMARN is to become a cohesive institution. Institutional coordination, both internal and external to the Secretariat has been the main difficulty. The lack of a unified office space for the Secretariat is a major impediment to effective coordination⁴⁵. The environmental impact review and decision-making committees have been the first formal internal coordination mechanisms. Other activities of the Sub-Secretariats have yet to be coordinated to achieve specific policy goals.

3.11 Human resources appear to be sufficient to accomplish the Secretariat's responsibilities. Current critical situations, however, are those of the Department of

⁴³ For example, SEMARN has restricted water pollution control to compliance with self-monitoring requirements contained in the recently issued licenses and permits. And the only public initiative has been a single water quality monitoring campaign, performed with the cooperation of health authorities, at 85 points on 68 beaches.

⁴⁴ For example, INDRHI's water quality laboratory is equipped to perform physical, chemical and bacteriological analysis of water quality, and is capable of analyzing 4,800 water samples per year. Due to lack of human and financial resources, use of this laboratory for monitoring activities has significantly decreased since 1994.

⁴⁵ Currently, the Sub-Secretariats are scattered around Santo Domingo and housed in their former Secretariats or institutions, which makes coordination extremely difficult.

Integrated Management of the Coastal and Marine Resource Management Sub-Secretariat and the Protected Areas and Biodiversity Sub-Secretariat where staff numbers are clearly insufficient. There is room for improvement of technical core staff competencies and for aligning the skill mix with environmental priorities. High staff turnover after each presidential election also undercuts technical capacity and work program sustainability.

3.12 The agencies under the SEMARN umbrella are still resource developers instead of environment managers. Although the environmental agencies are now united under SEMARN's umbrella, their main terms of reference and activities have not really changed. INDRHI's main focus is still on providing irrigation services rather than on managing water resources. The Sub-secretariat for Soils and Water deals with mining regulations and technical assistance to farmers rather than with broader river basin management. The Sub-secretariat for Forest Resources promotes community and commercial forestry rather than regulating forestry activities in accordance with environmental goals. The Sub-secretariat for Coastal and Marine Resources stimulates fishing rather than coastal zone management. Furthermore, the 'housing' problem acts as a barrier to undertaking the required cultural change.

C. Promoting environmental mainstreaming and building consensus

3.13 SEMARN has the potential to play a leadership role in catalyzing the large potential gains from environmental mainstreaming. So far, environmental mainstreaming has been left to ONAPLAN, but it is unclear whether ONAPLAN has the technical resources to assume this key task. Mainstreaming offers significant opportunities – particularly as some government agencies seem open to increased cooperation. In many cases, those agencies expect SEMARN to take a leadership role. Opportunities for mainstreaming include working with: (i) the Secretariat of Health (SESPAS) in water pollution control; (ii) the Secretariat of Agriculture (SEA) in making a case for reforming agricultural expenditures; (iii) the Secretariat of Industry, Energy and Commerce (SEIC) on support for cleaner technologies; (iv) the Secretariat of Tourism (SECTUR) in exploiting eco-tourism in national parks and improving coastal zone use; (v) the Secretariat of Finance in developing market-based instruments for environmental management; and (vi) the National Planning Office (ONAPLAN) in incorporating environmental planning in national development planning.

3.14 Coordination with other Ministries and stakeholders in policy formulation and implementation remains a challenge. Initial efforts have also been made towards improving coordination. Seven Environment Units (acting as environmental impact assessment liaison units) have been created in the following institutions: Secretariat of Public Works, Power Regulator; National Power Company; Mining Directorate of the Secretariat of Energy; INDRHI; Metropolitan Transport Authority; and Santiago Water and Sanitation Corporation. An additional 17 environmental units are envisioned. Although a positive development, it is unclear whether these units have the capacity to carry out strategic environmental assessments and influence policy-making. SEMARN is often seen more as playing the role of "police" rather than seeking synergies for improved environmental and natural resources management. More systematic coordination with

these units would help to improve relations with other Ministries, facilitating the mainstreaming of environmental policies.

3.15 Relationships with the private sector are improving. Given the nature of environmental problems and the political realities of the country, the private sector is arguably the most important partner for SEMARN. So far, SEMARN's approach has been heavily regulatory, although the Secretariat has taken steps to make environmental policy more participatory. SEMARN has made good progress in involving stakeholders in the formulation of norms and standards, and the design of environmental assessment procedures, but more ample communication and ensuring broader participation⁴⁶ could provide additional buy-in. More recently, SEMARN is actively trying to involve the private sector as a partner in environmental management relations – the foremost example being the launch of a Cleaner Technology Program for small and medium enterprises, where two industrial associations and an academic institution are partners. SEMARN also invited private sector representatives to the stakeholder workshop on identification of national environmental priorities.

3.16 A wide range of academic and civil society organizations working on environmental and natural resources issues can become effective partners. Beginning in the 1980s and accelerating in the 1990s, a large number of local NGOs working with specific watersheds, parks and community areas were established, and many of them currently work with SEMARN on environmental education, community awareness and sustainable management of natural resources⁴⁷. The academic community has also become more involved in environmental studies, research and projects. Several universities have been leaders in raising the public's awareness of environmental issues and conducting research on specific natural resource questions⁴⁸.

Box 3.1 Plan Sierra and Deforestation: Plan Sierra is a well established and highly regarded local NGO that has implemented a very successful reforestation plan that not only halted deforestation of a large area around San José de las Matas (Cibao), but also reduced migration of poor farmers to nearby cities. The essence of Plan Sierra's success is the combination of reforestation with microenterprise (mainly in organic coffee production) and education, empowering local farmers to see trees as a potential source of prosperity. Some of the notable activities undertaken under the reforestation plan have included: (i) Programa de Cedisierra – a program that has provided funding to farmers on 1,014 small shade coffee farms to increase production through sustainable practices; (ii) a program (in partnership with USAID) for rehabilitating 25,000 hectares of coffee farms destroyed by Hurricane Georges; and (iii) the establishment of coffee grower associations, now with over 4,000 members, to share technical assistance and improve opportunities for obtaining credit.

⁴⁶ For example, although it has suffered some setbacks, the initial process of regulation of the mining sector was very well received by the private sector.

⁴⁷ Those include, among others, PRONATURA, Plan Sierra, Progresses, FEPROBOSUR, and the Jaragua Group.

