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Republic of Ecuador  
Country Environmental Analysis  
Environmental Quality and Natural Resource Management for  
Sustained Economic Growth and Poverty Alleviation

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## Acronyms and Abbreviations

AAA	<i>Autoridades Ambientales de Aplicación</i>
AAAR	Authorities Accredited to Issue Environmental Licenses ( <i>Autoridades Ambientales de Aplicación Responsables</i> )
AME	Association of Ecuadorian Municipalities ( <i>Asociación de Concejos Municipales</i> )
AN-MDL	Designated National Authority to the Clean Development Mechanism ( <i>Autoridad Nacional-Mecanismo de Desarrollo Limpio</i> )
ARI	Acute Respiratory Illness
CAF	Andean Development Corporation
CAN	Andean Community
CAS	Country Assistance Strategy
CDF	Charles Darwin Foundation
CDM	Clean Development Mechanism
CEA	Country Environmental Analysis
CEDECNMA	Ecuadorian Commission for the Protection of Nature and the Environment ( <i>Comité Ecuatoriano para la Protección de la Naturaleza y la Defensa del Medio Ambiente</i> )
CEPAL	Economic Commission for Latin America
CEREPS	Special Fund to Foster Productivity and Scientific and Technological Development
CGE	State General Controller ( <i>Contraloría General del Estado</i> )
CIAM	Environmental Information Center ( <i>Centro de Información Ambiental</i> )
CLIRSEN	<i>Centro de Levantamientos Integrados de Recursos Naturales por Sensores Remotos</i>
CNC	National Climate Committee
CNC	National Coordination Commission ( <i>Comisión Nacional de Coordinación</i> )
CNDS	National Council on Sustainable Development ( <i>Consejo Nacional de Desarrollo Sustentable</i> )
CNG	Compressed natural gas
CNRH	Water Resources National Council
CO	Carbon monoxide
CODEMPE	Council for the Development of the Indigenous Communities of Ecuador ( <i>Consejo de Desarrollo de las Nacionalidades y Pueblos del Ecuador</i> )
CODENPE	Council for the Development of Nationalities and Peoples of Ecuador
COI	Cost-of-illness
CONCEL	National Electricity Council
CONCOPE	Consortium of Provincial Councils of Ecuador ( <i>Consorcio de Consejos Provinciales</i> )
CONELEC	Electricity National Council
CONESUP	National Council for Higher Education
COPD	Chronic obstructive pulmonary disease
CORDELIM	Corporation for Promotion of the CDM
DAC	<i>Dirección de Aviación Civil</i>
DALYs	Disability Adjusted Life Years
DHS	Demographic and Health Surveys
DIGMER	<i>Dirección General de la Marina Mercante y del Litoral</i>

DINAPA	National Office for Environmental Protection
DNBAP	National Department of Biodiversity and Protected Areas
DPL	Development Policy Loan
ECORAE	Institute for the Eco-development of the Ecuador Amazon Region
EDFSE	Strategy for the Sustainable Development of Ecuador's Forests ( <i>Estrategia de Desarrollo Forestal Sustentable del Ecuador</i> )
EIA	Environmental impact assessment
EML	Environment Management Law
EMPs	Environmental management plans
ERFEN	<i>Programa para el Estudio Regional del Fenómeno El Niño en el Pacífico Sudeste</i>
FAN	National Environmental Fund
FAO	Food and Agriculture Organization
FEISEH	<i>Fondo Ecuatoriano de Inversión en los Sectores Energético e Hidrocarburífero</i>
FGE	Attorney General
FUNDAR	<i>Fundacion Para El Desarrollo Alternativo Responsable De Galapagos</i>
GPA	Environmental Protection Management Office
GDP	Gross domestic product
GEF	Global Environment Facility
GMO	Genetically modified organisms
GNI	Gross national income
GNP	Galapagos National Park
GOE	Government of Ecuador
GPA	<i>Gerencia de Protección Ambiental</i>
HCA	Human capital approach
ILO	International Labour Office
INAMHI	National Institute of Meteorology and Hydrology
INDA	National Institute for Agrarian Development
INECI	Ecuadorian Institute of International Cooperation
INGALA	National Institute of Galapagos
INOCAR	Oceanographic Institute of the Navy
INP	<i>Instituto Nacional de Pesca</i>
INS	National Institute of Health (Colombia)
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction (United Nations)
ITT	Ishpingo-Tiputini-Tambococha
LAC	Latin America and Caribbean
LGA	<i>Ley de Gestión Ambiental</i>
LORM	<i>Ley Orgánica de Régimen Municipal</i>
LPG	Liquefied petroleum gas
MAE	Ministry of Environment
MCS D	Ministry of Coordination of Social Development
MIDUV	Ministry of Housing and Urban Development
MEF	Ministry of Economy and Finance
MEM	Ministry of Energy and Mining
MOE	Ministry of Environment
MOT	Ministry of Tourism
MP	Particulate matter
MRE	Ministry of Foreign Affairs

MSP	Ministry of Health
MT	Ministry of Tourism
NGO	Nongovernmental organization
NO <sub>x</sub>	Nitrogen oxides
O <sub>3</sub>	Ozone
O&M	Operation and maintenance
OCP	Heavy Crude Pipeline
ORT	Oral rehydration therapy
PANE	State Patrimony of Natural Areas    State Natural Areas Heritage
PAs	Protected Areas
PEPDA	<i>Proyecto Eliminación de Piscinas Contaminadas en el Distrito Amazonico de Ecuador</i>
PFE	National Forest Patrimony
PM	Particulate matter
PM <sub>10</sub>	Particulates of less than 10 microns in diameter
PMRC	Coastal Resources Management Program
ppm	Parts per million
RADs	Restricted activity days
RIOCC	Iberoamerican Network of Climate Change Offices
RMG	Galapagos Marine Reserve
RNIA	National Environmental Information Network
SDGA	National Decentralized System of Environmental Management ( <i>Sistema Descentralizado de Gestión Ambiental</i> )
SEA	Strategic Environmental Assessments
SENPLADES	National Secretariat for Planning and Development
SENRES	National Secretariat for Human Resource Development and Compensation in the Public Sector
SESA	Agricultural Health Service
SICGAL	Inspection and Quarantine System for Galapagos
SIISE	Integrated System of Social Indicators of Ecuador
SLG	Special Law for Galapagos
SNAP	National System of Protected Areas
SNDCF	Improve and operationalize the Decentralized Forest Control System ( <i>Sistema Nacional Descentralizado de Control Forestal</i> )
SNDGA	National Decentralized Environmental Management System
SO <sub>2</sub>	Sulfur oxides
SOTE	Trans-Ecuadorian Oil Pipeline System
STFS	Social Front Technical Secretariat ( <i>Secretaría Técnica del Frente Social</i> )
SUMA	United Environmental Management System ( <i>Sistema Unico de Manejo Ambiental</i> )
TEL	Tetra-ethyl lead
UCS	Union of Concerned Scientists
UNESCO	United National Education, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VSL	Value of statistical life
WWF	World Wildlife Fund

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## I. Introduction

### 1. Background

#### Importance of the Environment and Natural Resources and Policy Challenges

Ecuador is a country with exceptional natural resource and environmental advantages and challenges. It is strategically located and has considerable oil reserves in the interior and the coastal region. Despite being one of the smallest countries in South America, its mainland combines a tropical coastal region, a fertile highland valley in the Andes, and a relatively unspoiled and resource-rich Amazon interior. The latter, together with the unique Galapagos Islands, make Ecuador one of the most biologically diverse countries in the world, with an estimated 9.2 species per square kilometer and a relatively high number of endemic species. This natural wealth has allowed Ecuador to compete successfully in the production and export of bananas, cocoa, coffee, palm oil, shrimp, tuna, and ornamental horticulture, among other produce (Figure I.1). Natural-resource-related products, mostly oil, amounted to 80 percent of exports and close to 40 percent of gross domestic product (GDP) in 2001. Protecting Ecuador's rich but fragile natural resources and environmental quality is, thus, critical to the country's long-term economic growth and social progress.

Estimating wealth is useful for development planning. A nation's wealth is the basis for production, growth, and welfare. For many developing countries, natural capital is an important source of well-being. Ecuador is no exception. The average Ecuadorian has a total wealth of roughly \$34,000 (Table I.1).<sup>1</sup> This includes not only produced assets such as buildings and machinery, but also natural wealth in the form of land, forests, and subsoil assets, and intangible capital, such as human resources and institutions.

A quick glance at the wealth composition (Figure I.1) for Ecuador shows that while intangible capital is by far the largest share of wealth, natural capital is an important component of tangible wealth, one that is greater than produced capital. Natural capital constitutes nearly 40 percent of total wealth, produced capital accounts for 8 percent, and intangible capital for 53 percent. This pattern is qualitatively different from the one for the Andean Community and Latin America, where natural capital is a much smaller share of wealth compared to the total.

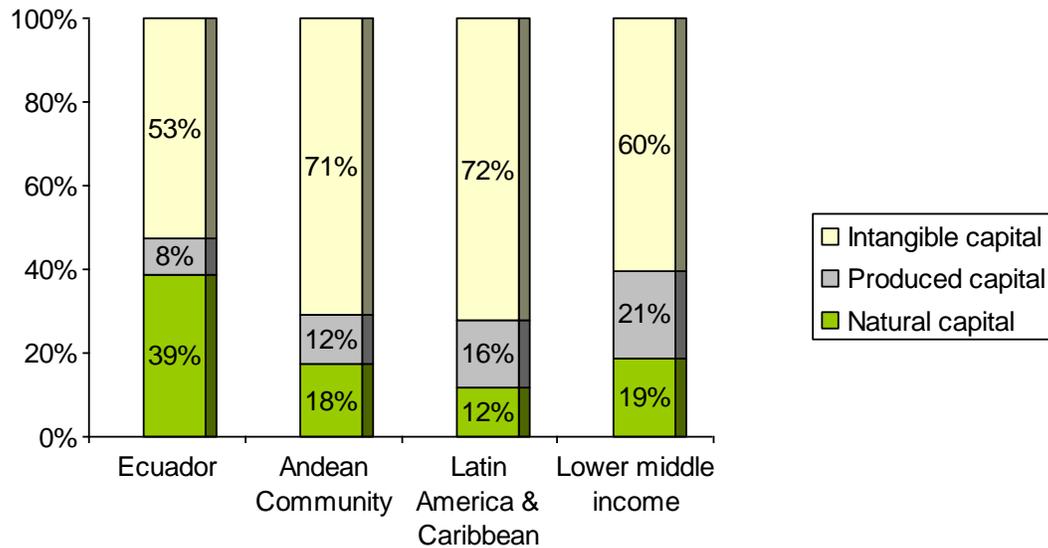
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<sup>1</sup> The estimates presented here measure total wealth as composed of: (a) produced capital—the sum of machinery, equipment, structures (including infrastructure), and urban land; (b) natural capital—including land resources, forests, and subsoil assets; and (c) intangible capital—a wide array of assets such as human capital, quality of institutions, and governance.

	<b>Ecuador</b>		<b>Andean Community</b>	<b>Latin America &amp; Caribbean</b>	<b>Lower- middle Income</b>
Asset Type	\$ Per Capita (2000)	Share	Share	Share	Share
Subsoil assets	5,205	40	39	48	44
Timber resources	335	3	3	4	4
Non-Timber Forest Resources	193	1	7	5	4
Protected Areas	1,057	8	5	5	4
Cropland	5,263	40	35	24	35
Pastureland	1,065	8	12	13	9
Natural capital	13,117	39	18	12	19
Produced capital	2,841	8	12	16	21
Intangible capital	17,788	53	71	72	60
<b>Total wealth</b>	<b>33,745</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: World Bank (2006a) and team's calculations.

**Figure I.1. Total Wealth Composition in Ecuador (percent, 2000)**



*Source:* World Bank (2006a) and author's calculations.

The wealth numbers underpin a crucial issue: natural wealth constitutes a potentially large pool of resources that can be sustainably channeled to create produced and human capital. How natural capital is transformed into other forms of capital is crucial for Ecuador's development strategy. This is an issue that cannot be ignored, especially since the poorest households are likely to be the most dependent on natural resources.

Ecuador has established several instruments and organizations to manage natural resources and protect the environment, starting with the 1976 Law to Prevent and Control Pollution. To support the law's implementation, several regulations to prevent and control air and water pollution were subsequently issued. The 1994 National Environmental Action Plan established environmental priorities for the first time and started a process to develop a framework for environmental management at the national and local levels. As a result, the Ministry of Environment was created in 1996. The 1998 Constitution affirms the right of Ecuadorians to live in a healthy environment, ecologically balanced and pollution free. The Constitution also establishes the State's responsibility to defend and protect the country's natural heritage and the environment. Congress in 1999 passed the Law of Environmental Management, which sets up the guidelines for environmental policy. As a result, the Environmental Strategy for Sustainable Development was issued by the Ministry of Environment (MAE) in 2000. The strategy stressed the protection of fragile ecosystems and consolidated the structure of protected areas. In addition, environmental management is highly decentralized in Ecuador. The environment-related responsibilities of municipalities include: (a) land use planning, (b) water effluent prevention and control, (c) air quality, (d) solid and hazardous waste management, and (e) industrial licensing.

But despite these and other institutional efforts, Ecuador still faces significant environmental challenges, including:

- *Ecuador's natural capital management is not on a sustainable path.* Adjusted net savings<sup>2</sup> are negative, which means that total wealth (and, therefore, the capacity to produce sustainable economic growth) is decreasing. In 2004, the savings rate went from 28 percent of gross national income (GNI) to -2 percent of GNI once depreciation of produced capital, the depletion of natural resources, particularly oil and natural gas, and damage from global and local air pollutants were taken into account.<sup>3</sup>
- *Soil and land degradation.* About 25 percent of farm households suffer significant soil losses each year, and the problem is particularly severe in agricultural lands on moderate or steep slopes, which usually are cultivated by the poorest farmers.
- *Deforestation.* The country has one of the highest annual rates of deforestation—a 1.4 percent change compared with the Latin America and Caribbean (LAC) and world averages of 0.4 percent and 0.1 percent, respectively.
- *Poor water quality.* Lack of potable water and sanitation services and poor hygiene are associated with more than 600,000 cases of diarrheal illness each year among children under age 5, and the death rate of children under age 5 (diarrheal illness being the main cause) is higher than the LAC average.
- *Indoor air pollution.* Acute respiratory illnesses, resulting from household use of traditional fuels for cooking, affect mainly women and children in rural areas; traditional fuels account for 18 percent of energy consumption.
- *Urban air pollution.* This is one of the leading causes of respiratory illnesses in Ecuador; air quality is particularly serious in high-altitude cities like Cuenca and Quito.
- *Vulnerability to natural disasters.* Because of its geographic location, Ecuador is highly vulnerable to natural disasters such as drought, flooding, volcanic eruptions, and earthquakes, all of which provoke human suffering and high economic costs, like the 1997–98 El Niño, the damages of which were estimated at 14 percent of gross domestic product (GDP).

These problems compromise Ecuador's long-term economic growth and impose significant socioeconomic costs (particularly for vulnerable groups such as poor children and women). The advent of a new administration in Ecuador provides an opportunity to review and improve environmental management and policy based on an analysis of the performance of environmental institutions and the key environmental challenges that Ecuador faces. This will help the new environmental authorities develop policies and interventions that take advantage of potential win-win opportunities, and assess tradeoffs, in order to protect and restore a deteriorating environment, avoiding unrealistic and ineffective regulations that might hinder competitiveness and investment.

## **2. Country Environmental Analysis (CEA) Objectives and Organization**

This document does not aim to describe the state of the environment in Ecuador. Rather, its main objective is to provide an analytical foundation to identify the country's institutional weaknesses and provide practical policy options that will enhance its capacity to establish and address

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<sup>2</sup> Adjusted net savings equal net savings plus education expenditures minus energy depletion, mineral depletion, net forest depletion, and particulate matter and carbon dioxide damage.

<sup>3</sup> Broader measures of saving, which take into account capital accumulation and the depletion of natural resources, are useful in providing a clearer measure of a country's sustainability.

environmental policy priorities linked to poverty reduction and sustained economic growth. Linking environmental considerations to sectoral projects and policies will provide important information on key synergies and tradeoffs involving the environment, economic growth, and poverty. Along this line, the CEA can be used to strengthen the environment-related policies of the new administration. The second objective is to guide environmental assistance and capacity building supported by the Bank or other development partners through the assessment of capacity issues, especially in relation to specific environmental priorities.

The main elements of the CEA include analyses of (a) environment and natural- resource-related institutions, (b) the environmental aspects of the oil sector, (c) forestry, (d) conservation, (e) environmental-health, and (f) climate change. The CEA also identifies policy recommendations and describes the role that the World Bank could play in helping the Government of Ecuador (GOE) strengthen its institutional capacity in order to address the country's natural resource and environmental problems in a more effective way.

## II. Institutional and Organizational Analysis

### 1. Institutional Analysis

To address its environmental and natural resource challenges, Ecuador requires effective and efficient environmental policies, laws, and organizations.<sup>4</sup> This section focuses on the existing institutional structure (legal framework; policy instruments, including licensing, information systems, and public participation; and compliance and enforcement mechanisms) followed by an analysis of the stakeholders that play a key role within this institutional setting. It concludes with an examination of the strengths and weaknesses of the country’s environmental framework and a set of recommendations the purpose of which is to outline the key avenues for action.

#### 1.1 Environmental Policies

Governments must be clear about the reasons for their interventions, the objectives of these actions, and the responsibilities of the groups involved in the design, implementation, and enforcement of these interventions. As shown in Table II.1, the MAE has issued a number of environmental policies since its creation.