⁴⁸ More specifically, the Autonomous University and the Pedro H. Enríquez National University (UNPHU) in Santo Domingo, and the Center for Urban and Rural Studies (CEUR) of the Madre y Maestra Pontifical University (PUCMM) in Santiago. In addition, the Technological Institute of Santo Domingo (INTEC) established a graduate program in environmental education in 1988, and the Superior Institute for Agriculture (ISA) has launched a forestry school.

3.17 There is scope for engaging the public more effectively. Currently, SEMARN has a department responsible for environmental education, training school teachers across the country and developing materials for environmental education. Beyond the classroom, public participation in decision-making is still limited. Although the Sub-secretariat of environmental management has introduced public participation in environmental impact studies, there is room for improving those procedures (including for better informing the public has their opinions have been taken into account in decision-making), as well as for extending public participation to the other sub-secretariats. More broadly, wider dissemination of environmental information and the impact of environmental degradation for the well being of Dominicans would further the current low profile of environmental issues in the political agenda.

D. Implementation of environmental policy instruments

3.18 Implementation of environmental policy instruments has until now been partial and uneven (see Table 3.1). The main policy instruments comprise: environmental planning, land use planning, protected areas, environmental impact assessment and permit system (including environmental audits), inspections, strategic environmental assessment, environmental norms and standards, environmental information systems and economic incentives (taxes, subsidies, environmental services and investments).

Policies	Assessment	Reasons
Agriculture	Poor	Credit subsidies for agriculture, irrigation subsidies and the overall protective trade regime contribute to water pollution and scarcity. Absence of natural resource management.
Fishing	Fair	Some attention being paid to the conservation of the resource.
Forestry	Fair	Potential unrealized as efforts to promote forestry remain unfocused.
Mining	Fair	Mining fees in place. Dialogue to reduce impact of mining of aggregates, but regulations not consistently enforced. Active mining policy may reduce impacts of La Rosario goldmine.
Industrial	Poor	No promotion of cleaner technologies, including certification schemes.
Energy	Fair	No subsidies, but low taxes. Some incentives to renewable energy, but not major support.
Transport	Poor	Road construction does not take into account damages to watersheds. No visible policy to reduce age of stock of diesel-powered vehicles.
Tourism	Poor	Tourism development policy does not take into account carrying capacity. Zoning regulations are not consistently enforced.
Social	Fair	Extra funds allocated to community forestry. Subsidy to LPG phased out but coming back under high international oil prices.
Urban	Poor	Low pricing precludes investments in water supply- related infrastructure, including wastewater treatment. Housing policy favors middle class rather than relocation of poor living in flood-prone areas.
Trade	Poor	Rice protection contributes to water scarcity. High tariffs for clean technology equipment.
Tax	Fair	No environmental taxes in sight, but open to implementation.

3.19 Environmental planning, and in particular spatial land use planning, have not been addressed. Given the nature of environmental priorities in the DR, building on existing initiatives to implement spatial land use planning could provide large pay-offs. Central issues related to water resources management, watershed degradation, and solid waste disposal have fundamentally to do with the location of human activities in the territory and their local demands and impacts on natural resources. Spatial land use planning, as a process that covers both decision-making and implementation, could be used to direct those human activities to appropriate locations, taking into account carrying capacities. ONAPLAN is taking the lead in developing a spatial land use plan (terms of reference have been developed and financing is being secured), and SEMARN has built important mapping capacity. A national integrated water resources plan would be an essential input to the spatial land use plan. And Municipalities would have to be strongly involved. In the mean time, on-farm land use planning is being promoted by the Secretariat of Agriculture and Sub-Secretariat of Soils and Water.

3.20 SEMARN has developed a large set of environmental norms and standards,⁴⁹ but in the rush to comply with the mandate of law 64-00, some of those regulations are not adhered to or enforced. Since SEMARN has insufficient resources to enforce those regulations,⁵⁰ and the regulations are seen as too stringent, the economic agents do not comply. Self-monitoring and reporting requirements (focused on industrial facilities, free trade zones, and hotels) somewhat compensate for regular inspections, but follow-up monitoring of management has yet to be initiated. SEMARN has recognized the risk, and its approach to regulation included a one-year testing phase for standards, after which the standards are fine-tuned and applied for a five-year period. Although this approach is positive, the Secretariat's strategy of 'starting hard', coupled with lack of enforcement capacity, is likely to test credibility of the Secretariat while alienating the private sector. The creation of a culture of non-compliance would create further obstacles in the future.

3.21 Environmental impact assessment and environmental permits are considered as a priority by the Environmental Management Sub-secretariat and have been carried out on a regular basis. A strategic approach has been adopted, focusing limited available capacity first on the tourism industry. Problems remain, however, as after licenses are granted, no follow-up is undertaken, limiting the final results.⁵¹ The system also requires strengthening outside SEMARN – there is a high rate of rejection of Environmental Impact Assessments - suggesting that the consultants require further assistance in preparing them. In addition, across the Government there is a lack of resources and institutional coordination to conduct Strategic Environmental Assessments of public policies and programs.

⁴⁹ Areas covered so far include: water quality control (standards for effluent discharge by industries and municipal runoff and sewerage systems); solid waste (norms and procedures for municipal waste collection and disposal, as well as for radioactive solid waste management; procedures for licensing and inspection of management facilities); air quality (emission standards for industry and vehicles; control measures); and noise (emission standards for stationary and mobile sources, noise monitoring procedures).

⁵⁰ The division in charge of environmental quality monitoring and standard enforcement is dramatically understaffed – no more than 15 professionals have to control an estimated 20,000 enterprises.

⁵¹ For instance, it has been reported that some hotels get the wastewater treatment equipment required to get licensed, but they do not operate it.

3.22 Economic instruments. Use of economic instruments has until now been very limited. The only one in place is a fee for the extraction of mineral resources. Although high-level staff have participated in training events, with only one junior environmental economist in its payroll, SEMARN probably still lacks the technical capacity to devise and implement economic instruments. Nevertheless, water pricing, effluent fees, tipping fees, and payments to upstream land users for environmental services have a large potential to help solving the environmental priority issues. Some current initiatives go along these lines, in particular negotiations for a cooperation agreement with an electric corporation regarding the provision of environmental services in the Yaque del Norte river basin, and preliminary studies on the granting of subsidies to land owners for forest conservation.

3.23 Information instruments. The experience of some South-East Asian economies indicate that a pollutants disclosure program and a program to disseminate information on air and water pollution could be valuable additions to the existing environmental policy toolkit. Moreover, just keeping the overall public and non-governmental organizations more informed of environmental activities, data, issues and non-compliance might help to foster environmental awareness and build an environmental constituency.

ENVIRONMENTAL COUNCIL.

3.24 The National Council for the Environment and Natural Resources (NEC) is to promote the interaction of environmental institutions with other government organisms, academia, private sector and environmental NGOs. The NEC's main attributions comprise environmental policy formulation and evaluation and biodiversity protection. The Council consists of 22 members (13 ministers, and 9 representatives of social groups – universities, NGOs, business, and peasants) and is headed by the Environment Secretary. The NEC has not yet been activated, and could serve as a valuable mainstreaming tool for SEMARN. Draft regulations have been proposed, but are waiting for approval. The large number of members and the high-level of government representatives have been identified as difficulties to make it operational.

ENVIRONMENTAL FUND.

3.25 The National Fund for the Environment and Natural Resources (NEF) was created under Law 64-00 to finance programs, research and education on environmental conservation and rehabilitation. Although a draft regulation has been prepared, the fund has yet to be implemented. Once created, the fund is to be supplied by revenues from fines, permit systems, and other environmental services; compensation for environmental damages; 25% of taxes paid for the use of natural resources; 33% of other non budgetary revenues of SEMARN; and national and international donations. Its operation would open the possibility of adding resources to SEMARN's budget and provide for other government and non-government environmental institutions.

MUNICIPAL ENVIRONMENTAL MANAGEMENT UNITS

3.26 Decentralization of environmental management is underway and is to be seen as a long-term process. The DR is currently experiencing a national process of decentralization and under the current administration municipalities will double their share of government spending. SEMARN is leading the way and has strongly committed to decentralization of environmental management. A number of municipalities have created municipal environmental management units (MEMU), and SEMARN is supporting the MEMUs mostly in the form of training.

3.27 Currently, there are two barriers to the full decentralization of environmental management. First, SEMARN has not yet defined the future system. Questions that will be addressed include: (i) which functions should SEMARN execute by itself (either at central or sub-national level); (ii) which agencies (at national, regional, and local level) should execute the other functions; (iii) what resources will be required; and (iv) what will be the accountabilities and management indicators. Second, most MEMUs are not yet strong enough to receive environmental management functions. Given limited resources, strengthening of the decentralization process will require focusing on selected MEMUs according to demand and capacity to avoid spreading out resources too thinly.

ENVIRONMENTAL FINANCING

3.28 There is room to improve the level and effectiveness of environmental expenditures. Although a quantification of the total financial resources needed to address the most urgent environmental priorities is beyond the scope of this report, it is clear that the current level of environmental expenditures is insufficient to address the agenda outlined in the previous chapter. The level of public environmental expenditures remains stagnant, and SEMARN in particular has low financial resources. Currently, the effects of low expenditures are compounded by poor allocation with a budget structure that make it difficult to attack priority environmental issues. Although information on private environmental expenditures is extremely scarce, anecdotal evidence suggests that there is scope to leverage private sector participation in environmental management. Finally, donor support for environmental issues is very important, but there is room for increasing alignment with priorities.

3.29 The level of public environmental expenditures remains stagnant. Assuming budgets are the most telling indicators of government priorities, the DR's commitment to the environment has not radically increased in recent years, even after the passage of Law 64-00 and the creation of SEMARN in 2000. Between 1999-2001, the overall public sector expenditure in environment increased only by 0.01% of GDP (see table 3.2). For any developing country assessing whether the level of public environmental expenditures is adequate is a difficult undertaking: there are no clear international benchmarks, environmental issues differ, and the relative weights of public and private expenditures vary. Although it offers only a limited view, looking closely at the responsibilities and budget of the environmental agency helps.

3.30 Even within a stagnant envelope, **there are important opportunities for improving environmental and poverty outcomes.** For example, the DR spends a lot of resources on the agricultural sector (8 % of the annual budget), and does so in a way that is largely environmentally damaging. Another point to notice is that broad environmental expenditures tend to be regressive – currently it is primarily the non-poor farmers who benefit from support to rice, and the non-poor households who benefit from subsidized housing and water and sanitation works.

3.31 SEMARN has very limited financial resources. SEMARN’s budget seems relatively high at first sight (2.2 percent of government spending), but this is deceptive. The annual budget of SEMARN proper in 2001 was only DR\$385 million (some US\$15 million). Transfers to off-budget institutions (mainly INDRHI for irrigation infrastructure) represented 73 percent of the total. Given its inherited payroll, most of SEMARN’s budget is spent in wages and salaries (see below). The effect of the recent fiscal crisis on its budget is still uncertain. The low political profile of environmental issues plays against it, but given the low level of non-payroll expenditures there is not much left to cut.

		1997	1998	1999	2000	2001
Central government	Total	0.92	1.30	1.61	1.46	1.70
	Net of transfers	0.84	0.98	1.15	0.91	1.19
	Transfers	0.08	0.32	0.47	0.55	0.50
Off-budget institutions		1.86	1.64	1.91	1.51	1.88
Total public sector		1.95	1.96	2.38	2.06	2.39

Source: National Budget Office, World Bank staff

3.32 **SEMARN faces difficulties in matching expenditures to environmental priorities.** A detailed analysis of SEMARN’s executed budget illustrates the heritage of the past and the difficulty to align expenditures with priorities. Spending focuses largely on ‘green’ issues, leaving ‘brown’ ones under-funded (see table 3.3). For instance, the executed budget of the Vice-Secretariat for Forest Resources was, in 2001, nine times that of the Vice-Secretariat of Environmental Management. The latter had to make do with a mere DR\$17 million (some US\$700,000). The National Aquarium and the National Zoo (both off-budget institutions) had also allocations higher than that of the Vice-Secretariat of Environmental Management. And within the Vice-Secretariat for Marine and Coastal Resources, the budget for fisheries was three times that for coastal and marine resources conservation. SEMARN has initiated a new budgeting process around programs rather than departments that should facilitate alignment over time. But given the weight of salaries in the overall budget (see below), room for improvement is limited, particularly without a staff restructuring.