**Table II.1. Environmental Policies Issued by Ministry of Environment**

National Policy	Basic Contents
Environmental Strategy for Sustainable Development (1999)	Presents the basic environmental management framework, aimed at biodiversity, forests, bio-aquatic resources, water, hydrographic watersheds, bays and beaches, ecotourism, energy, and environmental quality.
Basic Environmental Policies (1994 and 2006)	Government declaration of principles to generate conditions for sustainable development and environmental management.
Biodiversity Policy and National Strategy (2006)	Issued in 1999 and turned into government policy to establish biodiversity as a strategic resource and to define general guidelines for its preservation and sustainable use.
Sustainable Forestry Development Strategy	Presents the general guidelines and mechanisms for forestry resources use.

*Source: Analysis of Institutional Capacity for Environmental Management in Ecuador (2007).*

The development of this policy framework demonstrates that environmental issues have begun to take a prominent place in the national debate and public administration. Despite this achievement, however, public policies are often so general and all-encompassing that in practice they do not provide sufficient direction and focus to guide government efforts.

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<sup>4</sup> The report differentiates between the concepts of institution and organization. Institutions include all the formal and informal “rules of the game” existing in the country, including laws, regulations, and practices. In the case of practices, the report focuses on the key actors influencing environmental institutions, which includes the key entities, bodies, and “bureaucracies” in charge of developing, applying, and enforcing the institutional framework.

Furthermore, Ecuador has expanded its public policy agenda in which new priorities continually arise without adequate priority setting and compete with each other for scarce resources and attention. This lack of priority setting is compounded by a lack of interinstitutional coordination in the policymaking process. Consequently, in the case of environmental policy, there is a risk that a growing number of “good intentions” may obscure priorities. In this sense, a clearer definition of national priorities for environmental protection (including their justification) would provide greater direction. Specific quantitative goals and an understanding of the connection between stated environmental policy and the specific tasks carried out at MAE and other environment-related agencies would also improve the effectiveness of environmental protection activities.

## 1.2 Legal and Regulatory Frameworks

Today, Ecuador has an increasingly sophisticated system of laws and regulations. The 1995 Constitution establishes each citizen’s right to “enjoy a healthy environment, ecologically balanced and pollution free.” Chapter 5 of the Constitution calls for (a) preservation of the environment and conservation of ecosystems, biodiversity, and the integrity of Ecuador’s genetic wealth (*patrimonio genético*); (b) pollution prevention, restoration of degraded habitats, and sustainable natural resource management; and (c) establishment of a National System of Protected Areas that guarantees the conservation of biodiversity and ecological services. The Constitution provides a basis for developing legislation and reforms around these principles.

The 1999 Environment Management Law (EML) is the cornerstone of the country’s environmental management framework. It was enacted after thorough consultation with both the private sector and nongovernmental organizations (NGOs), among other key stakeholders. The law provides general policy guidelines for both public and private institutions and sets out the roles of MAE, the National Decentralized System of Environmental Management (SDGA), and other government entities.

The EML provides a good general framework for regulating and managing environmental issues, including those related to pollution control and conservation. It articulates a set of ambitious principles of environmental policy, including the right of citizens to live in a healthy and ecologically balanced environment, the principle of sustainable development, shared social responsibility for the environment, a call for ending unsustainable consumption and production patterns, and the obligation to compensate for environmental damages. The law touches on practically all of the ideal elements of good environmental management, such as mainstreaming environmental policies (through the creation of the SDGA), public participation in environmental management, gathering and disseminating information, environmental education, and economic instruments.

The country’s environmental legal framework includes five laws (the EML, the Pollution Prevention and Control Law, the Forestry Law, the Water Law, the Law for Biodiversity Protection in Ecuador, and the Special Law for the Galapagos Province), regulations, and municipal bylaws (*ordenanzas*). In addition to these five laws, Ecuador has several other laws governing environmental and natural resource issues (see Table II.2).

**Table II.2. Ecuadorian Laws that Include Environmental and Natural Resources Issues**

<b>SECTOR</b>	<b>LAW</b>	<b>DESCRIPTION</b>	<b>YEAR</b>
Environment	Environmental Management Law (codified)	Establishes: (1) basic guidelines for national environmental management, (2) environmental management decentralized system, and (3) MAE competencies.	1999
Land Use Planning	Environmental Management Law	Assigns the responsibility to prepare the land use national strategy. Authority: MAE.	1999
	National Security Law	Establishes restrictions for the use of beach areas, rivers, and borders considered of national security. Authority: National Security Council.	1972
	Municipal Organizational Law	Authorizes the municipalities to organize and plan the land distribution. Authority: Municipalities.	1971
Forestry	Forestry Law (codified)	Establishes guidelines for forestry use and management, establishes the framework of protecting forests and natural protected areas. MAE is responsible of its implementation. Forestry control and management—for decentralization was transferred to the Provincial Councils since 2006.	1981
	Protected Areas and National Parks Law (codified)	Basic regulations for the protection of national parks, especially for activities related to tourism.	1996
Energy	Hydrocarbons Law (reformed)	Establishes mechanisms and uses of hydrocarbon resources, establishes environmental obligations of government and its representatives. Authority: MEM.	1978
	Mining Law (reformed)	Establishes access mechanisms to government mining concessions and briefly delineates the environmental obligations of government and its concessionaires to abide by the environmental regulation. Authority: MEM.	1991
	Power Sector Law	Regulates all electricity-generation operations. Authority: CONELEC.	1996
Water	Water Law (codified)	Water use and administration, definition of usage mechanisms. Forbids water pollution and orders the efficient use of the water. Authority: CNRH.	1972
Biodiversity	Biodiversity Protection Law (codified)	Implies two articles, one of which declares the biodiversity a national public good.	1998

Environmental Health	Health Law	Replaces the Health Ordinance (1971), establishes the organization of the National Health System, delineates environmental health guidelines, water quality, and ionized and non-ionized emissions. Authority: MSP.	2006
	Municipal Organizational Law (codified)	Establishes the obligations of the Municipalities to provide potable water, wastewater treatment, and solid waste management in their jurisdictions. Authority: Municipalities.	1971
Environmental Quality	Environmental Management Law	Creates the Environmental Management System and the environmental licensing framework. Authority: Institutions affiliated to the SDGA.	1999
	Environmental Pollution Control and Prevention Law (codified)	Establishes basic guidelines related to prevention and control of environmental pollution. Authority: Ministry of Environment.	1978
	Municipal Organizational Law (codified)	Establishes the obligation of the Municipalities to ensure prevention and control of the quality of the environment in their jurisdictions. Municipalities.	1971
Galapagos	Galapagos Province Special Law	Establishes management and demarcation guidelines for the islands, planning mechanisms, finance, and administration.	1998

*Source:* Prepared by author based on available national laws.

Notwithstanding the considerable benefits that this framework offers, overlaps and contradictions do exist among these laws. One of the main reasons for the lack of coherence in the framework is that almost all of these laws were enacted before the EML. In addition, an analysis was not carried out during the preparation of the EML to identify conflicting provisions that needed to be derogated. Instead, the lawmakers relied on implicit derogation principles (a recent provision takes precedence over an older one, but a special law takes precedence over general laws, and so on) and on simply stating a blanket derogation of any provisions that contradict the law or its regulations, without identifying them individually. This aspect has tended to structurally weaken the overall coherence of laws and reduce transparency.

Water resources management offers a clear example of conflicting jurisdictions. No single agency has the authority or responsibility for ensuring the sustainable management of water resources or determining how resources are distributed among competing users. When water is used for irrigation, the Ministry of Agriculture is involved; municipalities are involved in the provision of potable water; and MAE is responsible for ensuring that water quality complies with the technical standards, that wastewater is properly treated before discharged, and that water reuse activities are not carried out without an environmental permit.

As in most countries, the EML defers to explicit subordinated regulations developed and enacted by the government and the Ministry together with other public bodies. Table III.3 provides a listing of the country's environmental regulations. These regulations set out requirements for the issuance of licenses for mining and energy-related activities.

**Table III.3. Environmental Regulations**

<b>Sector</b>	<b>Regulation</b>
Mining	Mining Activities Environmental Regulation
Hydrocarbon	Hydrocarbon Activities Environmental Regulation
Electricity	Power-related Activities Environmental Regulation
Environmental Management	Unified text of the Ministry of Environment Secondary Environmental Legislation
Public Consultation and Social Participation	Regulation to Art. 28 of the Environmental Management Law on Public Consultation and Social Participation

Source: *Analysis of Institutional Capacity for Environmental Management in Ecuador* (2007).

Significantly, the EML lacks important regulations (*reglamentos*) that would support its implementation, and in particular provide guidelines on interinstitutional coordination to further environmental policy goals. The lack of this type of secondary legislation significantly limits the effectiveness of the EML.

### 1.3 Environmental Policy Instruments

#### 1.3.1. Environmental Licensing

The primary instrument for managing the environmental implications of economic activities and investment projects in Ecuador is the environmental license. Article 19 of the EML calls on the country's decentralized oversight agencies to assess, in accordance with the Environmental Management System (*Sistema Unico de Manejo Ambiental*, SUMA), all private and public works and investment projects that may cause environmental impacts.<sup>5</sup> The EML establishes the SUMA as the main mechanism for determining and estimating impacts and providing environmental permits. In addition, Article 20 of the law states that any activity that may pose an environmental risk has to obtain an environmental license before it is initiated.

The Ecuadorian environmental licensing system, like most systems in the region, is overly ambitious in its aim to evaluate all works and projects. Despite the decentralized nature of the Ecuadorian system, authorities are overburdened and unable to manage the environmental implications of the country's current projects and activities. The solution to this problem entails not only efficiency gains via improved processes, equipment, and training; it must also include a new approach to environmental management. Licensing, through environmental impact

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<sup>5</sup> Public and private works and other investment projects that may cause environmental impacts are identified prior to their implementation by the corresponding decentralized agency, in accordance with the SUMA.

assessments, has become the main (and sometimes only) management tool to minimize or mitigate environmental impacts to third parties, due to the absence of regulations for pollution control, zoning, and water resources management. Only by designing and implementing additional environmental policy instruments (for example, regulations in these areas) will Ecuador be able to attain efficient, effective, and affordable environmental management.

The new regulations should include environmental standards for the design, construction, operation, and maintenance of infrastructure. By adapting these standards, localized, direct impacts would be managed through the engineering process and be subjected to standard enforcement mechanisms rather than through the environmental impact assessment (EIA) process. The EIA would, nonetheless, still play an important role in regulating infrastructure projects that have potentially significant impacts according to a more selective screening process. The screening criteria to determine those projects with more significant impacts may include, among others: protected areas, impacts on vulnerable groups, and vulnerability to natural disasters.

An innovative characteristic of the Ecuadorian licensing system is its decentralized nature. The MAE can accredit other authorities, *Autoridades Ambientales de Aplicación* (AAAs), with environmental responsibilities (at both national and subnational levels) that include, among others, issuance of environmental licenses. These accreditations are valid for a three-to-six-year period. The following AAAs have been accredited by the Ministry: the Ministry of Energy and Mining (MEM), the Provincial Council of Loja, the municipality of Quito, the Electricity National Council (CONELEC), and the municipality of Cuenca. In addition, the following authorities have requested accreditation, which is pending: the municipality of Guayaquil, DIGMER, the Provincial Council of Azuay, the Provincial Council of El Oro, the Provincial Council of Orellana, and the Ministry of Housing and Urban Development (MIDUV).

Article 22 of the EML calls for environmental audits (conducted by the same authority that issued the license) to verify compliance with the environmental management plans prepared as part of environmental assessments. This monitoring and enforcement mechanism has two limitations. First the MAE and AAAs allocate limited resources to monitoring and enforcement. Second, the fact that the authority that issues a license is responsible for monitoring compliance with the environmental management plan may lead to conflicts of interest, particularly in a system where environmental licenses are issued by sectoral authorities such as MEM.

The environmental licensing system does contain two mechanisms to prevent potential conflicts of interest. First, an AAA may not be able to renew its accreditation (or its accreditation may even be revoked) if the AAA is found to be negligent or ineffective in carrying out its environmental responsibilities. However, this threat is not always credible. Second, Article 25 of the EML calls on the State General Controller (*Contraloría General del Estado*, CGE) to audit the country's licensing, monitoring, and enforcement processes to verify that they are conducted in accordance to the law and other regulations. However, with a staff of only 10, the CGE has been restricted in conducting these audits, further limiting the effectiveness of this mechanism.

### *1.3.2. Environment and Natural Resource Information*

Article 9 of the EML mandates that one of the MAE's primary obligations is to collect environmental information as an instrument for planning, education, and oversight. This information should be maintained in a National Environmental Information Network that records, analyzes, synthesizes, and publicly disseminates environmental information. In Ecuador, there are several organizations that manage environmental information, including the Environmental Information Center (*Centro de Información Ambiental, CIAM*), *Centro de Levantamientos Integrados de Recursos Naturales por Sensores Remotos (CLIRSEN)*, BIODATOS, and EcoBio. However, the national network is not yet fully functional and the environmental information that is collected is rarely used to support planning and oversight.

Similarly, Article 15 of the EML calls for the creation of a Green Accounting System to provide adequate estimates of the value of environmental goods and services. In addition, this article calls on MAE to produce an annual report with the results of an economic valuation of the environment and renewable resources. Unfortunately, this information (which could be an important tool in establishing the country's policy priorities) has not yet been produced.

Although some environmental information is available through MAE and its website, there are still significant information gaps, such as on aquifer levels, number and quality of existing wells, pesticide runoff, solid and hazardous wastes, deforestation rates, and the health impacts of pollution. Furthermore, most of the information on the MAE website is seldom updated and is not yet linked to other available information. Information should be collected on a periodic basis and used to support planning, decisionmaking, and compliance monitoring. Further improvements required to modernize environmental information resources include:

- Ensuring the compatibility of databases;
- Systematizing and securing a repository of existing information to avoid significant and irreparable losses of “intelligence” due to staff turnover in key areas such as Natural Heritage; and
- Gathering information concerning compliance with environmental laws and regulations, the cost of compliance, and the effectiveness of enforcement measures in terms of achieving applicable environmental objectives.

### *1.3.3. Stakeholder Participation<sup>6</sup>*

The GOE has encouraged an open and participatory approach to environmental policy. The EML specifically provides for various mechanisms and processes to ensure that stakeholders and interested individuals have the opportunity to participate in environmental management (including Articles 28 and 29 on Participation Mechanisms, and Articles 41 and 42 on Protection of Environmental Rights). In addition, the newly published regulations on public participation

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<sup>6</sup> Participation is defined as “a process through which stake-holders influence and share control over development initiatives and the decisions and resources that affect them” (World Bank 1996).

(*Reglamento al Artículo 28 de la Ley de Gestión Ambiental sobre la Participación Ciudadana y la Consulta Previa*) further reinforce this open approach.<sup>7</sup>

### *Legal and Regulatory Consultations*

According to Article 88 of the Constitution, before making any decision that may have environmental impacts, the government must inform and consult the community affected by these impacts.<sup>8</sup> The recently issued regulations on public participation fill an important gap, since previously Ecuador had not established a public consultation process that would require ministries and regulators to post their draft laws and regulations in a public site for a reasonable review period. The newly established consultation process comprises three stages: information dissemination, receipt of comments, and open dialogue. Following this consultation process, a report must be issued within five days that includes stakeholder observations, agreements reached, alternative courses of action in the cases where no agreements were reached, and recommended courses of action backed by legal, economic, and social analyses. The relevant authority has 15 days to provide comments on the report and request clarifications. Once the report is approved, the relevant authority must then incorporate the report's recommendations within the corresponding instrument.

Similarly, the MAE standards committee, responsible for determining the content of technical standards, follows World Trade Organization practices with respect to transparency and accountability. For example, this committee has balanced representation among the private and public sectors and uses "notice and comment" procedures to inform and consult the public during the development of technical norms.

### *Consultations prior to the approval of EIAs*

The recently published regulations on public participation define the consultations required during the environmental assessment process. The MAE and other environmental authorities accredited to issue environmental licenses (*Autoridades Ambientales de Aplicación Responsables*, AAAR) are required to conduct these consultations, which also comprise three steps (dissemination of information, receipt of comments, and open dialogue). This public consultation is also followed by the submission of a report detailing stakeholder observations, agreements reached, alternative courses of action in the cases in which no agreements were reached, and recommended courses of action backed by legal, economic and social analyses. The project proponent will incorporate all agreed actions in the environmental management plan. In cases where no agreements are reached, the project proponent will instead develop a recommended course of action backed by legal, social and economic analyses. The competent authority will then determine whether the proponent's suggested actions adequately respond to the public's views.

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<sup>7</sup> Regulations were issued in October 2006.

<sup>8</sup> Art. 88. Any State decision that can affect the environment should be consulted in advance with the community, such that they are duly informed. The law will guarantee their participation.

### *Citizen Complaints*

Enforcement responsibilities are dispersed, preventing the development of a clear and easy-to-use mechanism to file complaints. MAE has decentralized enforcement to some municipalities but not to others. Moreover, MEM is responsible for enforcing environmental regulations in mining and oil operations and CONELEC has this responsibility for electricity projects. Anecdotal evidence suggests that the public perceives a conflict of interest in these institutional arrangements. The State General Controller (*Contraloría General del Estado*, CGE) oversees that all public agencies meet their responsibilities (including enforcement of environmental regulations). The CGE has received 96 environment-related complaints since 2003 and has investigated 41 of them.<sup>9</sup>

### *Active Consultation*

Article 7 of the EML calls for the creation of the National Council of Sustainable Development (*Consejo Nacional de Desarrollo Sustentable*, CNDS), which includes representatives from the private sector and civil society and is responsible for advising the President on the development of environmental policies and the National Environmental Plan. In addition, Article 10 states that all government agencies with environmental management responsibilities will take part in the Decentralized Environmental Management System (*Sistema Descentralizado de Gestión Ambiental*, SDGA) and that the SDGA will follow the guidelines established by the CNDS. The National Coordination Commission (*Comisión Nacional de Coordinación*, CNC), which is comprised of representatives from environmental NGOs, indigenous communities, and Afro-Ecuadorian communities, is responsible for overseeing the SDGA.