	DR\$ million	% (1)		DR\$ million	% (1)
General Management, total	146.7	38.0	Forest Resources, total	125.2	32.4
Superior Administration	106.5	27.6	Superior Administration	22.7	5.9
Planning and Programming	4.9	1.3	Reforestation and Forest Mgt.	22.6	5.8
Environmental Education	5.1	1.3	Coordination of Operations	64.9	16.8
Environmental Police	13.5	3.5	Planning and Forestry Policy	4.1	1.1
Communications	3.3	0.9	Forest Protection	4.4	1.1
Admin. & Financial Services	13.3	3.4	Forestry Training & Research	6.5	1.7
Environmental Mgt, total	17.0	4.4	Soils and Waters, total	31.2	8.3
Superior Administration	7.8	2.0	Superior Administration	10.7	2.8
Environmental Quality	2.6	0.7	Watershed Management	13.4	3.5
Environmental Assessment	2.3	0.6	Control of Mineral Resources	4.0	1.0
Environmental Protection	2.5	0.6	Land management	3.8	1.0
Env'l Norms & Technology	1.8	0.5			
Biodiversity and Protected Areas, total	42.7	11.1	Coastal and Marine Resources, total	23.0	6.0
Superior Administration	10.1	2.6	Superior Administration	6.1	1.6
Parks Administration	21.6	5.6	C.M. Resources Conservation	4.2	1.1
Wildlife and Biodiversity	11.0	2.8	Fishery Resources Control	12.7	3.3
Off-budget institutions, total	1,040.1				
INDRHI	976.0	252.6	National History Museum	7.7	2.0
National Zoo	9.1	2.4	National Aquarium	28.0	7.2
National Botanic Garden	19.3	5.0			
Source: World Bank staff, National Budget Office					
Notes: (1) As percentage of SEMARN's budget, net of transfers. The figures refer to executed budget.					

3.33 As already mentioned, public environmental expenditures in the DR are characterized by a high-level of spending by off-budget institutions – almost 80 percent of the total in 2001); a clear bias towards current expenditures – particularly wages and salaries (see table 3.3); and large differences between programmed and executed budgets. It is difficult for central governments to oversee off-budget agencies, creating opportunities for misalignment of spending and priorities⁵². The prevalence of wages-and-salaries makes agencies with environmental responsibilities incapable of executing their functions. And the difference between programmed and executed budgets – in DR largely attributable to the historic budgeting culture – prevents environmental spending to be results-oriented.

⁵² For example, although INDRHI has responsibilities for water resources management, including water quality and groundwater management, it focuses its budget mainly on irrigation works. This is particularly relevant since INDRHI's budget is over 30 times that of SEMARN's soils and water program.

	Total (DR\$ million)	Wages and Salaries	Other current expenditures	Capital expenditures
General management	146.7	26%	7%	67%
Environmental management	17.0	87%	6%	7%
Soils and Waters	31.2	78%	6%	16%
Forest Resources	125.2	92%	4%	4%
Biodiversity and Protected Areas	42.7	91%	6%	3%
Coastal and Marine Resources	22.7	87%	5%	8%
Total SEMARN proper	385.5	65%	6%	29%
Off-budget Institutions	1,040.1	31%		69%

Source: National Budget Office, World Bank staff

3.34 **There is scope for greater involvement of the private sector in environmental management.** Information about private spending on the environment is extremely scanty, but anecdotal evidence suggests that it is currently at low levels. In principle, this situation represents opportunities. Indeed, examples from the tourist sector (see box 3.2) suggest a great deal could be done to develop leverage over the private sector in the field of environmental management. But private involvement will depend on the distribution of environmental benefits. Private sector led-initiatives could be fruitful in those cases where the future of key industries, most prominently tourism, is tied to environmental quality – particularly when the source of environmental degradation and main beneficiaries of environmental improvement are the same. Private/public sector partnerships have their greatest potential in cases of investments that generate public and private goods (such as waste-water treatment plants, and solid waste management operations).

3.35 Focusing on pollution issues, given the past lack of pollution control legislation, private investments in pollution abatement by the private sector in a wide sense (including private industries, utilities, and private citizens) has been very low. The introduction of the polluter pays principle suggests that private environmental expenditures will have to rise significantly in the near future.

3.36 Augmenting the role of the private sector in environmental management faces a number of constraints: first, short-term vision on the part of the private sector for size rather than quality of growth, and lack of recognition of threats from environmental degradation and resource constraints; second, the lack of a clear incentive framework for public-private partnerships; third, the lack of private sector leadership to exploit opportunities for private engagement/investment; and finally, a backlash to privatization caused by recent experiences in the power and solid waste sectors.

Box 3.2 Private Sector-Led Initiatives in Sustainable Tourism Development

Punta Cana, a resort in the eastern coast in DR, offers an example for the Caribbean of how luxury tourism development and conservation can be combined. This high-end resort was established with the goal of catering to luxury-class tourists while respecting the natural habitat of Punta Cana. The developers have set aside 10,000 hectares as a nature reserve and native fruit tree garden. The Punta Cana Nature Reserve includes 11 freshwater springs surrounded by a subtropical forest where many species of unusual Caribbean flora and fauna live in their natural state. Guests can explore a "nature path" leading from the beach through mangroves, lagoons of fresh water springs and dozens of species of Caribbean bird and plant life. The Punta Cana Ecological Foundation has begun reforesting some parts of the reserve that had been stripped of their native mahogany and other trees in the past. Programs to protect the offshore barrier reefs and the recycling of wastewater for use in irrigating the grounds have been implemented. The resort is also home to a biodiversity laboratory run in association with Cornell University.

CAST, a partnership between the Caribbean Hotel Association, Green Globe 21 and the International Hotel Environment Initiative (IHEI), offers another example of the potential role of the private sector in improving environmental management. Created in 1995 with the financial assistance of regional business leaders, it aims to a more competitive tourism product through the gain of international recognition for Caribbean hoteliers. CAST's mission is to enhance the quality of the region's hotels and tourism by offering training on sustainable tourism. It also promotes the industry's efforts and successes to the traveling public and other stakeholders and serves as a vital link to all stakeholders with sustainable tourism interests in the Wider Caribbean Region. CAST members have reaped cost savings.