Neither the CNDS nor the CNC has fulfilled its potential as advisory and consultative bodies. Regulations that would provide guidelines on how the CNDS functions have not been developed. As a result, the CNDS lacks a program, a Secretariat, and a budget. Furthermore, no regulations have been issued that would support the operation of the CNC, and, equally important, neither the private sector nor line ministries (apart from MAE) have joined the commission (see Box II.2). Consequently, these agencies have been unable to carry out the important roles for which they were created.

#### **Box II.1. National Coordination Commission Members**

- The Minister of MAE (chair).
- The Head of the National Secretariat for Planning and Development (SENPLADES).
- A representative of the Consortium of Provincial Councils (*Consortio de Consejos Provinciales*, CONCOPE).
- A representative of the Association of Municipalities (*Asociación de Concejos Municipales*, AME).
- The President of the Ecuadorian Commission for the Protection of Nature and the Environment (*Comité Ecuatoriano para la Protección de la Naturaleza y la Defensa del Medio Ambiente*, CEDECNMA).
- A representative of the Council for the Development of the Indigenous Communities of Ecuador (*Consejo de Desarrollo de las Nacionalidades y Pueblos del Ecuador*, CODENPE).
- A representative of the Afro-Ecuadorian communities.
- A representative of the Army.
- A representative of the National Council of Higher Education.

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<sup>9</sup> CGE's Environment Unit has 10 staff.

## *Indigenous Communities and Oil Operations*

Article 84 of the Constitution calls for consultations with indigenous communities for all projects that take place on their communal lands. However, this consultation process also lacks a regulation that sets out procedures to guide this process. Consequently, these consultations can result in practices that erode communities' social capital and promote "clientelism." Lack of government oversight to facilitate agreements and monitor their compliance further hinders the consultation process. Despite these challenges, some consultations have been successfully conducted.<sup>10</sup>

### 1.4 Compliance and Enforcement Mechanisms

#### *Enforcement*

Article 87 of the Constitution calls for administrative, civil, or judicial penalties for those who violate environmental laws and regulations. Administrative sanctions for environmental violations include fines and forfeiture of bonds. Project proponents who fail to file an environmental impact assessment may be barred from operating until they comply with this requirement. Environmental crimes (defined as serious neglect and intention to cause harm) are considered in the Criminal Code and sanctioned with potential prison terms. However, the Attorney General (*Fiscalia General del Estado*) does not have adequate staff to investigate environment-related offenses and only one case has been brought to court.

Enforcement responsibilities are widely dispersed. The EML only bestows MAE with the responsibility of coordinating with respective authorities the development of environmental compliance systems. In addition, MAE and other Authorities Accredited to Issue Environmental Licenses (*Autoridades Ambientales de Aplicación Responsables*, AAARs) are responsible for overseeing compliance with the action plans accompanying the licenses that they issue. MAE has decentralized enforcement to 62 municipalities but only very few of them allocate the necessary resources to meet that commitment. Quito and Cuenca are good examples of cities that do allocate the resources required for this enforcement.

The current enforcement system needs to be strengthened and the importance of adequate enforcement cannot be overstated. The deterrent, corrective, and guiding effect of an environmental management framework, and its credibility, depend on the enforcement of its rules. While efforts are underway to strengthen enforcement, the enforcement framework is still considerably fragile. Lack of resources may be part of the explanation, but better structures and working methods might also promote better enforcement. The GOE should consider creating an autonomous institution specialized in enforcement of environmental regulations, with clear, legally defined responsibilities and appropriate powers and resources to achieve its objectives.

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<sup>10</sup> Izko (2004) describes how consultations based on informed participation of the communities involved can be successful.

## *Compliance Promotion*

Although one of the understood principles of environmental policy is a preference for inducing environmentally sound behavior over sanctioning, there are almost no mechanisms in the current framework to encourage better compliance. Intermediate actions to achieve improved compliance could include notices of violations, warnings, and compliance agreements. In fact, these actions may be more effective in fostering compliance than relying solely on prevention when combined with credible sanctions and a track record of enforcement. The law does allow, on an exceptional basis, alternative tools such as voluntary application plans in lieu of environmental diagnostics. However, it still emphasizes administrative sanctions, criminal penalties, and compensation. The use of compliance promotion mechanisms prior to the sanctioning process would improve effectiveness (see Box II.2).

### **Box II.2. Emphasizing Compliance Promotion: The Canadian Example**

Under the Compliance and Enforcement Policy for the Canadian Environmental Protection Act, 1999, Environment Canada secures compliance through two types of activity: promotion and enforcement.

#### **General Principles**

- Compliance—the state of conformity with the law—with the Act and its regulations is mandatory.
- Enforcement officers throughout Canada will apply the Act in a manner that is fair, predictable, and consistent. They will use rules, sanctions, and processes securely founded in law.
- Enforcement officers will administer the Act with an emphasis on prevention of damage to the environment.
- Enforcement officers will examine every suspected violation of which they have knowledge, and will take action consistent with this Compliance and Enforcement Policy.
- Enforcement officers will encourage the reporting of suspected violations of the Act.

#### **Compliance Promotion Measures**

- Education and information about the law.
- Technical information on pollution prevention and pollution control, on measures to prevent releases of substances into the environment, and on methods for analysis and monitoring.
- Consultation on regulation development and review with both the parties to be regulated and the beneficiaries of regulation; and publication of proposed regulations providing affected parties and members of the public a minimum of 60 days to comment on the text.
- Environmental Codes of Practice and Guidelines that do not have the force of law, but that can assist in adopting management practices that will result in better protection of the environment.
- Promotion of environmental audits that are internal evaluations conducted by companies, government agencies, and others on a voluntary basis to verify their compliance with legal requirements and their own internal policies and standards. They are carried out by either outside consultants or employees of the company or a facility from outside the work unit being audited. Enforcement officers do not request environmental audit reports during routine inspections.

#### **Enforcement Activities**

- Inspection to verify compliance (Inspection Program)
- Investigations of violations
- Measures to compel compliance without resorting to formal court action:
- Warnings
- Directions in the Event of Releases
- Tickets
- Ministerial Orders
- Detention Orders for Ships
- Environmental Protection Compliance Orders.

### **Measures to compel compliance through court action**

- Injunctions
- Prosecution
- Environmental Protection Alternative Measures
- Penalties and Court Orders Upon Conviction
- Use of Court Orders Upon Conviction
- Civil Suit by the Crown to Recover Costs.

### **Criteria for Responses to Alleged Violations**

Whenever an alleged violation of the Act is discovered, enforcement officers will apply the following factors when deciding what enforcement action to take:

- Nature of the alleged violation. Consideration of the seriousness of the harm or potential harm, the intent of the alleged violator, whether this is a repeated occurrence, and whether there are attempts to conceal information or otherwise subvert the objectives and requirements of the Act.
- Effectiveness in achieving the desired result with the violator. The desired result is compliance with the Act, within the shortest possible time and with no further occurrence of violation. Factors to be considered include the violator's history of compliance, willingness to cooperate with enforcement officers, evidence of corrective action already taken, and the existence of enforcement actions under other statutes by other authorities as a result of the same activity.
- Consistency in enforcement. Enforcement officers will consider how similar situations were handled when deciding what enforcement action to take.

*Source: Canadian Environmental Protection Act (1999); <http://www.ec.gc.ca/CEPARRegistry>.*

## **2. Organizational Analysis**

The development of government agencies responsible for environmental and natural resource management in Ecuador has followed a path similar to many Latin American countries. The UN Conference on the Human Environment held in Stockholm in 1972 triggered the creation of a number of new government agencies responsible for environmental and natural resource management worldwide. Following this conference, Ecuador issued the Pollution Prevention and Control Law (1976) as its first law supporting environment protection. The 1994 National Environmental Action Plan established environmental priorities for the first time and initiated a process to develop a framework for environmental management at the national and local levels. An outcome of this process was the creation of the Ministry of Environment in 1996.

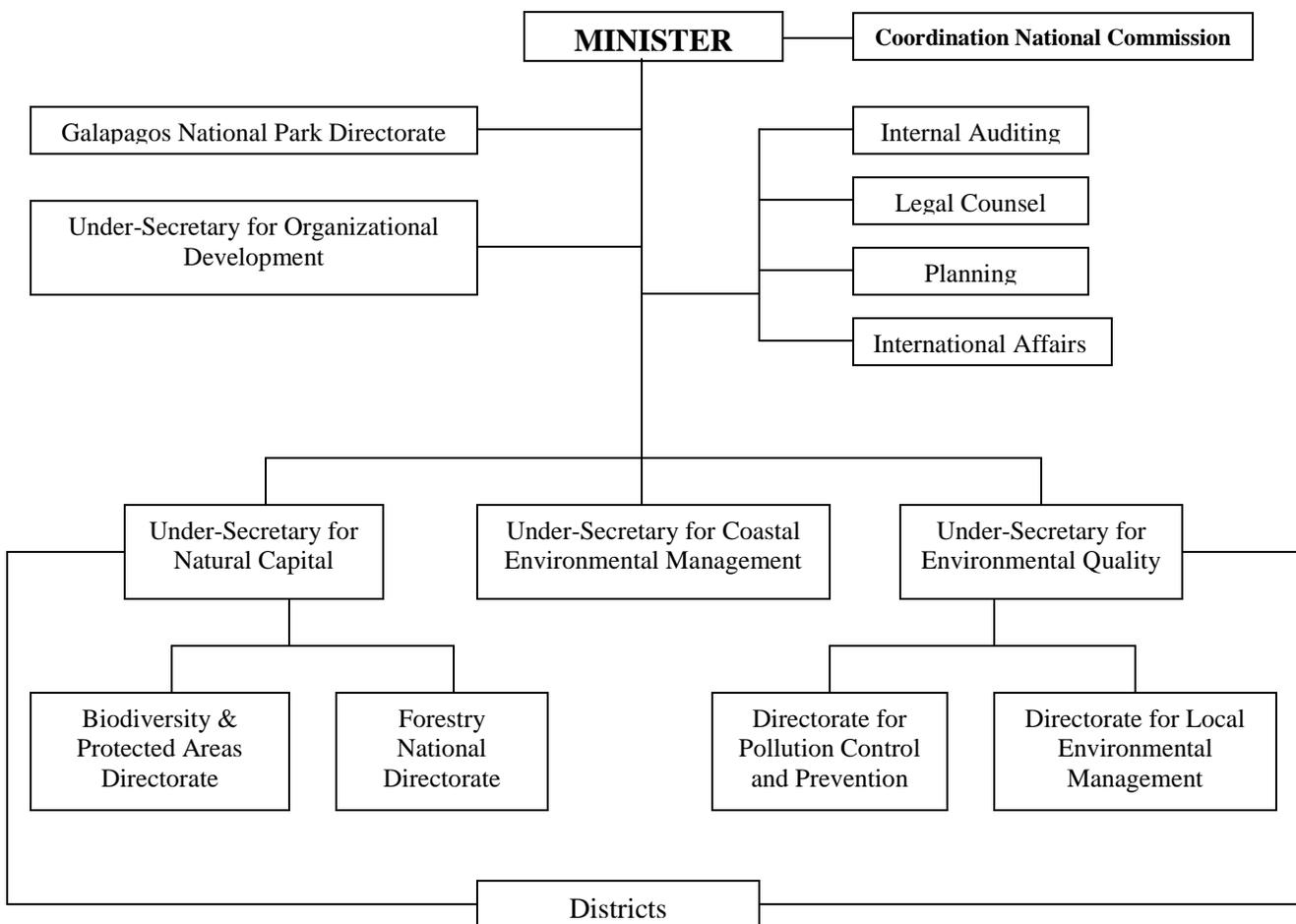
According to the EML, the MAE has the following responsibilities:

- Develop a National Strategy on Zoning;
- Propose environmental management and licensing procedures;
- Approve plans, projects, and activities required for national environmental management;
- Coordinate the development of environmental standards;
- Determine the type of projects that require environmental licenses;
- Collaborate with the private sector and other public organizations;
- Collect environmental information and make it publicly available;
- Create an Advisory Council comprised of representatives from all agencies that make up the SDGA, guaranteeing in particular the participation of sectoral agencies (line ministries) and civil society;
- Define monitoring and enforcement systems;

- Coordinate with the relevant agencies the implementation of monitoring and enforcement systems;
- Regulate through bio-security standards testing, the use, marketing, and import of genetically modified organisms (GMOs);
- Foster public participation in the development and implementation of environmental and natural resource policies and related actions; and
- Other responsibilities mandated by other laws and regulations.

To carry out these numerous responsibilities, the Ministry has a staff of 546. Figure II.1 provides a diagram of MAE’s organization.

**Figure II.1. Organizational Chart**



Recurrent resource shortages and increasing responsibilities have translated into unrealistic workloads that hinder effective planning and coordination within MAE and often prevent MAE’s senior staff from making informed strategic decisions that would support priority setting, planning, resource reallocations, agreements on joint programs with other ministries, and making the best use of the policy instruments provided by the legal framework.

MAE is one of the smallest ministries in Ecuador. From 2001 to 2006, it received on average 0.15 percent of the government budget, and this percentage has decreased in the past few years (see Table II.4). In addition, the government funds earmarked to MAE are not based on a periodic analysis of needs and priorities, but rather follow the allotments set in previous years.

**Table II.4. MAE Budget**

<b>Year</b>	<b>MAE Budget (millions of U.S. dollars)</b>	<b>Total Government Budget (millions of U.S. dollars)</b>	<b>MAE Budget as a Percentage of the Total Government Budget</b>
2001	10.90	5 488.6	0.20 %
2002	10.60	5 505.6	0.19%
2003	8.80	6 187.8	0.14%
2004	9.00	7 322.9	0.12%
2005	9.10	7 914.58	0.11%

*Source:* Ministry of Economy and Finance.

Effective public sector environmental institutions require a number of characteristics including effective cross-sectoral coordination; a balance between centralized and decentralized environmental oversight; and transparency, participation, and public access to environmental information (Lovei and Pillai 2003). As indicated in the previous section, the country's environmental law has established a series of mechanisms to foster these characteristics.

#### *Cross-sectoral Coordination*

Although the MAE is the principal actor within the country's environmental management framework, a number of powerful line ministries and agencies (with considerably larger budgets and political influence) have environmental mandates (see Table II.5).

**Table II.5. Organizations with Environmental Management Responsibilities**

<b>Central Government</b>				
<b>Organization</b>	<b>Type</b>	<b>Area of Influence</b>	<b>Legal Framework</b>	<b>Comments</b>
Ministry of Environment (MAE)	Central Government, issue policies	National Environmental Authority, in charge of regulation in those areas not mentioned in the Law (electricity generation, hydrocarbons, mining, and water)	Coding of the Environmental Management Law, Forestry Law, Unified Secondary Environmental Law	National Environmental Authority
Ministry of Energy	Central Government, issue	Regulates hydrocarbon and mining activities.	- Hydrocarbons Law	Authorizes the implementation of

and Mines (MEM)	policies	Environmental Authority in these sectors.	<ul style="list-style-type: none"> <li>- Environmental Rules for Hydrocarbon Activities.</li> <li>- Rules for Public consultation and participation for hydrocarbon activities.</li> <li>- Mining Law.</li> <li>- Environmental Rules for Mining Activities.</li> </ul>	<p>hydrocarbon activities.</p> <p>Grants mining concessions.</p> <p>It is the sector's environmental authority, approves licenses and environmental impact studies, regulates and oversees its enforcement in the country, except in the Protected Natural Areas.</p>
Electricity National Council (CONELEC)	Central Government, issue policies	Electricity generation activities.	Electric Sector Law.	Sector's Environmental Authority, issues environmental licenses.
Water Resources National Council (CNRH)	Central Government, issue policies	Water Management National Authority.	Decree 2224 of October 25, 1994 (Official Registry 558 of October 28, 1994).	Self-governed. There is no legal obligation to coordinate with other entities. It mainly aims at water management for agriculture.
Merchant Marine General Directorate	Central Government, issue policies		National Security Law.	
Marine Interests General Directorate	Central Government, issue policies			
Coastal Resources Management Program (PMRC)	Project Implementation Agency	Coastal Resources		Under the Presidency of the Republic.
Institute for the Eco-development of the Ecuador Amazon Region (ECORAE)	Projects Fund	Projects in the Amazon region. In charge of the design and execution of the Master Plan for the Eco-development of the Ecuador Amazon Region.	Codification of the ECORAE Law and strengthening of its sectional governments.	Funded by contributions obtained from each oil barrel extracted in the Amazon region.

State Modernization National Council	Central Government, issue policies. Restructured and placed under the guidance of SENPLADES	In charge of State modernization processes, decentralization.	State Modernization Law.	
Planning and Development National Secretariat	Central Government, issue policies, planning			
Council for the Development of Nationalities and Peoples of Ecuador (CODENPE)	Design policies	Aimed to nationalities and indigenous peoples. They are part of the National Commission for the SDGA Coordination.	Replacing Decree of the Executive Decree for the Creation of the Council for the Development of Nationalities and Peoples of Ecuador, CODENPE (Decree No. 180).	
<b>Galápagos</b>				
Galapagos National Institute (INGALA)	Under the Presidency of the Republic	Planning and technical assistance, and inter-institutional coordination in the Galapagos Province.	Galapagos Special Law RO 278, March 8, 2001.	Grants entrance to the archipelago and issues residence licenses, coordinates planning.
Galapagos National Park	Under MAE	Administration and Control of the National Park and Marine Reserve.	Presidential Decree RO 873 of July 20, 1959.	

<b>Self-governed Sectional Governments</b>				
Municipalities	Self-governed local government. Planning, policy design, and land administration.	Municipal land management, planning, and land use. Water supply and environmental sanitation.	Municipal Organic Law.	Responsible for environmental quality control, land use, and other tasks linked to decentralization.
Provincial Councils	Self-governed local governments.	Management in rural areas, forestry control as of December 2006.	Provincial Organic Law.	
Community	Local Governments.	In charge of social control and execution of tasks	Community Organizations	

Organizations	Social Control Entities.	delegated by the Municipalities.	Organic Law.	
Association of Ecuadorian Municipalities (AME)	Local Governments Association.	Provides technical assistance to all its members. Representation in specific issues, Lobbying—self-governed public institution.	Municipal Organic Law.	LGA modified LORM, dictating that the association has a permanent environmental management technical assistance unit for the municipalities.
Consortium of Provincial Councils of Ecuador	Local Governments Association.	Provides technical assistance to all its members. Representation in specific issues, Lobbying—self-governed public institution.	Provincial Organic Law.	
Community Organizations National Council	Local Governments Association.	Provides technical assistance to all its members. Representation in specific issues, Lobbying—self-governed public institution.	Community Organizations Organic Law.	

Given the numerous government agencies that have environment responsibilities, Article 5 of the EML established the Decentralized System of Environmental Management (*Sistema Descentralizado de Gestión Ambiental, SDGA*) as a mechanism to coordinate different sectors and government levels. The SDGA is lead by the CNC, which in turn is chaired by the Minister of MAE.

The CNC, however, has not been effective in promoting coordination given: (a) MAE lacks staff dedicated to developing and overseeing meaningful sectoral agendas;<sup>11</sup> (b) key ministries and organizations do not participate in the CNC; and (c) regulation gaps that could provide guidelines for the CNC’s operation. An effective CNC would provide MAE with the analytical and political support it requires to play a more active role in cabinet meetings in which key policies and projects—including decisions on infrastructure investments—are discussed.

### *Balancing Centralized and Decentralized Management*

One of the principles of environmental management is that it should be delegated to, and carried out at, the most decentralized level where issues can effectively be managed and national bodies can provide required support and coordination. In 2003, debates on the reform of intergovernmental arrangements centered on transferring resources and responsibilities to subnational governments.<sup>12</sup> With all 22 provincial councils and roughly two-thirds of all

<sup>11</sup> To engage powerful ministries in a meaningful collaboration process, MAE needs to produce figures and analyses that show the economic and social importance of incorporating environmental considerations into sectoral policies.

<sup>12</sup> Municipalities and provincial councils.

municipalities signing agreements to accept the transfer of responsibilities in four sectors (transport, environment, tourism, and agriculture), the country was ready to embark on a large-scale decentralization process.

Since then, only a handful of municipalities and provincial councils have effectively adopted and are managing their new responsibilities. They execute a higher share of total public expenditures,<sup>13</sup> but this is not due to a transfer of responsibilities, and instead reflects the increase in intergovernmental grants. Although public service coverage has improved since 1990, deficiencies still remain in water and sanitation provision and the management of solid waste. Overall, many of the problems faced by the country's intergovernmental framework have yet to be fully addressed and resolved.

**Box II.3. Responsibilities According to Ministerial Agreement 055, Transferred to Local Governments**

(a) Forestry management, forestry farms, wild flora and fauna.

- Policy design.
- Preparation and implementation of strategies and development programs, and sustainable use of forestry resources.
- Issuing of regulations for forestry, forestry farms, wild flora and fauna, and closed season, in coordination with the Ministry of Environment, and in accordance with clause (d) of article 12 of the Environmental Management Law.
- Authorization and control of forestry usage and transport of forestry products, through the granting of highway use waybills.
- Protecting forests declaration and issuing of certificates of impact on protecting forests.
- Validation of locally proposed programs and projects, considered within the national strategies and development programs.
- Judgment and resolution of first instant infractions within their jurisdiction.
- Prevention and control of disasters and threats to forestry resources.
- Declaration of protected areas within their jurisdiction.
- Training, information, and implementation of forestry extension and on biodiversity.
- Authorize and control the usage, internal commercialization, and wild flora and fauna ownership.

(b) Environmental quality.

- Policy design.
- Publication of technical standards according to the already transferred competencies and previous coordination of this Ministry, in agreement with clause (d) of article 12 of the Environmental Management Law.
- Regulations for the establishment of incentives related to technological improvement to ensure the best possible environmental quality.
- Establishment of penalties and sanctions according to current standards and regulations.
- Design mechanisms to prevent, control, sanction, and correct those actions that distort or infringe current standards.
- Approval of environmental impact studies for polluting activities and industries, according to Chapter II of the Environmental Impact Evaluation and Environmental Control, Title III of the Environmental Management Law.
- Decide on an environmental impact evaluation system for projects and activities not considered of national interest and which competency does not belong to another sector of the Environmental Management Decentralized System.
- Control of the enforcement of: regulations, environmental quality standards, environmental licensing for polluting activities, and industries both public and private.

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<sup>13</sup> The share of subnational spending has been growing over recent years: while in 2000 the share of subnational expenditures in total public expenditures was 10.2 percent, today it is about 22.4 percent.

- Carry out environmental audits aimed at production activities or susceptible to causing environmental damages.
- Design and implement the plan for prevention and control of environmental quality in provinces and cantons, and its management indicators.
- Coordinate the systems for control of the verification of the enforcement of environmental quality regulations regarding air, water, land, noise, wastes and polluting agents, and the implementation of technical assistance programs and projects for industry, the agro-industry, and sundry services, including industrial retrofitting.
- Promote private sector and community participation in the activities related to the maintenance and improvement of environmental quality, and the use and operation of sustainable environmental technologies, in coordination with public and private entities.
- Provide technical assistance to public and private entities and organizations regarding control and implementation of specific environmental quality standards.
- Develop and finance projects on environmental quality control.
- Provide training and information.

Investments are not coordinated between national and local levels of government, with subnational governments executing a higher share of investments. In 1994, subnational governments executed 36.6 percent of public investment, while in 2004 they executed 47.2 percent (CONAM 2006:100), highlighting the need for municipalities and provincial councils to better coordinate investments based on clear priorities. However, national investment is highly fragmented across social funds, regional development agencies, and sector ministries, which offer financing instruments to subnational governments in an uncoordinated fashion. This undermines the quality and efficiency of public services.

The mechanisms for transferring environmental management responsibilities (*convenios*) to municipal and provincial levels are weak and do not provide a clear delineation of responsibilities. The large-scale transfer of functions initiated in 2001, in which all provincial councils and two-thirds (out of 220) municipalities signed a framework agreement for the transfer of environmental responsibilities, was not implemented. Only a few subnational governments effectively assumed their new responsibilities, among them the municipalities of Cuenca and Quito.

The 2006 Ministerial Agreement (No. 106) provides notable improvements in the definition of responsibilities and jurisdictions. However, the procedures for this transfer of environmental management functions are still unclear.

- Coordinated approaches to these transfers have been abandoned and instead they proceed in a one-to-one fashion, in which the AAA assumes one individual environmental management responsibility at a time rather than a group of related responsibilities;
- Municipalities and provincial councils do not fulfill even minimum transparency requirements before adopting their new responsibilities;
- Transfer agreements lack service quality indicators, undermining the monitoring and evaluation of service delivery as an effective means for improving and/or achieving efficiency;
- The allocation and/or training of human resources required to carry out these additional responsibilities at the local level has not occurred.

A strategy to create a well-functioning intergovernmental system should include the following elements:

- *Establishing minimum levels of transparency and accountability in an incremental fashion.* It is important to continue measures that would gradually create a constituency of actors benefiting from higher levels of transparency and accountability. The central government alone is not able to enforce sanctions for noncompliance. Users and consumers of public services and goods have an important role to play in creating additional incentives that would make both central and subnational government officials more accountable for the services they provide.
- *Changing the focus from transfer of management and expenditure responsibilities to coordination.* The large-scale effort that has been carried out since 2000 to transfer environmental management and expenditure responsibilities has time and again stalled. This effort will most likely continue on a one-to-one basis, with AAAs assuming one individual environmental management responsibility at a time. Efforts should now be made to coordinate increasing environmental management responsibilities among the various executing agencies and levels of government, instead of focusing efforts on the transfer process itself.
- *Capacity building at the subnational level.* Training, adequate equipment, and processes, and sufficient budget allocations, have to be provided to local environmental units to ensure that they have the resources to assume these environmental management responsibilities.

### **3. Conclusions and Recommendations**

Ecuador, a country with exceptional natural wealth, faces environmental and natural resource challenges that may compromise the country's long-term economic growth and impose significant socioeconomic costs. To address these problems, Ecuador needs to further strengthen its environmental and natural resource management institutions. Strengthening does not necessarily mean scaling-up or increasing budgets and staff of current organizations. Ecuador must learn from its rich experience in environmental management and from international best practices and adapt its institutions and organizations to current and emerging conditions and challenges. This analysis concludes that if MAE improves the effectiveness of its core functions and coordination mechanisms with other ministries, agencies, and subnational authorities, in the short term Ecuador will be better able to address key environmental and natural resource problems that are affecting the well-being of the population and the capacity of its economy to grow in a sustainable way.

#### Recommendations

***Strengthen MAE's ability to carry out core functions and oversee coordination efforts.*** Environmental institutions have to perform at least three core functions:

- *Picking up signals*—identifying (and hopefully anticipating) problems by analyzing information and listening to messages from different groups.

- *Coordinating interests*—mobilizing dispersed interests and providing forums in which parties can express their interests, assess options and strategies, and work out mutually acceptable agreements.
- *Executing agreements*—following through on what has been decided.

One of the greatest weaknesses identified in the environmental sector is the lack of an environmental policy that orients the country toward specific goals and that clearly establishes short-, medium-, and long-term priorities. **MAE’s planning unit has to be strengthened** to be able to provide analytical support for the creation of such a policy and to support the decisionmaking process that establishes the yearly list of plans, projects, and priority activities for environmental policy.<sup>14</sup> This function is particularly important to ensure that the increasing financial resources allocated to special funds are invested in accordance with specific, clear, and objective criteria in the best interests of Ecuadorians.

Given that the environment cuts across economic sectors and several institutions with environmental functions, **an improved cross-sectoral coordination mechanism is essential.** Cross-sectoral coordination bodies can help align the operations of different agencies. This coordination must be institutionalized at the highest government level. The EML establishes Decentralized System of Environmental Management (SDGA) as the coordination mechanism across sectors. Regional experience shows that coordinating bodies have been successful when (a) they oversee a well-defined policy, priorities, or activity; (b) there is a strong political leader to champion a cause; and (b) technical and financial resources are available for monitoring and oversight.

The SDGA is led by the National Coordination Commission (CNC), which in turn is chaired by the Minister of MAE. To be an effective coordination mechanism, the CNC needs: (a) secondary legislation (regulations) that provide guidelines for its operation (including funding, oversight of agreements, and other responsibilities); (b) the involvement of key line ministries that currently do not participate in the commission (for example, MEM); and (c) meaningful sectoral agendas. In addition, an effective CNC would give MAE the political authority and analytical tools to better participate in cabinet meetings where central policies and projects—including decisions on infrastructure investment—are discussed.

With regard to **decentralization**, consideration should be given to:

- ***Establishing minimum levels of transparency and accountability in an incremental fashion.*** AAAs must be made accountable for compliance and enforcement of their environmental responsibilities. Apart from developing monitoring mechanisms at MAE, it is important to continue developing and implementing measures that would gradually create a constituency of actors who benefit from greater transparency and accountability. The central government alone is unable to enforce sanctions for noncompliance. Users and consumers of environmental goods and services have an important role to play in creating incentives that make both central and subnational government officials more accountable for the services they provide.

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<sup>14</sup> Article 9 of the EML.

- ***Shifting the focus from transfer of environmental management and expenditure responsibilities to expenditure and functional coordination.*** Efforts should be made to coordinate the increasing size of subnational expenditures and environmental responsibilities among the various executing agencies and levels of government, instead of focusing efforts on the transfer process itself.
- ***Capacity building at the subnational level.*** Training, adequate equipment and processes, and sufficient budget allocations have to be provided to the environmental units of municipalities that now have environmental management responsibilities.

***Better support for environmental decisionmaking and monitoring through improving the RNIA.*** Very little environmental information is available at MAE or through its website. In addition, a system for periodically gathering data on environmental quality and in a format consistent with other national, regional, and international database systems is not yet in place.

This report recommends that MAE revitalize the National Environmental Information Network (RNIA) so that it provides relevant environmental information to support decisionmaking, policy implementation, and performance monitoring throughout SDGA and to stakeholders and the general public. Some of the key ingredients of such a program are:

- Learning from the experience of the Social Front Technical Secretariat (*Secretaría Técnica del Frente Social, STFS*) with regard to establishing information systems and indicators (see Box II.4).
- Developing RNIA indicators to be used by government officials to steer policy priorities, for instance, concerning water resource planning and administration and pollution control and prevention.
- Improving water and air quality monitoring.
- Creating an inventory of wastewater discharges and point-source air emissions.
- Developing a monitoring system to track information on environmental performance of major industrial facilities; this information could be published on MAE's website.
- Integrating into the RNIA information that is already available and regularly received at the Ministry and other government agencies, including studies, professional experience [a consultant registry??], permit applications, and citizen complaints.
- Both the richness of natural resources and severity of environmental degradation in Ecuador make a strong case for the role of environmental resources in reducing poverty, fighting hunger, and lowering child mortality. Policymakers need to be aware of the likely consequences of environmental degradation. MAE should develop periodic analytical work, such as environmental accounting, to determine the cost of environmental degradation.

#### **Box II.4. Responsibilities of the Social Front Technical Secretariat**

**The Social Front Technical Secretariat (STFS)** is an organization with technical, administrative, and financial autonomy, created in 2000 to meet the following objectives:

- a) Coordinate the design and development of social policies;
- b) Design the monitoring and evaluation system of projects and programs in the social sector;
- c) Promote the institutional modernization of the social sector;
- d) Provide the sector with an information system;
- e) Promote a public management culture based on transparency, ethics, and effectiveness;
- f) Develop social audits in which beneficiaries participate;
- g) Provide technical and methodological support to social programs.

STFS has the following five divisions:

- a) Integrated system of social indicators
- b) Social expenditure monitoring
- c) Social projects bank
- d) Identification of social benefits system
- e) Institutional reform.

The STFS has made important contributions to information management; monitoring and evaluation of social expenditures; and to effective and efficient managing of social projects.

***Promote Public Participation in the Environmental Agenda.*** Strengthening institutions and organizations includes not only building and improving legal frameworks and organizations, but also increasing citizen engagement and voice. Improvements to legislative oversight and administrative mechanisms do help, but they are insufficient unless accompanied by increased demand from citizens and other stakeholders for better access, quality, and responsiveness in the delivery of public services. Greater citizen involvement can be facilitated by disclosing data on environmental quality, enabling public review of proposed laws and regulations, and enhancing spaces and opportunities for citizen and civil society engagement with political and economic actors. Participatory methods such as expanded data collection and analysis can then be used by the public to hold policymakers accountable, thus enhancing both public sector accountability and performance—the demand side of governance. This report recommends the following actions to enhance public participation:

- Support increasing the capacity of indigenous communities to participate in the oversight of programs and projects executed by private industry and public agencies, in a manner that goes beyond initial consultations and creates social audit mechanisms. These systems should be aligned with indigenous organization structures and should promote social audits that operate during the entire cycle of oil activities. It must be added, that oil companies agree with the introduction of participatory environmental monitoring

procedures. The regional association of oil companies has recently completed a document on this issue.

- Create an Environment and Natural Resource Observatory along the lines of the Fiscal Observatory (see Box II.5) in order to facilitate policy dialogue and agreements.
- Create a citizen complaints system that is easily accessible by the public in an effort to promote accountability of environmental authorities.
- Issuance by MAE of a biennial report on the state of the environment.

#### **Box II.5. The Fiscal Policy Observatory**

**The Fiscal Policy Observatory (<http://www.observatoriofiscal.org>)** was created to promote agreements that would allow sustainable fiscal policies. The fiscal observatory is a reference point for public opinion and an information source for the media, private sector organizations, NGOs, and higher-education organizations. The fiscal observatory has promoted public discussion of relevant issues, such as: public debt, subsidies, tax revenues, country-risk, and fiscal deficit. Its members come from a wide range of backgrounds, from bankers to intellectuals.

*Improve the Effectiveness and Efficiency of SUMA.*<sup>15</sup> Since the establishment of SUMA, the government has made great progress in evaluating the significance of environmental and social impacts associated with development projects. However, overreliance on EIAs and implementation flaws are hindering the effectiveness of environmental management by the authorities. “Fine-tuning” the current system (that is, improving the accreditation process, screening, scoping, public participation, monitoring, and enforcement) will not be enough to provide Ecuador with an efficient and effective way to address the environmental impact of projects. MAE should review the role that EIA plays in environmental management and look for additional policy instruments (such as economic incentives, emission standards, and strategic environmental assessments (SEA)) that could address environmental impacts in a more effective and efficient way. In addition, some components of the licensing process (particularly monitoring and enforcement) need to be revitalized.

The following key recommendations are provided to help the government continue to improve the efficiency and effectiveness of the licensing process. The first two recommendations are meant to improve the “environmental management system” by developing and applying additional instruments. The remaining recommendations are aimed at improving components of the licensing process.

- **Develop and implement additional regulations.** There is an overall lack of key environmental legislation and regulations. Despite whatever improvements could be made to the EIA process in Ecuador, there remains a crucial need to implement key regulatory standards for discharges to air, soil, and water. This should be a priority and form a key part of improving the environmental management process by not overburdening the EIA process and bringing in additional instruments better suited to deal with most pollution problems.