3.37 **Donors represent a key source of finance.** Eleven donors actively support the environment sector, resulting in external financing of some US\$176 million for the period of 1998-2002. An additional US\$107 million have been pledged in future commitments for 2003 onwards. These aid flows are channeled through 48 projects. Although the DR tops the Caribbean region in absolute terms, it falls to the bottom after correcting for population (see table 3.5). Given the much smaller size of many Caribbean countries, one would expect the average per project for the DR to be significantly higher than the regional average, but in 1998-2002 the amount was a low US\$4.3 million versus a Caribbean average of US\$4.0 million. After removing the three highest value projects the average per project in the DR falls to US\$2.0 million, suggesting that the overall donor portfolio carries high transaction costs and an excessive donor management burden.

3.38 **Donor support does not fully match environmental priorities.** Data indicates that donor support is highly skewed towards natural resource management, which accounts for 83 percent of projects and 76 percent of total funding. As a consequence solid waste management and pollution control (in particular water pollution) remain largely under-funded. In addition, while the data does not reveal how much is given to

mainstreaming by donors, the current weakness of mainstreaming across GoDR suggests that donors could play an important role here.

	DR	Haiti	Jamaica	Guyana
Period analyzed	1998-2002	1999-2003/04	2000-2004	1998-2003
Total funding for environment (US\$ million)	175.5	182.1	89.8	149.8
Funding for environment excluding water (US\$ million)	79.7	49.6	25.6	54.2
Funding for water (US\$ million)	95.8	132.5	64.2	95.6
Number of projects	41	27	28	36
Population, 2001 (million)	8.5	8.1	2.6	0.77
Funding per capita and year (US\$)	4.1	5.0	6.9	32.4
Funding per project (US\$ million)	4.3	6.7	3.2	4.2

Source: Adapted from Morrill, J. 2003. Donor support for the environment sector in the DR. Washington, DC: World Bank (processed)

3.39 Beginning in October 2002, the international donor community has been meeting periodically in the DR to improve coordination in the environment and natural resources management sectors. Initial meetings, led by CEPAL and the GTZ, focused on establishing a methodology for setting environmental priorities and defining environmental indicators for the DR. SEMARN has since taken full ownership of the process and established a set of useful indicators that will continue to be refined with the help of a donor-led task force. Future donor coordination working sessions will attempt to build a detailed donor strategy that coordinates involvement in the sector.

CHAPTER IV. RECOMMENDATIONS

4.1 This chapter makes a series of recommendations derived from the analysis in the previous chapters on environmental issues and institutional arrangements. The first section explores opportunities for institutional reforms in SEMARN that will have an impact on priority areas and will improve overall environmental and natural resources management. Subsequent sections will make specific recommendations for addressing the main areas identified in the CEA: overall water resources management; water quality and quantity; watershed management; solid waste; and air pollution.

INSTITUTIONAL RECOMMENDATIONS

4.2 Acknowledging the major achievements of Law 64-00 and SEMARN's efforts to implement the law, the road ahead in implementing the law remains somewhat daunting. The sheer scope of the reform agenda is ambitious, suggesting that SEMARN must focus on priority issues, taking into account limited funding and capacity. This study proposes a possible strategic approach derived from the World Bank's *World Development Report 2003: Sustainable Development in a Dynamic World* (WDR). In Chapter III, the WDR asserts that institutions for sustainable development should focus on executing three functions well: (i) to pick up signals - are systems in place to ascertain environmental problems and monitor them?; (ii) to balance interests - are there formal (e.g. laws or regulations) or informal mechanisms in place to balance the interests of all stakeholders?; and (iii) to implement solutions - does the institution have the capacity to implement the agreed solutions?.

Picking up signals

4.3 Under the first function, there are significant opportunities for SEMARN to improve its capacity to monitor environmental health and natural resource depletion. Recognizing that environmental monitoring is costly, SEMARN could focus on getting data collected, analyzed and disseminated in the following areas: (i) water quality; (ii) water scarcity in specific, fragile areas; (iii) erosion/sediment build-up in the Nizao watershed; and (iv) air pollution in Santo Domingo or Santiago. This requires installing monitoring equipment and coordination with other agencies or academic institutions to streamline data gathering, analysis and dissemination.

4.4 To further alleviate the costs of monitoring, SEMARN can strengthen the administration of the reporting schemes that require polluters to periodically provide data on their pollution effluents. Enforcement could be accomplished through a combination of effective publication of reported data, and periodic, random site inspections backed by strong penalties for misreporting. Academic institutions, community groups and NGOs could be helpful watchdogs and allies in this task.

Balancing Interests

4.5 SEMARN has made significant progress in establishing formal arrangements that balance the interests of stakeholders, but some gaps remain in the legal and regulatory framework for the environment. In particular, the draft General Water Law and Water Supply and Sanitation Law could outline an appropriate institutional framework that separates service provider functions from policymaking and regulatory functions. Weaknesses in the most recent drafts of these laws have been discussed in Chapter III (see para. 3.4), and could be addressed before Congressional approval.

4.6 To strengthen the informal arrangements for balancing interests, SEMARN could work towards the creation of a consultation culture that seeks to build cooperation and consensus to address environmental priorities. One possible tool for initiating this consultative culture would be to make operative the Environmental Council. This body could be instrumental in helping to coordinate environmental policies across Government, mainstream the environment into sector programs and policies, and reach consensus on approaches to priority environmental problems. To improve the functionality of this potentially unwieldy body, commissions could be set up to meet more regularly on priority issues such as water quality and solid waste. As the functionality of the Council improves, more commissions could be established to deal with secondary issues.

4.7 SEMARN has other tools at its command to reach out to key stakeholders and build a consultative culture. SEMARN could develop bilateral arrangements with key ministries that incorporate regular briefing sessions and dissemination and consultation processes. Through preparing conferences, seminars, training opportunities and other special programs, SEMARN could reach out and educate polluters, including municipal solid waste managers and water supply and sanitation providers, industries and hotels. SEMARN could also build partnerships with civil society to identify local environmental issues and build a constituency for the environment. All of these activities suggest the need for a strong communications department that is capable of educating the public on environmental priority issues of the day.

Executing Solutions

4.8 To improve its ability to execute and implement solutions, SEMARN could focus on strengthening its skill mix, targeting limited funds and capacity towards priority environmental or natural resources issues. There remain capacity gaps in SEMARN that require training, including: (i) the use of mechanisms to monitor environmental programs; (ii) implementation of permit and licensing procedures and EIAs; (iii) the development of market based and other economic instruments; and (iv) techniques for public disclosure and participation. Initial capacity building efforts might focus on priority areas. Expanding beyond SEMARN, the environmental units in each line ministry will also require further capacity building in the same priority areas to augment

environmental mainstreaming and improve coordination between these units and SEMARN.