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<sup>15</sup> There has been speculation that the government is evaluating whether to give back to MAE the licensing authority that MEM and CONELEC currently hold. The principles behind this section’s recommendations apply to both centralized and decentralized environmental management systems.

- **Develop capacity to conduct SEA and strengthen links between EIA and SEA.**<sup>16</sup> *Undertake pilot studies for SEAs in Ecuador. Prospective pilot projects could include: fuel quality, environmental health, tourism, and sustainable agriculture.*
- **Improve the Accreditation Process.** The list of prerequisites for accreditation should be updated, and yearly as well as random audits to assess AAA procedures should be implemented.
- **Strengthen the Environmental Unit of the State General Controller (CGE).** The role played by the CGE is essential. Without an effective enforcer of public duties, the credibility of the licensing process is compromised. The CGE's environmental unit has a staff of only 10, severely limiting its role.
- **Strengthen AAA Oversight and Compliance Processes.** *Implement oversight and review processes in all AAAs by establishing dedicated oversight units in each AAA. In addition, undertake the following: (a) link the monitoring and oversight unit in each AAA to the corresponding legal compliance unit; (b) prepare a manual for monitoring environmental management plans and develop standardized procedures; and (c) consider charging project proponents of "large and special" projects for this monitoring and oversight (following the successful Colombian experience).*
- **Strengthen Public Participation in the Licensing Process.** *Develop a standard guide for public consultation and make it available in all AAAs.*

***Improve Compliance with Environmental Regulations by Enhancing Inspection and Enforcement Capacities.*** Compliance is one of the weakest aspects of Ecuador's environmental management framework. This is particularly relevant for a decentralized system where in the absence of credible enforcement, conflicts of interest can arise. Some of the components of an effective enforcement system are already in place (such as CGE's environmental unit) but the human, material, and technical resources for enforcement activities (particularly inspections) need to be secured and additional organizational arrangements should be considered (such as the creation of an autonomous enforcement agency).

In addition, the focus needs to be shifted from trying to change behavior with the threat of sanctions that are ultimately not enforced, to promoting compliance through achievable requirements that are applied gradually and with flexibility. It is important that these sanctions be credible to violators. Improving the legal framework with more precise regulations and standards (as indicated in previous recommendations) will make compliance and enforcement easier, but

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<sup>16</sup> SEA is a process aimed at improving strategic decisionmaking by integrating environmental considerations into the planning stage of the strategic decisionmaking process. SEAs can be a powerful tool to efficiently and effectively address the environmental implications of sectoral policies, plans, and programs because: (a) including environmental costs and benefits alongside economic, social, and political concerns allows the authorities to make more informed decisions; (b) including environmental considerations in the planning process offers the opportunity to influence the kinds of projects that will be implemented; (c) SEAs may lower subsequent compliance costs of individual projects and, thus, has the potential to streamline inefficient environmental licensing processes; and (d) analyzing plans, programs, or policies (rather than isolated projects) facilitates the consideration of cumulative and synergistic impacts of multiple projects.

those reforms must take into account compliance from the outset to avoid creating unenforceable requirements. Improving compliance will require time and numerous reforms. An abrupt increase in enforcement without adequate reengineering of the compliance system might seriously affect competitiveness and/or drive businesses toward the informal sector without achieving environmental protection goals.

This report recommends that the GOE bases the enforcement strategy on two pillars: (a) a compliance promotion program that combines information, technical assistance, and financial incentives; and (b) strong monitoring and a credible enforcement threat. Some of the key ingredients of such a program are:

- Establishing a compliance promotion program monitored by the CNC to bring the regulated community—including municipalities and other government entities—into compliance. The program might be based on the provision of information and technical assistance, financial incentives, and a credible enforcement threat, and might include an inspection program for unlicensed facilities and a follow-up and audit program for environmental management and environmental adjustment plans of licensed facilities.
- Establishing coordination through SDGA and information-sharing protocols between MAE and the inspection and enforcement units of AAAs. The outcomes of these efforts might be reported periodically to CNC.
- Staffing, training, and equipping the monitoring units of MAE and the AAAs and strengthening the capacities of the FGE (Attorney General) and the CGE.
- Promoting the creation of independent environmental certification and auditing entities to foster third-party verification in support of government enforcement and voluntary compliance.
- Assess the need for creating an autonomous enforcement agency.

***Make Budgetary and Special Funds Allocation more Efficient and Equitable.*** Actions that the GOE might consider to address the misalignment between resource allocations and environmental policy priorities include:

- Developing a priority-setting mechanism based on:
  - The impacts of environmental degradation on the poor and other vulnerable groups;
  - The costs and risks that environmental degradation imposes on society; and
  - The analysis of the efficiency and effectiveness of interventions.
- Establishing a planning and programming process to align environmental priorities with financial resource allocations.

With respect to the Institute for the Eco-development of the Ecuador Amazon Region (ECORAE), the resources currently being allocated to subnational governments should be more transparent. The idea is not to reduce amounts, but to ensure their rational use:

- The distribution of earnings should be based on revenues generated by operations in the region, priority investment needs, and verification of the administrative capacity of executing agencies.

- The appropriation and application of benefits should be made within the budget and be based on criteria of efficiency and social development.
- The rights of communities directly impacted by operations to participate in decisions regarding distribution of earnings must be considered.

### III. Environmental Health

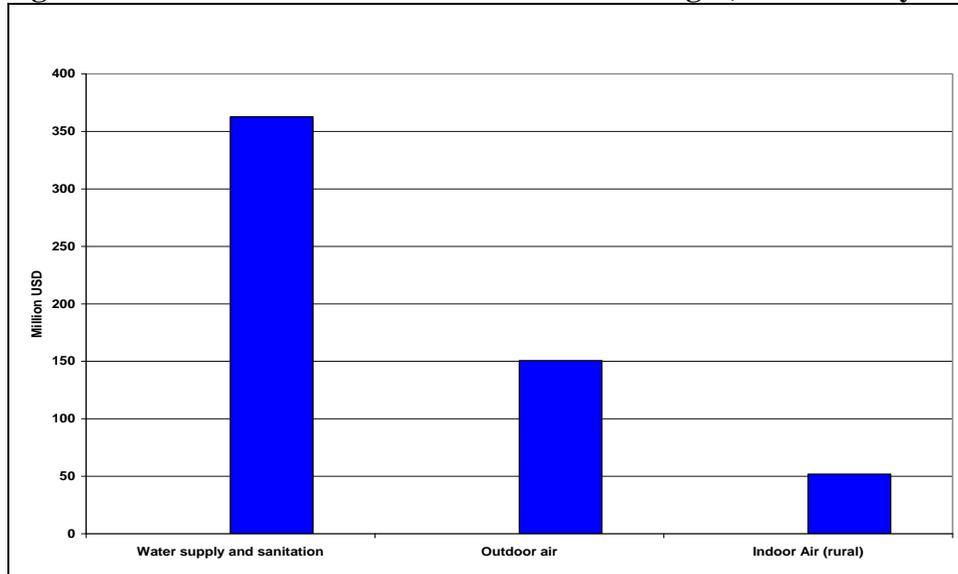
With increasing urbanization, new environmental challenges have arisen in Ecuador that have yet to be fully addressed. These challenges include the impacts of human activities on the environment, such as (a) localized environmental health problems associated with inadequate household water and sanitation; (b) urban and regional air pollution, inadequate waste management, and contamination of rivers, lakes, and coastal areas; and (c) natural resource degradation and global environmental problems. This environmental degradation threatens the well-being of current and future generations, particularly the most vulnerable segments of the population (children and the poor) who are disproportionately affected.

An analysis of the cost of environmental degradation shows that the most significant environmental costs to the country are associated with inadequate water supply, sanitation and hygiene, and ambient and indoor air pollution. The burden of these costs falls most heavily on poor children under age 5. The effects of degradation associated with these principal causes are estimated to cost approximately US\$537 million per year, or approximately 1.7 percent of GDP, due primarily to increased mortality and morbidity from waterborne diseases (particularly diarrheal illness), respiratory infection, and cardiopulmonary disease (Figure III.1). The rate of child mortality from these factors is approximately 34 deaths per 1,000 (ENDEMAIN 2004).<sup>17</sup> Similar studies on the cost of environmental degradation in Bolivia, El Salvador, and Peru indicate that the annual cost of environmental degradation from factors affecting public health and quality of life (for example, inadequate water, sanitation and hygiene, and air pollution) is highest in Bolivia, followed by Colombia, El Salvador, Peru, and Ecuador (Figure III.2).

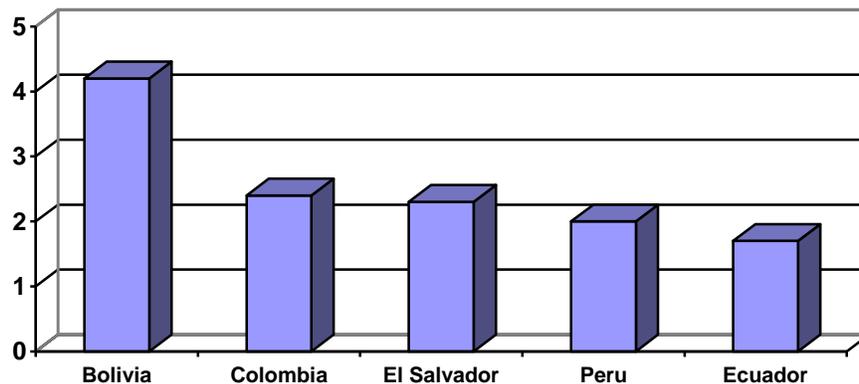
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<sup>17</sup> The 1999 ENDEMAIN Demographic and Health Survey reported the child mortality rate for children under age 5 at 51 per 1,000 live births.

**Figure III.1. Annual Cost of Environmental Damage (US millions/year)**



**Figure III.2. Cost of Environmental Degradation (Health and Quality of Life) (% of GDP)**



### **Water, Sanitation, and Hygiene**

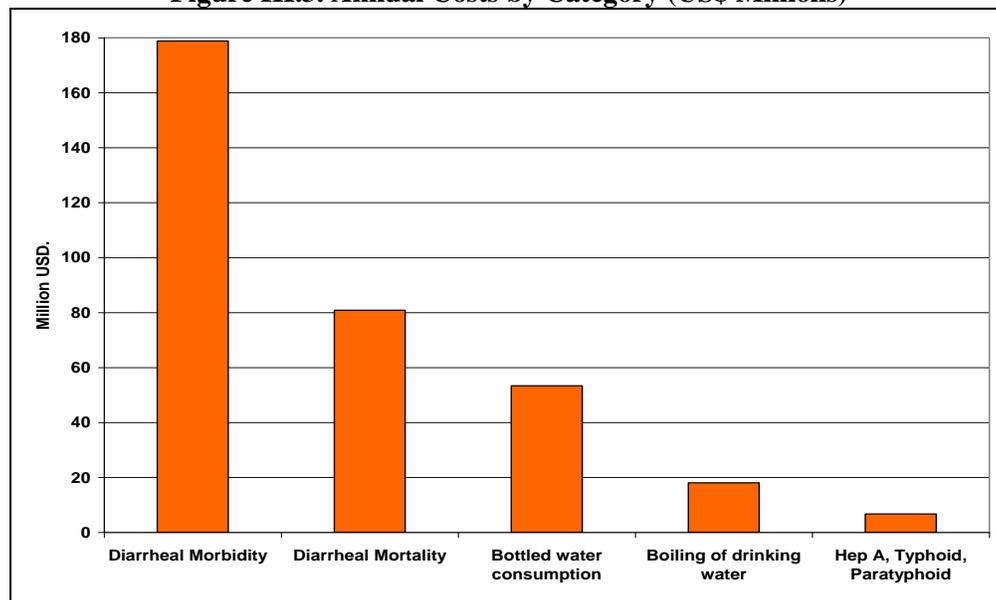
The poorest groups often lack adequate sanitation and water supply; 90 percent of the top three income deciles in urban areas have access to an improved water source compared with only 60 percent of the bottom three income deciles.<sup>18</sup> In 2001, water supply coverage stood at 82 percent in urban centers and 39 percent in rural areas. In addition, the lack of sanitation coverage in 71 percent of rural areas and 27 percent of urban centers presents a serious environmental problem for the country.<sup>19</sup> Insufficient potable water supply, sanitation facilities, and hygiene practices

<sup>18</sup> "Desigualdades en el acceso, uso y gasto con el agua potable en América Latina y el Caribe," Ecuador, Technical Report Series No. 5, Pan-American Health Organization, Washington, D.C., February 2001.

<sup>19</sup> "Plan Nacional de Desarrollo del Sector de Agua Potable y Saneamiento Básico," G. Yepes, B. Gómez, and E. Carvajal, October 2002.

are associated with various illnesses in both adults and children. Esrey and others (1991) provide a comprehensive review of studies documenting this relationship for diseases such as schistosomiasis (bilharzia), intestinal worms, diarrhea, and others. While diarrheal illness is generally not as serious as some other waterborne illnesses, it is more common and affects a larger number of people. Data from the Pan-American Health Organization (2004, 2006) indicate that 8 to 16 percent of child mortality is caused by intestinal diseases. Ecuador has achieved significant reductions in child mortality from diarrhea and other diseases; however, the costs associated with diarrheal morbidity from contaminated water and poor hygiene in both children and adults remain high (Figure III.3).<sup>20</sup> Although diarrheal morbidity constitutes a higher cost to the country, it is very difficult to identify all cases. The main reason is that a substantial share of cases are not treated or do not require treatment at health facilities, and therefore are never recorded. A second reason is that cases treated by private doctors or clinics are most often not reported to public health authorities. Household surveys therefore often provide the most reliable indicator of total cases of diarrheal illness. Data from the 2004 ENDEMAIN household survey estimate the total number of annual cases of diarrheal illness to be close to 15.5 million, or approximately 1.2 cases per person (Table III.1). The total annual cost of health impacts associated with diarrheal illness is estimated at US\$163 million in urban areas and US\$103 million in rural areas (Figure III.4).<sup>21</sup>

**Figure III.3. Annual Costs by Category (US\$ Millions)**



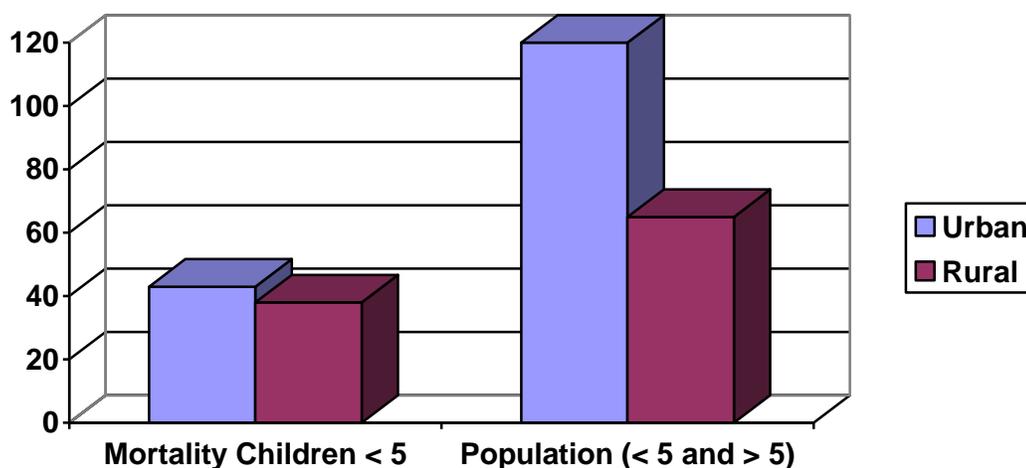
**Table III.1. Estimated Annual Cases of Diarrheal Illness in Ecuador in 2004**

<sup>20</sup> The 1999 ENDEMAIN Demographic and Health Survey reported the child mortality rate for children under 5 at 51 per 1,000 live births, while the 2004 Survey reports the child mortality rate at 34 per 1,000 births.

<sup>21</sup> Although only 37 percent of the country's population lives in rural areas, the estimated number of cases of diarrheal child mortality is approximately 15 percent higher than in urban areas since there is a substantially greater number of children living in rural areas.

	National	Urban	Rural
2-week diarrheal prevalence in children < 5 yrs (%)	21.7%	20.7%	23.0%
2-week diarrheal prevalence in population > 5 yrs (%)	3.7%	3.5%	3.9%
Annual diarrheal cases in children > 5 ('000s)	6,509	3,581	2,921
Annual diarrheal cases in population > 5 ('000s)	9,026	5,480	3,477
Total annual diarrheal cases	15,535	9,061	6,398
Diarrheal cases per person (all population)	1.18	1.09	1.31

**Figure III.4. Estimated Annual Cost of Diarrheal Illness (US\$ Millions)**

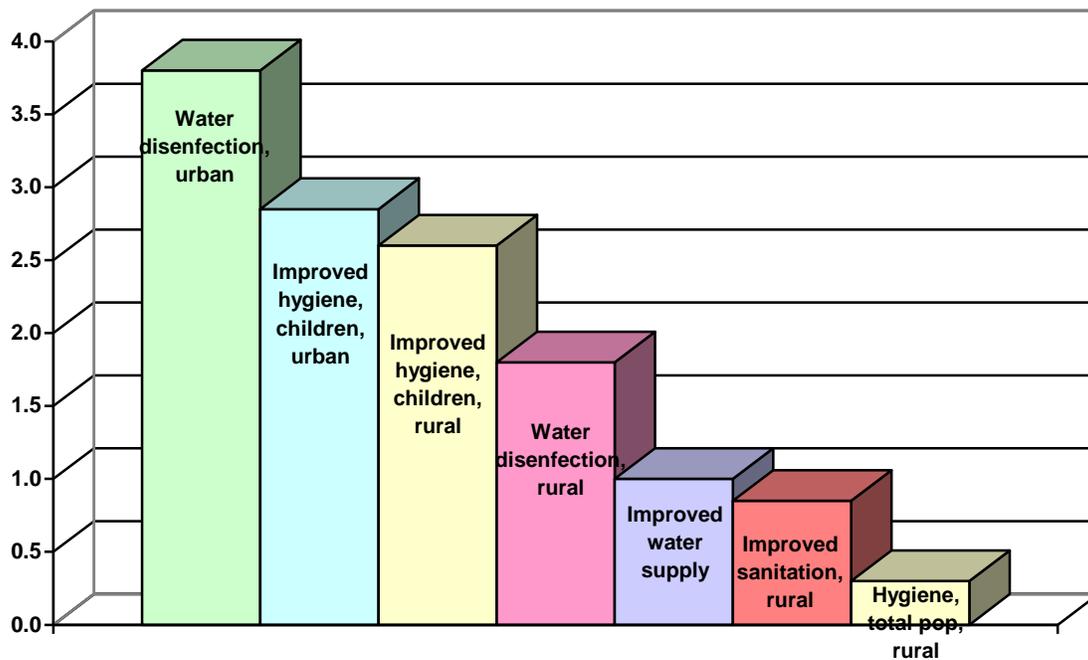


According to a meta-analysis of the effect of water, sanitation, and hygiene interventions on diarrheal illness, improvements in water supply and sanitation provide a 30 percent expected reduction in diarrheal disease.<sup>22</sup> This analysis indicates that while multiple interventions consisting of water supply, sanitation provision, and hygiene education act to reduce diarrheal illness, they are not more effective than individual interventions. For example, the meta-analysis reports a mean reduction in diarrheal illness of about 45 percent from handwashing interventions, highlighting the importance of incorporating hygiene interventions into programs aimed at reducing waterborne diseases. Similarly, two other studies report the most effective intervention to be handwashing after using the toilet, before preparing meals, and before eating, resulting in a mean reduction of 47 and 44 percent, respectively, in cases of severe diarrhea from good handwashing practices (Curtis and Cairncross 2003; Curtis 2002).

<sup>22</sup> Under this analysis, a comprehensive literature search and bibliographic review of international publications was conducted: (a) 2,120 titles published prior to June 26, 2003 were screened; (b) 336 papers were obtained for a more thorough examination; and (c) 64 of these papers (representing 60 distinct studies) were identified, which detailed water supply, water quality, sanitation, hygiene, or multifactorial interventions, and examined diarrhea morbidity as a health outcome in non-outbreak conditions. Data were extracted from these papers and pooled through meta-analysis to provide summary estimates of the effectiveness of each type of intervention.

Figure III.5 provides the benefit-cost ratios of various interventions to address waterborne diseases in Ecuador. These data show that the most effective intervention would be a safe water program that promotes hygiene through handwashing, and household drinking water disinfection. At 15 percent program effectiveness, that is, if 15 percent of the targeted population practices handwashing and household drinking water disinfection, such a program would prevent an estimated 10 to 15 percent of diarrheal illness and 11 to 21 percent of diarrheal child mortality (Fewtrell and Colford 2004; World Bank 2006). Hygiene improvement thus has a substantial potential to reduce diarrheal illness and mortality. Handwashing initiatives that are currently underway in other countries have already shown significant results. In Ghana, for example, early results from a public information campaign to promote improved hygiene show that the target population that is washing their hands with soap increased by 41 percent before eating and 13 percent after using the toilet.

**Figure III.5. Benefit-cost Ratios of Interventions to Reduce Inadequate Water Supply, Sanitation, and Hygiene Cost (Health benefits)**



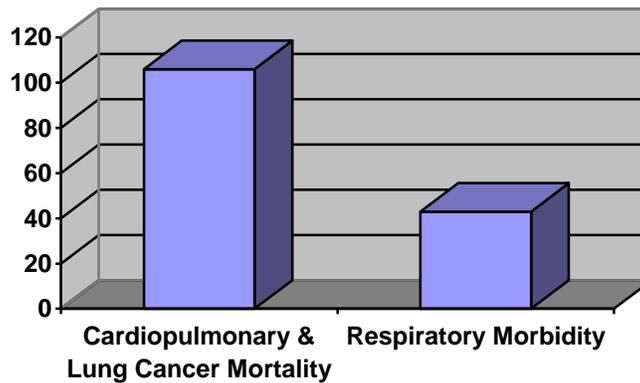
### Urban Air Pollution

The fact that close to 45 percent of the population lives in cities with more than 100,000 inhabitants creates aggregate health effects. These effects include cardiopulmonary diseases and lung cancer in adults and acute respiratory illness, particularly in children, as well as death from related diseases such as pneumonia. It is estimated that urban air pollution causes approximately 711 premature deaths in Ecuador each year and about 1,169 new cases of chronic bronchitis. In addition, there are approximately 171,839 cases each year of children with respiratory illness. Several major pollutants are associated with these serious health effects. The air pollutant that has shown the strongest linkage with these negative health impacts is particulate matter (PM) and

especially particulates of less than 10 microns in diameter (PM<sub>10</sub>) or smaller.<sup>23</sup> Pope, Burnett, and Thun (2002) provide strong evidence that it is even smaller respirable particulate matter (PM<sub>2.5</sub>) that has the most serious health effects. The gaseous pollutants (sulfur dioxide [SO<sub>2</sub>], nitrogen oxide [NO<sub>x</sub>], carbon monoxide [CO], and ozone [O<sub>3</sub>]) are generally not thought to be as damaging as fine particulates. The mean estimated annual cost of air pollution is US\$151 million. Most of the associated costs of urban air pollution are linked to mortality (approximately 71 percent) and morbidity (about 29 percent) (Figure III.6).

Urban air pollution resulting from industry and transportation in particular has worsened. In 2005, Quito exceeded the annual average PM<sub>10</sub> standard (50 micrograms per cubic meter [ug/m<sup>3</sup>]) in three out of four measurement areas.<sup>24</sup> The annual average PM<sub>2.5</sub> standard (15ug/m<sup>3</sup>) was exceeded in all six measurement areas (CORPAIRE 2005). On average the annual concentration of PM<sub>10</sub> in Quito was estimated at 62 ug/m<sup>3</sup> (Table III.2). Annual average PM<sub>10</sub> concentrations in Quito are similar to those of other Latin American cities with severe air pollution, including Mexico City and Santiago. The differences in mean PM<sub>10</sub> concentrations are much more obvious when compared with levels in cities outside the region. Cities with larger industrial production and transportation sectors, such as Los Angeles, Rome, and Tokyo, have successfully reduced their ambient concentrations to lower levels than those in Quito (Figure III.7).

**Figure III.6. Estimated Annual Cost of Urban Air Pollution (US\$ Millions)**



**Table III.2. Annual Average Concentration of PM Pollutants, Quito, 2005 (ug/m<sup>3</sup>)**

Station	PM <sub>10</sub>	PM <sub>2.5</sub>
Belisario	65.46	22.68
Jipijapa	48.05	24.44
El Camal	N/A	30.10
Centro	N/A	22.83

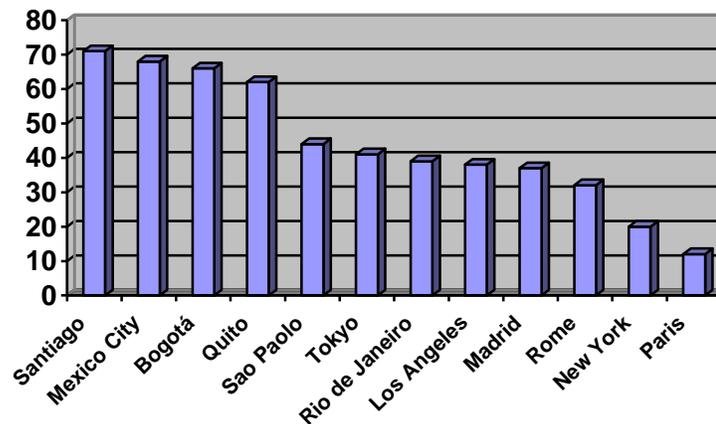
<sup>23</sup> PM<sub>10</sub> stands for particulate matter up to 10 microns in size.

<sup>24</sup> In the metropolitan area of Quito there are nine air quality stations. Four of these stations monitor PM<sub>10</sub> and six stations monitor PM<sub>2.5</sub>.

Tumbaco	N/A	N/A
Los Chillos	31.59	N/A
Cotocollao	79.99	21.45
Carapungo	N/A	22.35
Guamani	84.57	N/A

Source: CORPAIRE 2005 Report.

**Figure III.7. Average Annual PM<sub>10</sub> Concentrations in Selected Cities (ug/m<sup>3</sup>)**



Source: World Bank (2006).

**Interventions.** Some of the most promising options for managing urban air pollution include diesel quality improvement, in-fleet technology retrofitting and technology standards for new vehicles, CNG conversion for high-usage vehicles, and inspection and maintenance programs. City planning interventions are also needed. These options were considered for a study on Lima Callao (World Bank 2006). The main conclusions of the report are presented below.

**(1) Improving diesel quality is an important cost-effective option**

One important aspect of diesel quality is sulfur content. Low sulfur content (<50 ppm) has direct benefits in that it usually provides some reduction in particulate emissions from diesel combustion. The other benefit is that low sulfur content is often a prerequisite for advances in particulate control technology on diesel vehicles, or it at least makes the control technology more effective. Low sulfur content can also reduce secondary particulate formations (sulfates), providing an added benefit to health. In Peru, the estimated benefits from reducing the sulfur content from 5,000 to 10,000 ppm to 50 ppm equate to a reduction in PM emissions of around 20 percent, and SO<sub>2</sub> emissions of more than 90 percent.

**(2) CNG conversion and other alternative fuels are not a cost-effective option<sup>25</sup>**

Conversion to CNG would practically eliminate particulate emissions. It is often considered a viable option for taxis and other high-usage vehicles. However, conversion is costly given the

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<sup>25</sup> This result was obtained without consideration of the high rate of traditional fuel prices growth and global damages from carbon emitted.

old age and short remaining useful life of most of these vehicles. Introducing natural gas for new, heavy-duty vehicles to replace diesel could reduce PM emissions by 70 to 100 percent and NOx emissions by around 85 percent. However, estimates for this option indicate that benefits would most likely be lower than the costs, mainly due to the higher incremental investment and maintenance costs.

In addition, blending ethanol with gasoline and biodiesel with diesel are not cost-effective options for reducing particulates. Although blending biodiesel with petroleum diesel could yield marginal reductions in PM and SO<sub>2</sub> emissions, the formation of secondary particles (nitrates) from NOx emissions would increase. In addition, experiences in other countries indicate that production costs for biodiesel tend to be higher than the benefits. Blending ethanol with gasoline is also not cost-effective in reducing PM emissions.

### **(3) An I&M program should be a cost-effective measure**

The report's calculations indicate that the expected reductions in the cost per ton of particulate emissions from this program are lower than one would anticipate. One reason for this is that emission reductions during the initial years of the program will be relatively large because many vehicles have not been tuned up or repaired for a number of years. Therefore, the full outcome of an I&M program remains to be seen, and the effects on emissions can be expected only after several years.

### **(4) Particle control technology could be a cost-effective option after 2010**

Retrofit technology, such as trap oxidizer systems or oxidation catalysts, could be applied to existing heavy-duty diesel vehicles. However, their efficiency would be significantly reduced using the current high-sulfur diesel. This option, therefore, is an alternative only after 2010. The calculations based on today's vehicle fleet and taking into account the effects of low-sulfur diesel show a positive net benefit of retrofitting particle controls. Therefore, implementation of this technology should be considered based on the structure of the vehicle fleet and the expected costs and benefits after 2010.

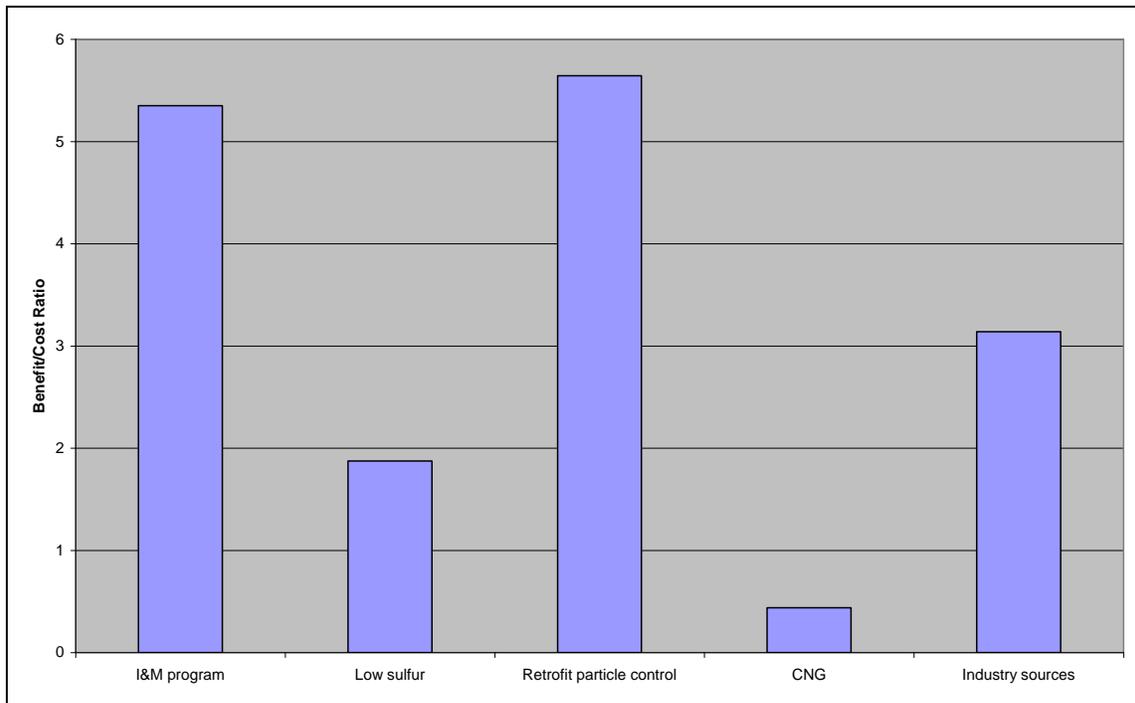
### **(5) Measures to abate industry sources could be cost-effective**

Although total particulate emissions from industry are relatively small compared with the transport sector, actions to reduce emissions from industrial sources could be cost-effective. International data indicate that benefits could be larger than costs, and this should be further examined based on local data.

Figure III.8 presents the benefit-cost ratios estimated for these five types of interventions in Peru (World Bank 2006). The figure indicates that all quantifiable interventions aimed at reducing particulate emissions have benefits that exceed costs with one exception: CNG conversion.

Improving diesel quality is widely considered to be the most effective option for reducing the health effects of urban air pollution in Latin American countries. As an example, Blumberg (2004) estimated that applying the low-sulfur content option in Mexico City would have a benefit-cost ratio of 41 (high case) or 10 (low case). A similar calculation was made for Lima Callao, and the benefit-cost ratio was found to be within the same range.

**Figure III.8. Benefit-cost Ratios for Various Control Options, Peru**

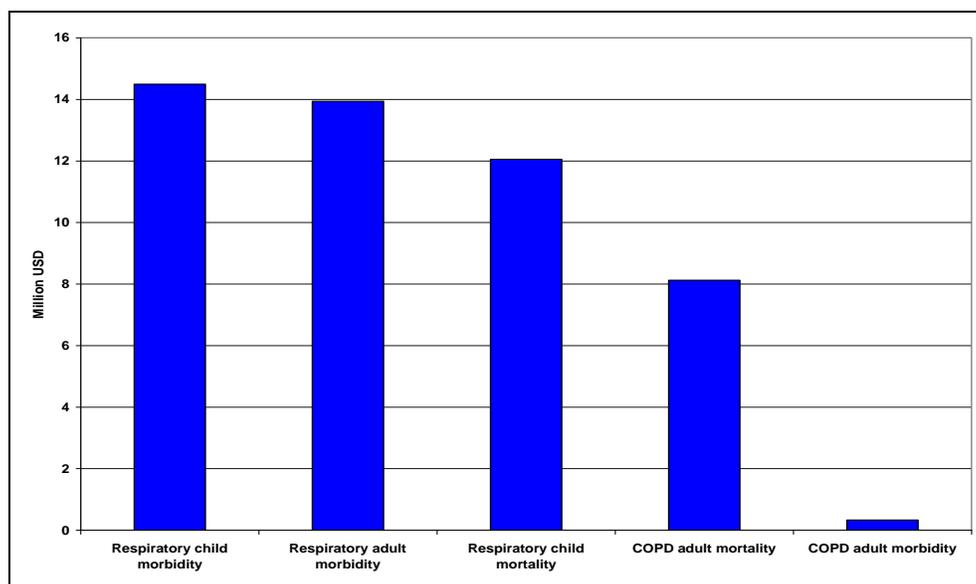


Source: World Bank (2006).

### **Indoor Air Pollution**

An estimated 228 fatalities per year are related to exposure to indoor air pollution associated with the use of fuelwood, charcoal, and other solid fuels for cooking. Approximately 23 percent of rural households burn solid fuels for domestic purposes, exposing women and children in particular to harmful concentrations of particulate matter and gaseous pollutants. This exposure is linked to illnesses such as acute respiratory infections (ARI), chronic obstructive pulmonary disease (COPD), and cancer. The mean annual cost of these health impacts is estimated at US\$49 million (Figure III.9). Table III.3 shows the percentage of urban and rural households in a sample of countries throughout Latin America that use solid fuel for cooking, and indicates that compared to many countries in Latin America, there are fewer rural households in Ecuador that use fuelwood.

**Figure III.9. Annual Costs of Indoor Air Pollution (million USD)**



As with other environmental problems, the adverse health impacts of indoor air pollution disproportionately affect the poorer segments of the population. Options for reducing these impacts include the use of cleaner fuels and technical mitigation options such as improved cooking stoves.