4.9 SEMARN might also consider some strategic reorganization to change the culture from natural resources managers to environmental managers, eliminate conflicts inherent in handling policymaking, regulation and service provision, and streamline environmental management. One suggestion is to retain INDRHI's water resources management responsibilities within SEMARN (as a Water Resources Management Authority) and to transfer the irrigation services responsibilities to the Ministry of Agriculture. Forestry and fisheries services could also be divided in such a manner, with SEMARN retaining the regulation authority. Central to the effort to reorganize will be the development of a human resources plan that concentrates capacity on priority areas and provides for budgetary adjustments to meet priorities.

4.10 In addition to making structural changes to the budget, SEMARN could examine additional avenues for funding. The initialization of the Environmental Fund could help to provide much needed financial support to certain areas, such as costly monitoring projects. The implementation of economic instruments for improving environmental management in priority areas (water pollution charges, water user fees, and payments for environmental services, and an environmental tax on transport fuels and private generators) could be a significant source of revenue to supply the Environmental Fund. Furthermore, there is certainly room for better donor coordination to ensure that external financing addresses priority environmental issues in the DR.

4.11 One final area that could help to improve the implementation of environmental solutions would be strengthening existing Municipal Environmental Management Units (MEMUs) in the areas of solid waste and wastewater treatment that takes into account the different needs for small, medium and large cities. SEMARN could provide municipalities with technical assistance in expediting environmental norms, implementing training programs, and in developing materials and guides for local level management. SEMARN can coordinate with international agencies, academic institutions like PUCMM, and the NGO community to build an environmental component into their ongoing decentralization efforts. In the medium term, funding will be required for MEMUs to begin projects previously designed in the work plans, possibly drawing in part from the Environmental Fund.

RECOMMENDATIONS FOR SPECIFIC SECTORS

Need for an Integrated Water Resources Management Framework

4.12 Building a coherent **water resources management framework** is an urgent task. To address this framework in the short term, and as mentioned under paragraph 4.5, SEMARN could work with INDHRI and other government and private stakeholders in finalizing the General Water Law that, among others: (i) deals directly with underground water management; (ii) outlines clear functional roles and responsibilities for Government agencies at the national and local levels that are appropriately divided

between service provider, regulator and policy maker; and (iii) sets in place the tools for water resources management – water rights registry, appropriate water pricing that takes into account the full costs of water, licensing and permitting, penalties and incentive mechanisms, planning and development programs (spatial land use planning), conflict resolution, disaster management, and monitoring.

- 4.13 In conjunction with processing the Water Law, SEMARN (with INDRHI and other line ministries) could prepare a **water resources management strategy** that focuses on sustainable demand management. The plan could elucidate, among other issues: (i) a detailed action plan for implementing the General Water Law once it is passed; (ii) possibilities to reduce water demand in irrigation; (iii) a public awareness program targeted to different user groups; (iv) adaptive research on groundwater management, water quality, and watershed erosion control; and (v) incentive programs for managing irrigation, urban water supply, reforestation and curbing erosion, coastal aquifer management, and watershed management.
- 4.14 To implement the strategy a national **Water Resources Management Authority** would need to be created within SEMARN (while the irrigation responsibilities of INDRHI would have to be transferred to the Ministry of Agriculture). Such authority would have to encompass the mandates of several other agencies (including the Dam and Reservoir Committee) that have now ambiguous and duplicating responsibilities.

Water Quality

4.15 New policies and institutional reforms will be necessary to address the key sources of water pollution: inadequate wastewater management and agricultural run-off. In regards to **wastewater management**, there is a clear need for greater investment in water sanitation infrastructure (only 20% of urban wastewater is treated or screened). To finance these investments and consequent operation and maintenance costs, adequate water supply and sanitation charges must be in place to support more than just service provision and to ensure cost recovery. The financial management of the potable water operators needs to be strengthened as well.⁵³ The new Water Supply and Sanitation Law could address this and other administrative inefficiencies, while also strengthening the role for SEMARN in regulating water supply and sanitation providers like CORASAAN, CAASD, CORAAMOCA and others as polluters.

4.16 Implementing water pollution charges, in line with the polluter pays principle enshrined in Law 64-00, will provide incentives to the polluters (industry and water utilities) to internalize the environmental costs of pollution by investing in pollution abatement equipment. In addition, the revenues could be directed to the Environmental Fund to finance water quality-related measures, including monitoring, capacity building, and environmental education, among others.

⁵³ This is one of the key reforms supported by IDB.

4.17 To improve water quality monitoring, SEMARN could develop reporting requirements and other incentives that treat water supply agencies like CORASAAN just like other economic agents. The Ministry of Health could also work with SEMARN to improve the regulation of water supply and sanitation services by identifying clear roles and responsibilities for each institution through a Memorandum of Understanding.

4.18 A second major source of water pollution, **agrochemicals**, could be better controlled by both the Ministry of Agriculture and SEMARN through proper incentives and regulations. Ending subsidized credit for agrochemicals would contribute to a reduction of water pollution. The Ministry of Agriculture (in consultation with SEMARN) could develop regulations and other measures that better control pesticide and other agrochemical use. Measures could include: (i) enforcing prohibitions on internationally banned agrochemicals; (ii) licensing dealers and various classes of applicators; and (iii) developing an information campaign and public awareness program that educates farmers on the proper use of agrochemicals. The Ministry of Agriculture could also implement education programs on integrated pest management as an alternative to the use of agrochemicals.

4.19 In the longer term, the Ministry of Agriculture, in conjunction with SEMARN, could examine the pollution effect of animal waste in concentrated animal feeding operations (CAFO) through a monitoring program. Future land use planning and spatial planning could control the placement of these CAFOs to prevent run-off into hydrologically sensitive areas. There may be potential as well for a system of regulations and incentives to encourage farmers to better capture the waste produced in CAFOs.

Water Quantity

4.20 To curb demand in the **irrigation sector**, INDHRI could make water pricing a priority. First, the Government could consider reducing subsidies to INDHRI for irrigation operation and maintenance, and place such responsibility with the farmers. At the same time, the Ministry of Agriculture could provide technical assistance to Water User Associations in implementing a water charge system based on higher charges for higher water use crops (i.e. rice) that would initially cover maintenance and operation costs while reducing demand. There is certainly scope for selective modernization of irrigation systems seeking economic water savings (drip irrigation for instance), and for technical assistance to farmers to improve on-farm water use.

4.21 In the **urban water supply** sector, demand could be reduced through an appropriate water pricing structure that reflects the true costs of supplying the resource (covering operation and maintenance costs), that provides adequate subsidies for the poor, and that encourages rational water use and renewal of the old water supply equipment. The Government could also partner with water utilities to provide for education programs on water use to curb over consumption.

4.22 **Coastal groundwater management** needs additional attention by SEMARN and INDRHI in: (i) improving the analytical database (aquifer mapping); (ii) establishing clear management responsibilities; (iii) building capacity to monitor and manage the

resource; and (iv) executing some form of regulation and enforcement (licensing and penalties for overdrawing). In the area around Santo Domingo, INDRHI might want to examine the possibilities for using surface water to recharge coastal aquifers.

Watershed Management

4.23 Within the broad topic of watershed management, two priority issues emerge that should be addressed: (i) upper watershed degradation; and (ii) flood management.

Looking first at the **upper watersheds**, the Ministry of Agriculture could examine the possibilities for instituting the following

- technical assistance to farmers on proper hillside farming (contour plowing, crop rotation, avoiding the burning of crop residues) and ranching techniques, with a focus on key watershed areas;
- payment by downstream users (irrigation and electricity sectors) for environmental services (tree planting and maintenance) that reduce erosion;
- sustainable forestry farming and managed secondary growth; and
- pilot a watershed committee in the area around Santiago, an area that has shown the capacity to plan, as demonstrated by its detailed environmental plan.

The Ministry of Communication and Public Works could develop proper road building regulations to reduce erosion.

4.24 As has been highlighted in Chapter II, **flood management** is an important issue for the DR. An agenda for flood management would include: (i) clarify roles and responsibilities of national and municipal institutions (General Water Law and Strategy); (ii) prevent building in flood prone areas and plan flood control infrastructure needs; (iii) coordinate with meteorological institutions to plan for disasters and develop a disaster management plan; and (iv) put in place adequate drainage infrastructure in urban areas to prevent flooding and help control run-off.

Solid Waste

4.25 Solid waste management will require both legal and institutional reforms, as well as a commitment to invest in collection equipment and sanitary landfills. First, there is a need for the elaboration and implementation of a **national solid waste management strategy**. Such strategy could be developed by an ad-hoc national agency in which municipalities are represented. Possible duties of this agency would include: elaborating a national solid waste management strategy; coordinating and promoting inter-municipal cooperation; helping develop cost recovery mechanisms; and providing financial and technical support for capacity building at the municipal level.

4.26 With only one sanitary landfill in operation, the DR will need to **construct additional landfills**. Landfill construction as well as other necessary investments for collection and disposal equipment (including Operation and maintenance costs) may require further budgetary allocations from the Central Government. New landfills will require appropriate EIAs that, among other things, ensure that they are not constructed on

hydrological sensitive areas. The introduction of tipping fees will be key to help ensure the financial sustainability of the new landfills.

Air Pollution

4.27 Urban growth and increased car ownership suggest that air pollution may become a priority in the near future. With this in mind, the ability to **monitor air pollution** in Santiago and Santo Domingo needs to be improved. To reduce car emissions, the Government could consider import licenses on old cars that do not have modern pollution control devices. The heavy traffic patterns, caused in part by a city plan developed in colonial times, could be controlled through better urban planning, traffic flows and public transportation. In the same logic as the water pollution charges, the GoDR could also consider the introduction of an environmental levy for transport fuels and private generators that would provide the right signals to air polluters and allow for cost recovery for urban air pollution prevention measures.

Biodiversity and National Parks

4.28 In addition to the passage of the Protected Areas and Biodiversity Law, there are three priority areas where actions might be taken to protect the DR's biodiversity and improve protected areas management. In the short term, SEMARN, and in particular the Sub-Secretariat for Biodiversity and Protected Areas, could focus on developing protected areas management plans. These plans would require the collection of baseline data for each area, as well as the development of monitoring procedures and the identification of infrastructure and human resource needs. Secondly, SEMARN could explore co-management opportunities with local NGOs or community groups to build local support for protected areas, as well as increase vigilance for preventing further loss of biodiversity or natural resource degradation. Finally, in the longer term, SEMARN could work towards establishing clear title for the land considered to be "protected" to prevent conflict over boundaries and ensure the regulatory mandate is in place to control natural resources use and extraction.

Priorities

4.29 The lack of data does not allow for scientific priority setting on the basis of economic, health and poverty impacts. Nevertheless the recommendations can be classified into short (next 2 years), medium (2-5 years) and long-term (>5 years) needs to be addressed. The matrix is divided into policies, institutional strengthening and investments. The distinction between the three categories is sometimes marginal, but in general policy measures require policy decisions with accompanying laws and regulations, institutional measures are activities to strengthen and/or institutional reforms, while investments require a longer-term financial commitment with later pay-offs.

4.30 The matrix below provides arguably a possible sequencing scenario. Although every element of the matrix is important, unfortunately not all recommendations can be achieved in the short term. The political economy aspect is also important. As the DR will have a new government by mid-2004, some urgent reforms such as the long awaited

General Water Law and Water Supply and Sanitation Law (with such possible consequences as water price hikes for urbanites) need to be tackled early on while the government is benefiting from the momentum of public support.⁵⁴ This is also the case for the reduction of irrigation subsidies, as the economic climate for rice farmers after the strong devaluation of 2003/2004 is very favorable to introduce reforms in the agricultural sector. Institutional reforms in solid waste and overall institutional strengthening should also go ahead as soon as possible. The financial and political cost of these institutional reforms and strengthening can be achieved under the present budgetary constraints.

4.31 Considering the delicate position of the public finances, public infrastructure investments may have to wait a few years. Nevertheless, the new regulatory framework which could be created by the passage of both water laws would be able to attract some private investment, at least if the laws would provide incentives for the private sector to be involved. This could, in the medium-term, start reducing water quality and solid waste problems considerably. The expected impacts of the General Water Law on water consumption, however, may be more long-term than medium-term (which is a reason to start soon). Where water scarcity is acute (as in the East of the country), this problem has to be tackled sooner than later and with involvement of the private sector.