**Table III.3. Households Using Solid Fuels**

	Percent of Households		
	Urban	Rural	Total
Bolivia 2003	8	79	34
Colombia 2000	2	61	18
Dominican Republic 2002	3	24	10
Guatemala 1998/99	32	78	57
Haiti 2000	89	98	95
Nicaragua 2001	38	92	60
Peru 2000	11	87	39

## **IV. The Oil Sector: Problems and Possibilities**

### **1. Brief History**

Since the 1970s the petroleum sector has been a basic pillar of the Ecuadorian economy. But while this important energy resource has provided great benefits, it has also generated social, environmental, and cultural problems that have worsened over the years.

The petroleum industry, initially composed of foreign companies, did not design and implement adequate measures to prevent and minimize negative social and environmental impacts. These impacts were particularly severe because activities were being carried out in fragile Amazonian ecosystems, inhabited by native peoples with little political and economic power, within the context of a trend toward increased settlement of sparsely inhabited areas, quickly changing land use and weak legal institutions and laws.

Although the National Petroleum Company of Ecuador (*Petroecuador*) inherited a heavy environmental and social burden when it took over most oil operations in the early 1990s, it has not been able to improve technical, technological, environmental, and social standards, and its operations are a continuing cause of environmental degradation and social conflict.

This chapter provides a brief summary of the current situation and proposes a program of actions and investments that would qualitatively improve Petroecuador's environmental performance within a few years. The assessment will cover five main areas: (a) legal and institutional, (b) environmental, (c) technological, (d) organizational and operational, and (e) social and cultural.

### **2. Current Situation**

#### **2.1 Institutional and Legal Aspects**

The laws and regulations governing the petroleum sector, including environmental standards and requirements, include:

- The Constitution of the Republic of Ecuador
- Environmental Management Law
- Law on Prevention and Regulation of Environmental Pollution
- Hydrocarbon Law
- Special Law for Petroecuador
- Substitute Environmental Regulations for Hydrocarbon Operations (Decree 1215)
- Supplementary Environmental Legislation (Volume 6: Environmental Quality)
- Health Code
- Regulations on Social Participation and Public Consultation.

Environmental management and regulatory policies in the petroleum industry are set by the Presidency of the Republic and implemented through the Ministry of Environment and the Ministry of Energy and Mines, with Petroecuador and its subsidiaries operating as regulated entities.

The Hydrocarbons Law requires petroleum operations to conform to the principles of sustainable development, environmental protection, and conservation. Petroecuador and its contractors must present their plans, programs, projects, and financing for approval by the appropriate ministry to ensure that their activities do not negatively affect the environment or the economic and social

welfare of local communities. When appropriate, they must conduct environmental impact assessment studies (EIAs) and create environmental management plans (EMPs) to prevent, mitigate, control, rehabilitate, and compensate for adverse impacts.

#### *Ministry of Environment and the Decentralized Environmental Management System*

The Environmental Management Law makes the Ministry of Environment the national authority on environmental matters and gives it responsibility for leading, coordinating, and regulating the National Decentralized Environmental Management System (SNDGA), which encompasses all government institutions involved with environmental issues.

The sectoral ministries have direct responsibility and authority for environmental management within their sectors, although in areas designated as part of the National Heritage of Natural Areas, Forests, and Protected Vegetation, the Ministry of Environment must review and approve terms of reference for all EIAs, EMPs, and environmental audits.

#### *Ministry of Energy and Mines (MEM)*

Environmental management in the hydrocarbon sector is the responsibility of MEM, which evaluates and approves all EIAs and EMPs in coordination with other environmental authorities. MEM's National Office for Environmental Protection (DINAPA), located within the Undersecretariat for Environmental Protection (SPA), is the technical/administrative unit for regulating, overseeing, and auditing environmental management in the oil sector. Petroecuador, its subsidiaries, and all other contractors and partners involved in oil exploration, extraction, refining, industrialization, storage, transport, and marketing must coordinate their environmental management plans (including social aspects) with the SPA, which in turn coordinates with other government agencies, civil society, and social, indigenous, and/or peasant organizations.

DINAPA approves EIAs and EMPs, carries out site inspections, drafts reports, conducts environmental audits, analyzes and validates monitoring reports prepared by the petroleum companies, recommends penalties for legal and regulatory violations, certifies environmental consultants and labs, monitors services that are outsourced, and provides assistance on environmental issues during the precontracting and contracting process.

The only directives guiding DINAPA's environmental oversight are the Substitute Environmental Regulations for Hydrocarbon Operations (Decree 1215) and Volume 6 of the Unified Supplementary Environmental Legislation, which created regulations for the Unified Environmental Management System (SUMA).

#### *Petroecuador*

The Hydrocarbons Law and the Special Law for Petroecuador give the company control of all aspects of the petroleum industry, including planning, coordination, and supervision of its subsidiaries (Petroproducción, Petroindustrial, and Petrocomercial) and the *Gerencia de Oleoducto*. An Environmental Protection Unit was created in 1990 to help prevent pollution and to avoid negative social and economic impacts and oversee operations from an environmental standpoint.

This unit was replaced in 2000 by the Environmental Protection Management Office (GPA), which includes a Coordination Unit, Technical Unit, Monitoring Unit, and Sociocultural Unit. The GPA does not have a mandate to implement environmental management policies or exercise internal corporate environmental oversight. Rather, its main functions are to carry out support and coordination activities to help the subsidiaries comply with environmental legislation and the oversight exercised by MEM through DINAPA.

The Technical Unit develops the GPA's Annual Operating Plan and budget, designs and supports implementation of the environmental management system, and develops guidelines for environment management, studies, audits, and plans. The Monitoring Unit coordinates and supervises the subsidiaries' monitoring programs and keeps a database of environmental information. The Sociocultural Unit works through cooperation accords between government entities, foundations, nongovernmental organizations, and social organizations to provide compensation for environmental impacts caused by the subsidiaries' activities. In principle, this unit supervises and supports the community relations activities of the subsidiaries. These units administer two financing instruments, the Fund for Pollution Prevention and the Assistance and Transfers–Fund for Community Development.

### *Fuel subsidies*

An important policy issue in Ecuador is the government's social policy of price controls and unusually high subsidies for domestic gas, diesel, and liquefied petroleum gas (LPG). Direct subsidies are highest in the case of LPG, which is widely used by poor households for cooking and heating. Imports account for almost 80 percent of domestic LPG demand and the domestic price can be less than 10 percent of the international price (depending on price fluctuations). These subsidy and pricing policies not only distort energy demand and create higher emissions of greenhouse gases and pollutants, but lead to widespread smuggling, corruption, and enormous costs both for direct government spending and in lost revenues (see Box IV.1). While the rationale is that the price controls support the poor, other measures such as cash payments to the poor to help cover fuel costs, could be a more effective targeting mechanism that would have lower environmental and economic costs.

## **2.2 Petroecuador's environmental problems**

The main environmental challenges for Petroecuador are:

- Waste pits contaminated with oil or drilling mud
- Unremediated spills
- Discharge of untreated produced water
- Installations abandoned without proper planning.

### *Contaminated waste pits*

Waste pits are mainly associated with oil wells in the Amazon and with refineries. There may also be waste pit problems at terminals and storage facilities, but information is not available. There are 346 confirmed unremediated waste pits in the Amazon region, most inherited from Texaco, with an estimated volume of 84,000 barrels of petroleum and a surface area of about 265,000 square meters. However, Petroproducción's PEPDA waste pit clean-up program

estimated that that there may be as many as 600 such pits, many covered or filled in without remediation, overgrown by vegetation, and still posing an environmental threat.

#### **Box IV.1. The Cost of Energy Subsidies in Ecuador**

Energy depletion, particularly from the extraction of oil and natural gas, constituted nearly 20 percent of Ecuador's gross national income in 2004. Yet these estimates fall short in showing some of the complexities inherent in the energy sector. In fact, highly subsidized prices for oil and gas are imposing a deadweight loss on the economy, owing to the opportunity cost of the subsidy itself. Subsidized domestic consumption of gasoline, diesel, and LPG reduces export opportunities while contributing to the propagation of energy-inefficient technologies.

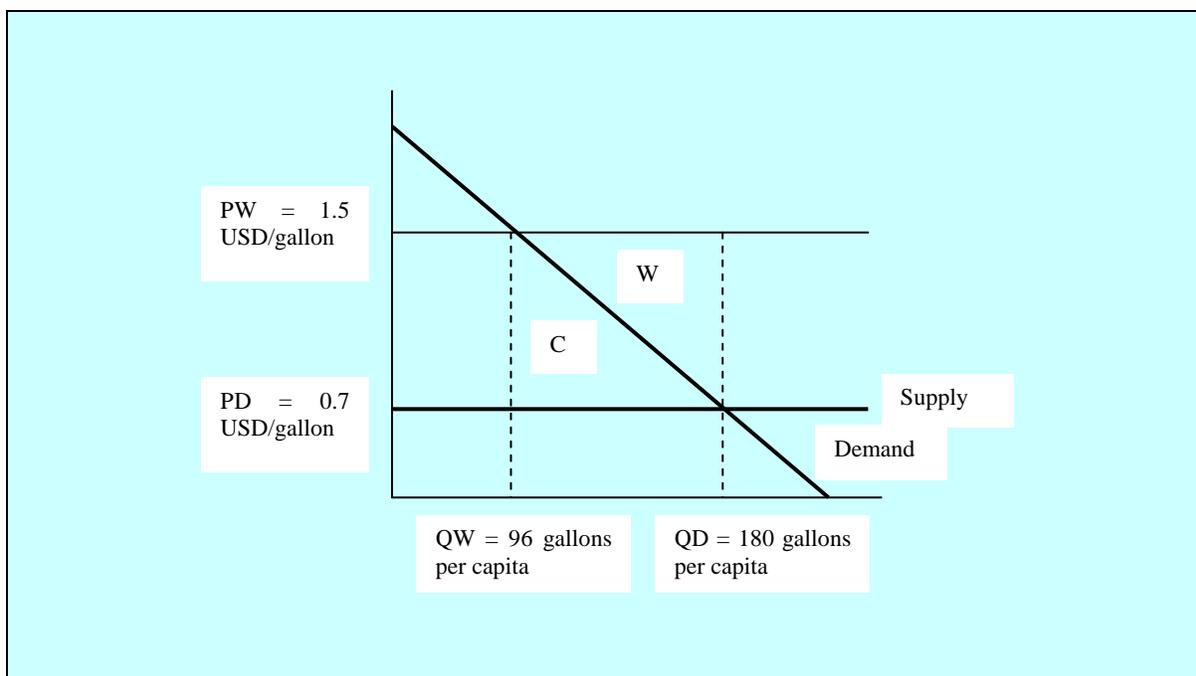
The figure below illustrates the economics of fuel subsidies using a simple comparative static framework. With the subsidy, fuel is sold domestically at  $PD$ , while the prevailing world price is  $PW$ . By eliminating the subsidy, the domestic price would go up to  $PW$ , causing (a) domestic demand to fall to  $QW$ , and (b) allowing the quantity  $QD-QW$  to be exported. The average domestic price of petroleum products in Ecuador was around \$0.70 per gallon in 2005, while the world price was around \$1.50 per gallon. Bringing domestic prices to the world level could reduce demand from 180 gallons to 96 gallons per capita, assuming that if prices in Ecuador were at the world level, consumption would be equivalent to the average consumption of the countries in the same income group as Ecuador. The elasticity of demand that is implicit in this estimation is -0.4.

Increasing prices would cause some people to reduce fuel consumption. This reduces the welfare of such consumers by the amount in area  $C$ . However, resource rents from pricing reform would be  $(PW-PD)*QD$ . It is easy to see that such rents more than compensate for the welfare loss of the price reform. The opportunity cost of subsidized energy is:

$$OC = (PQ - PD)*(QD - QW).$$

The price reform is actually welfare improving. Net welfare gain associated with moving to world prices and increasing exports is the triangle  $W$ .

Using these numbers, the annual opportunity cost to the Ecuadorian economy of the fuel subsidies is estimated at 2.6 percent of GNI. Nondiscriminatory subsidies favor those that consume more energy, which is typical of the more affluent, so this policy literally takes important resources away from the poor. Targeted assistance programs would be more effective in protecting the poor, while saving the national economy financial resources, which could in turn be used for other purposes. For example, the cost of energy subsidies is twice the amount of total education expenditures.



There has been little progress in cleaning up these pits or remediating contaminated soils and wetlands. Some initial remediation was done by companies contracted by Texaco as part of a 1998 agreement with the government. During the past two years (through July 2006) the PEPDA Program has remediated, covered, and revegetated almost 60 pits at an average cost of less than \$90,000. Assuming the same cost, almost \$54 million would be needed to remediate 600 pits. While more research is needed on pits at refineries and terminals, the cost of remediating six pits identified at the Esmeraldas refinery is estimated at about \$540,000.

### *Unremediated spills*

There is no organized information available on sites of unremediated spills. For example, when a recent crude oil spill from the Cuyabeno 8 well affected lakes in the Cuyabeno Reserve, contamination from a previous spill in 1998 was also detected, which would cost more than \$900,000 to clean up. There may be some unidentified and unremediated spills in the Amazónico District, especially from secondary pipelines or from flow lines from wells or from transfer lines between stations. While the GPA recently received information on a number of such cases, it not systematized. A study by Petrocomercial of a gasoline and diesel spill in the Chongón area estimated that remediation will cost \$2.5 million.

### *Discharge of untreated produced water*

Petroproducción has made progress in resolving the problem of untreated or inadequately treated produced water being discharged into the environment. But while *El Petrolero* (issue 27: April 2006) said that “Petroproducción did not throw out a single barrel of produced water,” and cited a reinjection capacity of 230,000 barrels a day in the Amazónico District, it also said that 94.6 million barrels of water were produced in 2004, or 29,000 barrels a day more than the reinjection capacity. In addition to ensuring that all produced water is reinjected, serious research is needed to determine if there is dispersion and surface filtration from the geological formations into which the produced water is being injected.

### *Improper practices for abandoning installations*

Further research is needed to properly identify and inventory abandoned installations in the oil fields, refineries, and terminals and determine their environmental risk. A study by the Central University proposed methods for dismantling and abandoning old tetra-ethyl lead (TEL) plants, but it is not known whether ultimately they were abandoned in an appropriate way. Some older sites on the Santa Elena Peninsula are known to have been abandoned without proper care and may continue to pose environmental problems for some time.

### **2.3. Technological aspects**

The deterioration of Petroecuador's infrastructure is causing ongoing problems with spills, leaks, pollution, and health impacts on workers and the people living in affected areas. The technology in most of Petroecuador's operations dates to the 1970s, with only minor modifications and technological improvements.

#### *Flaring of associated gas*

While Ecuador is a net importer of natural gas, only 48 percent of the gas being produced in Ecuador is captured for use in oil extraction or energy production. The remaining 52 percent is vented or burned, causing environmental problems and economic loss. The volume of gas lost each year at the oil fields in the Amazon fields is greater than that produced by the Amistad field for electricity generation.

#### *Obsolete pipes*

Most pipes have problems with corrosion and obsolescence. According to an August 2006 Petroproducción report, of the 542 spills in the Amazónico District between January 2003 and August 2006, 44 percent were caused by corrosion, 28 percent by sabotage, 11 percent by equipment failure, and 8 percent by human error. Petrocomercial reported 65 spills in 2003–06, but 69 percent were caused by illegal tapping of pipelines. Petroecuador has spent \$54 million in the last three years to control spills and carry out cleanup and remediation of affected areas, including compensation to people affected by the spills.

#### *Lack of monitoring systems*

The issue of monitoring, early alert, and rapid response systems is closely related to the problem of spills. Only the Trans-Ecuadorian Oil Pipeline System (SOTE) has a pressure- monitoring system to detect ruptures and leaks, and even if leaks are detected promptly they can result in substantial spills because of the large volume in a single section. None of the flow lines, secondary oil pipelines, or multiproduct pipelines have automatic monitoring systems. A pilot project is planned for the Quito–Ambato pipeline that will use vibration sensing and satellite transmission to allow alert-times measured in minutes and indicate the exact location of the spill, although the final response is still manual. The pilot requires an investment \$30,000 at the planning stage and another \$100,000 for implementation. Installing the system along the entire pipeline could cost as much as \$1.5 million.

Another project developed through Petroproducción detects drops in pressure in the pipeline and alerts the operators, who can determine the exact location of the problem and then close off the

pipeline in a matter of minutes. A project of this type, with an investment of \$1.6 million, is at a very advanced stage at the Campo Auca oil field. Extrapolating from this example, it would cost about \$60.8 million to implement automated monitoring, early alert, and rapid response systems in all of Petroproducción's fields in the Amazónico District.

#### *Combustion emissions*

Data from various installations reveal emissions of carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>2</sub>), and particulate matter (PM) above the national limits. In stations and terminals the problem is not severe and could be addressed at low cost through adjustment of equipment, minor repairs, and more frequent maintenance. But at refineries the problem is critical and would require new equipment, modified fuels, and possibly chemical additives. For example, substantially reducing SO<sub>2</sub> emissions would require a new emissions treatment system and lower sulfur fuel, at a cost of about \$100 million.

#### *Liquid effluent pollution*

Treatment of effluents from camps, administrative and service areas, and industrial sites for separating water and oil would cost only about \$5,000 per station, but the cost would be much higher for industrial plants and refineries producing other types of discharges. Improving effluent treatment at the Esmeraldas refinery could cost about \$3.5 million, while design and construction of a treatment system for La Libertad is estimated at \$4 million.