4.32 The resolution of all environmental problems starts with awareness building and this can only be done through monitoring, data analysis and their publication. Without monitoring and hard facts, no political base will be built for regulations and enforcement. Although all monitoring is urgent (it takes a while to obtain the data and analyze them consistently), water quality monitoring should be tackled first -- because of its impact on the poor, health and tourism -- followed by water quantity and air pollution monitoring.

⁵⁴ INDRHI's proposals to change the water Law have so far been received with great mistrust from the potable water and hydroelectricity operators, which see INDRHI as biased in favor of irrigation. An alternative approach to design an acceptable institutional framework would be to use the Dam and reservoir Committee as a forum to first reach broad agreements among the three main users and bring SEMARN into the discussion. Once they have reached broad agreements, the draft Water Law reflecting these agreements could be presented to Congress.

PRIORITY ACTION MATRIX

	Short Term	Medium Term	Long term
Policy Measures			
<u>Water Resources Management</u>			
Passage of the General Water Law outlining clear responsibilities for Government agencies that are appropriately divided between service provider, regulator and policy maker; and sets in place the tools for water resources management	X		
Preparation and implementation of a water resources management strategy focusing on sustainable demand management		X	
Introducing appropriate water pricing structure in urban water supply		X	
Regulate coastal ground water management		X	
Introduction of water user fees			X
Reduction of irrigation subsidies to curb water demand	X	X	
Passage of a new Water Supply and Sanitation Law strengthening the monitoring of water quality, and introducing waste water disposal regime and effluent standards	X		
Introduction of adequate water supply, sanitation and water pollution charges		X	
Strengthening administration of reporting schemes of pollution effluents		X	
Introduction of regulations and controls on the sale and use of agrochemicals	X		
Introduce control on localization of concentrated animal feeding operations to avoid aquifer contamination			X
Introduction of payments for environmental services to farmers			X
<u>Flood management</u>			
Clarify roles of national and municipal institutions		X	
Prevent building in flood prone areas			X
Develop disaster management plan	X		
<u>Solid waste</u>			
Preparation of a national solid waste management strategy and establishment of an ad-hoc agency to implement the strategy in collaboration with municipalities	X		
Implementation of the solid waste strategy		X	X
<u>Air pollution</u>			
Introduction of environmental tax on transport fuels and private generators			X
Institutional Measures			
Environmental Council to become operational	X		
Environmental Fund to become operational	X		
Strengthening SEMARN's consultative culture	X	X	
Training of SEMARN staff	X	X	X
SEMARN's strategic reorganization		X	

Creation of a Water Resources Management Authority		X	
Strengthening of MEMUs		X	
Capacity building in environmental units in line Ministries		X	X
Awareness building	X	X	
Investments			
Monitoring of water quality	X		
water scarcity		X	
erosion			X
air pollution		X	
Renovation of water supply systems to reduce water losses		X	
Construction of additional water treatment or dumping plants		X	X
Construction of additional solid waste landfills		X	X
Training of farmers			
in upper watershed management (including anti-erosion practices)	X	X	
in irrigation water pricing	X	X	
in agrochemicals use	X	X	
Construct drainage infrastructure in flood prone areas			X

CHAPTER V: HOW THE WORLD BANK COULD ASSIST

5.1 The World Bank is well-positioned to provide assistance to the Dominican Republic on its environmental agenda. Below is a list of possible assistance that could be provided, which could be integrated or sequenced for maximum impact.

5.2. At the national level, the World Bank can build on the progress made in the National Environmental Policy LIL and provide continuous capacity building and technical support to SEMARN. Possible institutional strengthening activities could include:

- a) Implementation of an environmental indicators and monitoring system: the development of key environmental indicators and technical assistance to SEMARN in design and implementation of sustainable monitoring systems;
- b) Capacity building and strengthening of SEMARN in water pollution control, coastal aquifer management, managing water scarcity and air pollution monitoring. Capacity building could also strengthen implementation of the environmental licensing regime, including the preparation of EIAs, environmental audits, post-licensing inspections and other enforcement procedures;
- c) Institutional development by helping SEMARN to restructure their natural resources branches and change the institutional culture from natural resources to environmental management; and
- d) Implementation of an environmental education and outreach strategy that would target the political elite, public and private sector, and the general population.

5.3 Supporting environmental policy reforms. The World Bank could play a pivotal role in supporting much needed environmental policy reforms. Policy reforms could: (i) complete the water resources management framework (General Water Law and Water Supply and Sanitation Law); (ii) improve water quality and quantity monitoring; (iii) introduce proper incentives and regulations to control pesticide use; (iv) reduce subsidies to irrigated farming and introduce water pricing mechanisms; (v) introduce adequate water supply pricing in urban areas; (vi) initiate payment for environmental services in the upper watersheds; and (vii) create of a framework for solid waste management.

5.4 Supporting local environmental solutions through the Environmental Fund. The Bank could help finance decentralized environmental management by supporting the National Environmental Fund for the establishment of agreements between SEMARN and municipalities on local reforms. Under such scheme, municipalities would agree to implement environmental reforms or take environmental measures in exchange for support from the Environmental Fund that would finance related investments. Some examples of potential agreements could be: (i) municipalities agree to improve solid waste collection and make improvements in fee collection in exchange for funding of a

new sanitary landfill; (ii) municipalities and local water supply agencies agree to improve water fee collection systems in exchange for a new waste water disposal plant; or (iii) municipalities and farmers in upper watersheds agree to improve land use planning and cultivation practices in exchange for flood or erosion control infrastructure. Interested municipalities would make proposals to the Fund that would select the projects based on criteria developed through consultation with a wide range of stakeholders.

5.5 Possibilities for assisting in water-related reforms in the Ministry of Agriculture. Given the great impact of the agricultural sector on the DR's water resources, the Bank could continue providing technical assistance to the Ministry of Agriculture on implementing a number of water-related reforms, including managing irrigation water demand through strengthening water user associations and proper water pricing, improving the management of agrochemicals, and erosion control.

5.6 Investments. The Bank could support critical infrastructure improvements in solid waste and wastewater management. The construction of additional deep water outfalls, such as the one supported under the Wastewater Disposal in Tourism Centers project, would help to address some wastewater pollution issues in both urban coastal areas and tourism destinations. The Bank could also support solid waste management through a comprehensive project modeled after the recently closed OECS Solid Waste Management project – combining reforms and capacity building support with funding for sanitary landfill construction. GEF funds could be obtained to complement operations in sectors such as protected areas management and the monitoring of air pollution.

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