#### *Fuel quality*

The quality of gasoline and diesel is limited by the capabilities of the refineries. Only the Las Esmeraldas refinery is relatively modern in this regard. The antiquated refineries at La Libertad and Shushufindi produce gasoline with high olefin content but low octane (63 octane on average) and diesel and fuel oil with high sulfur content. While fuel quality complies with national standards, it still causes high pollutant emissions, engine damage, energy inefficiency, and requires imports of low-sulfur diesel and octane boosters.

Addressing fuel quality problems requires major policy initiatives and investments of between US\$300 million and US\$1 billion, including construction of a new refinery, installation of hydrosulfurization units for crude oil, diesel, and residues, and negotiation of favorable terms with foreign refineries to process Ecuadorian crude oil and receive clean fuel products in return.

#### *Management of industrial and hazardous wastes*

In addition to municipal solid wastes, refineries generate various solid and semi-solid wastes contaminated with hydrocarbons and other dangerous substances, which usually end up in municipal landfills. While some improvements have been made in recent years, the industry largely lacks appropriate plans for managing residues and the plans that do exist often are applied only partially or not at all due to lack of personnel, procedural manuals, financial resources, or failure to use best practices. Solid wastes pose a very serious contamination

problem at the Esmeraldas refinery, where they are haphazardly dumped in an open area, in substandard containers, exposed to the elements.

## **2.4. Organizational, Operational, and Staffing Issues**

### *Structure and organization*

The Petroecuador system of four subsidiaries with administrative and financial autonomy has proven ineffective and the GPA, which is supposed to serve as a corporate environmental agency, has serious weaknesses, including:

- Inability to formulate appropriate environmental and social policies or strategic plans.
- Inability to resolve environmental problems, update equipment, operations, and procedures, or define and coordinate needed investments.
- Inability to foster effective joint action with the subsidiaries and operational units, resulting in dispersed activities, wasted resources, inefficiency, and ineffectiveness.
- Does not have authority over the subsidiaries and operating units, and has been unable to earn a reputation for reliability and leadership.
- Low overall impact, despite annual budget of about \$35 million.
- Narrow, short-term vision and client focus, without the participation of key operational actors or mechanisms for evaluation and feedback.
- Lack of an information system for planning, monitoring, systematization, feedback, and follow-up.
- Insufficient equipment, computers, information systems, and even simple instruments for making field measurements.
- Overworked, insufficiently qualified, and poorly motivated staff.
- Overemphasis on EIAs, EMPs, monitoring, and research studies, some of which are low quality and few of which are evaluated, disseminated, or used in management or policymaking.

The subsidiaries have their own Environmental Protection Units, but they are ineffective and lack the influence and authority to perform their mandated functions. They communicate or coordinate with the GPA only when a problem forces them to or when seeking funds for activities under the GPA Operating Plan. There is also little contact or coordination (nor coordination mechanisms) between these units and the plants, districts, oil fields, and terminals. If any environmental management committees exist, they are not active.

The operational units are weak, lack sufficient staff and resources, and do not rigorously implement EMPs (though they have started to improve in this regard, with the creation of EMPs supported by the GPA). They also do not have sufficient and appropriate equipment to perform environmental duties in general or to tackle emergency situations effectively.

### *Environmental, operational, and staff culture*

There are serious weaknesses in the institutional culture of Petroecuador's staff and in the company's management plans. Many of Petroecuador's operations do not comply with national environmental legislation and regulations on atmospheric emissions, effluents, waste management, planning, approvals and permits, reporting, and other procedures. Most upper- and

mid-level managers are only interested in production and do not take responsibility for environmental management. For direct operational staff the environment is a remote concern that often is seen as an obstacle to productivity. Both the structure and the operating practices always give priority to production over environmental concerns.

While the GPA and the subsidiaries have spent large sums on various environmental studies, in most cases the results and recommendations are not put into practice. The studies are conducted merely to comply with the law but do not involve the operational units or address their real needs. The research budgets offered are often too low and the consultants underbid even further to win contracts, often resulting in inadequate and unqualified teams producing poor-quality studies. In addition, Petroecuador staff issue inadequate terms of reference, do not conduct rigorous follow-up, and do not reject substandard reports.

### *Key institutional strengthening measures*

Petroecuador needs to:

- Radically reorganize the GPA, from its mission, to operational structure, to staffing.
- Promote exchange of information and experiences among company technicians by forming technical committees and holding meetings, workshops, and forums.
- Train staff, select the right staff, and evaluate the impact of training on environmental performance, particularly in pollution prevention and emergency response.
- Improve the quality of impact studies, audits, monitoring, and information systems by favoring quality over costs, imposing more rigorous qualifications for consulting firms, evaluating the studies submitted, applying sanctions for unsatisfactory work, and involving Petroecuador's technical staff more fully.

## **2.5. Social Issues and Social-environmental Conflicts**

The oil boom has led to radical changes in Ecuador, particularly in the sociospatial dynamics of the Amazon region. The oil industry gave little consideration to the negative impacts its policies and operations would have on indigenous groups, while the government promoted policies of public works and colonization that fostered large-scale migration. This has irreversibly altered the dynamics of indigenous communities by changing the control, use, and ownership of their lands, dismantling social structures, degrading the natural resources on which they depend, and creating greater dependence on the market economy.

Conflicting constitutional, legislative, and regulatory provisions on state ownership of subsoil rights and affirmation of indigenous rights, including International Labour Office (ILO) Convention 169, have never been adequately resolved and have almost always favored resource exploitation over collective ancestral rights. Conflict resolution strategies are reactive rather than proactive and emphasize cash compensation over territorial rights.

The indigenous groups most severely affected include the Cofán, Secoya, and Siona, and to a lesser extent the Achuar, Kichwa, Shuar, and Waoranis. But there is no group that has not been affected in some way. Entire indigenous cultures and bodies of ancestral knowledge are being lost, and in the most serious cases even the people themselves are threatened with extinction. While it is possible to stop pollution and other direct impacts, addressing indirect outcomes such

as colonization, land use change, and social, cultural, and territorial impacts is more challenging. Ecuador still does not have a holistic study of how this complex web of dynamics has affected indigenous people.

At the same time, cooperation with local stakeholders is complicated by the industry's track record of poor environmental performance, indifference to communities and indigenous rights, lack of transparency and public consultation, disregard for local public and private institutions, and use of financial resources to divide local communities and get around obstacles rather than seeking participatory solutions to issues. This has weakened local institutions, fostered corruption, led to marked distrust of the oil industry and government institutions, and created significant opposition to oil exploration in the Amazon.

In the northeast region there are continuous lawsuits, uprisings, pressure, and blackmail against both public and private oil companies, mainly due to the dynamics of:

- Land reorganization and changes in the use of natural resources
- Modification of natural areas, deforestation, biodiversity loss, and contamination
- Divisions and changes in the social structure and culture of indigenous peoples
- Presence of new actors who come into conflict with indigenous populations and cause changes to the local economy.

#### *Land reorganization and changes in the use of natural resources*

The arrival of settlers and farmers in remote parts of the Amazon introduced a concept of land ownership and use that was dramatically at odds with the territorial dynamic and thinking of indigenous peoples. The creation of new infrastructure and settlements, development of a real estate market, and introduction of monoculture-based agricultural plantations has caused severe conflicts over occupation of traditional territories, land use changes, impacts on natural areas, and disputes over legalization of land rights.

#### *Alteration of natural areas, deforestation, biodiversity loss, and contamination*

In the 1980s and 1990s many oil concessions were granted in primary forests within the national system of protected areas or indigenous territories. Since 1970 at least 2 million hectares of the Amazon have been heavily altered. While direct deforestation by oil operations accounts for only a small part of this, the indirect impacts caused by the industry—drawing migrants to the area and enabling access that led to expansion of the agricultural frontier and introduction of cattle ranching and crop farming—have been far greater. Furthermore, the region's weak soils and rapid degradation under such uses ultimately leads to very poor living standards for many settlers and indigenous people.

Although the worst environmental pollution dates to the Texaco era, most contaminated areas have never been remediated and both old and new sites continue to leach pollutants into the soil and water. Furthermore, ongoing operations are creating new waste pits, oil spills, dumping of untreated produced water, and flaring of associated gas. While epidemiological data are lacking, health impacts that could be associated with environmental pollution are on the rise, including

hemorrhaging and abortions among women, diarrhea, skin and respiratory disease, gastrointestinal illnesses, stomach and bone cancer, and other problems.

Biodiversity and local natural resources have suffered as well. Deforestation has destroyed many ecological niches and probably entire species. Pollution, hunting, and extraction of wild products have caused many fish and animals to disappear from local areas. These impacts, combined with soil degradation and population pressures have practically exhausted local food sources in some areas.

#### *Division and fragmentation: Changes in sociocultural organization*

Although indigenous cultures are dynamic and adaptable, the changes resulting from oil industry activities were imposed from outside on populations with little or no control or choice in the matter. Communities have been displaced or have chosen to resettle near oil operations and many have developed a dependant relationship with them. This dependence has led to the emergence of a new type of community leader in charge of distributing and redistributing wealth from the oil companies and has created new networks of power and opportunities for corruption. Conflicts have emerged between the communities and their own leaders, interethnic divisions have been exacerbated, and traditional patterns of sharing goods and services disrupted. Furthermore, this model is not sustainable since it is based on extraction of a nonrenewable natural resource that eventually will be depleted.

Division and fragmentation affect all levels of indigenous communities and have become a crisis situation. It impedes cooperation among indigenous organizations and prevents agreements aimed at achieving common goals and pursuing common claims not only on oil sector issues but in the entire scope of indigenous demands. At the local level the market economy replaces community-oriented values with behaviors oriented toward the individual. Domestic fragmentation occurs as well, with men leaving their families to take temporary oil jobs and then spending their salaries in nearby towns rather than to meet family needs.

While the organizations and lifestyles of the settlers (*campesinos*) are different from those of indigenous people and are already deeply entwined with the market economy, they suffer some of the same impacts, particularly related to patterns of dependency and emergence of divisions and conflicts within and among organizations, individuals, and local governments.

#### *Changes to the local economy caused by petroleum operations*

The main economic impact of petroleum development in the Amazon is the spread of markets as a result of colonization indirectly associated with oil operations. Although in the first stages almost all the production of outsider settlers went toward subsistence, little by little they increased their agricultural and livestock production for local markets. As settlements grew into towns, demand for such production increased, and administrative, commercial, and service sector activities were established. As the urban economy grew and diversified, the rural economy also became more vibrant, including the establishment of larger-scale agriculture such as palm oil plantations and timber extraction.

Linking indigenous communities to the oil companies gave them access to money, along with the ability to acquire basic goods they did not have before. Their commercial transactions increased, they learned to till the land and raise livestock, and increasingly responded to the pull of the

market. As they have become dependent on markets, indigenous people have started seeing the jungle less as an integral part of their identity and more as a source of resources to generate income, abandoning traditional sensibilities and ways of life in favor of the cash economy. The youth, above all, have adopted the “modern” view of the world and left traditional customs behind. Perhaps these changes were inevitable, but they are nevertheless traumatizing for many cultures.

The greatest challenge will be forging a sustainable economy for indigenous communities that do not deplete their natural resources, especially since oil is an exhaustible resource (and few of the benefits are shared locally) and other activities such as tourism and timber extraction tend to channel income outside the region rather than building wealth and capacity locally. The tourism industry, which basically operates out of Lima and other cities, has limited opportunities for direct local involvement by indigenous people, who currently lack the knowledge, resources, and capital the sector requires. Timber extraction has greater negative than positive impacts, threatening territorial integrity, destroying ecosystems, and reducing environmental services. Unfortunately, the poverty and urgent needs of settlers and some indigenous people impels them to log forests as a way to generate income.

The high salaries of oil workers create unrealistic expectations for local employment and income and can distort the local labor market, increase the price of basic goods beyond the reach of local inhabitants, displace the local workforce from traditional activities, and weaken local productive processes. At the same time, professional and technical workers are mainly recruited from outside, do not invest their money locally, and sometimes live in the oil company camps and spend little of their income in the local economy.

### **3. Proposed Actions**

Ecuador urgently needs to incorporate a serious socioeconomic component as a pillar of its policies in the petroleum sector. Good management would help restore and protect environmental quality in the Amazon and other areas and would also improve efficiency and use of resources throughout the industry. This would help lower fuel-related imports, increase production of natural gas, reverse declining production in older oil fields, consolidate oil production in deliberately selected areas, and help resolve political, social, and economic problems both within and outside the oil sector.

In broad terms, some key elements to consider in reforming Ecuador’s oil-sector policy include:

- Territorial organization and planning to help consolidate current oil production zones, restore degraded areas, and limit expansion into areas where there are environmental and social concerns. No new concessions should be granted in protected areas, expansion toward the southeast should be restricted, and a broad national dialogue should be launched to identify areas for future exploration. Alternative development plans should be created for other areas based on different visions of development and taking into account the needs and perspectives of indigenous people.
- Greater investment—both public and private—in expanding and improving Ecuador’s refining capacity, including better environmental management, improved fuel quality, and reduced wastes. Petroleum resources, through mechanisms such as FEISEH, could help expand and diversify Ecuador’s economic base, increase investment in hydroelectricity, and

consolidate the Petroleum Stability Fund. These measures would reduce fuel imports, dependence on the oil sector, and vulnerability to price fluctuations.

- Institutional reforms to make Petroecuador more administratively and financially autonomous so that it can control its own capital and resources and invest in recovering production capacity, upgrading technology, and improving environmental management. Petroecuador's current responsibilities for oil policy—particularly administering contracts with private firms—should be transferred to the Ministry of Energy and Mines (MEM).
- Addressing social conflicts by developing proposals for integrated development in areas where oil activities are carried out and creating a mechanism for appropriate and transparent sharing of oil revenues. Measures need to be taken to restore confidence in environmental authorities, broaden public participation throughout the decisionmaking process, and address the problems of poverty, unemployment, and lack of services.
- Eliminating price controls and subsidies of petroleum products to create incentives for conservation and efficient fuel use thereby reducing pollution and emission of greenhouse gases. This would eliminate incentives for smuggling and corruption, reduce energy imports and government expenditures, and increase fiscal revenues. The negative social impacts of higher fuel prices could be remedied by targeted assistance to the poor.

Below are more detailed proposals for interventions in three main areas: (a) reforming environmental institutions, (b) improving the technical and environmental operations of Petroecuador, and (c) conflict management, benefit sharing, and protected areas

### **3.1 Reforming environmental institutions in the oil sector**

#### *Functions of the Ministry of Environment and the Ministry of Energy and Mines*

Clear authority on environmental issues should be restored to the Ministry of Environment, particularly for setting requirements and imposing penalties. MEM should focus on operational aspects and increase its capacity for oversight, monitoring, and support for implementing environmental and social policies. Both institutions need larger budgets, better equipment, stronger staffing, and improved management instruments. Instruments specifically need to be developed or improved in the following areas:

- **Planning and policy design.** Systems for planning and policy design in Ecuador have declined in recent decades, but the need to overhaul these instruments is particularly critical in the oil sector. New policies are needed in pollution prevention, land planning, environmental remediation, recovery of degraded sites, technology development, benefit sharing, alternative energy, and comprehensive regional development.
- **Information systems.** Ecuador needs to create or improve information systems in the oil sector, establish indicators to monitor performance and outcomes, enhance transparency, and provide greater public access. Interinstitutional integration in the creation and use of these instruments is critical and could be achieved both through existing but unimplemented agreements and new ones tailored to current circumstances and priorities.

The Ministry of Environment lacks a modern information system to handle environmental assessments, licensing, oversight, and monitoring. Such a system is critical for monitoring performance and compliance, supporting analysis (policy, economic, social, and environmental), making well-founded policies and decisions, assessing the quality of EIAs,

identifying changes, and establishing responsibilities and accountability. While MEM has made some steps toward registering EIAs and management plans, these records need to be integrated with other information related to the petroleum sector.

A cross-sectoral information system for regional planning and organization should be created to manage these activities, feed critical information into other systems, and foster collaboration among ministries. For purposes of the oil sector, the system should include information on natural areas, population issues, economic activities, institutional roles, indigenous territories, biodiversity, and production and management of wastes.

- **Strategic assessment.** This instrument is critical for policy formulation, regional planning, avoiding impacts and conflicts, and identifying alternatives. It should be complemented by a cost-benefit analysis of competing development options that considers economic, political, social, and environmental factors.
- **Improving EIAs and EMPs.** Measures should be taken to improve the quality and use of EIAs, EMPs, and other studies by the public and private sector, to improve the system for registering them, and to develop a system to monitor implementation of EMPs. This implies stricter qualification standards for consulting firms, evaluation of studies, application of sanctions for unacceptable work, and greater involvement by the technical staff of Petroecuador. It is vital that criteria for such work promote selection of qualified consultants and ensure delivery of superior products rather than just low-cost services.
- **Monitoring and auditing.** A new monitoring system needs to be established that builds on the information system and other management mechanisms to be developed by MEM. The system should help channel inputs from federal agencies and from local government and the public into the oversight process. An independent auditing system also needs to be established by the Ministry of Environment in coordination with MEM.

### *Legal reform*

- **Environmental Regulation.** The Substitute Environmental Regulations for Hydrocarbon Operations in Ecuador need to be updated, particularly to enhance enforcement and respect for collective environmental rights and the rights of indigenous peoples and nationalities. In addition, the duration of certain enforcement rules need to be extended. However, by contract, any changes to this regulation would not affect the environmental framework of the contract under which the Heavy Crude Pipeline (OCP) operates.
- **Unified Environmental Management System (SUMA).** Many aspects of the Environmental Management Law are regulated by the SUMA supplementary legislation. A serious flaw in these regulations is that EIAs and EMPs are required only after the government has already made a decision or approved a project. Therefore, rules should be developed requiring strategic assessment of hydrocarbon projects in the early planning stages to determine their technical, environmental, and sociocultural feasibility and identify issues that need further study or consultation before making an official decision.
- **Environmental licenses.** The legal framework and regulations for issuing environmental licenses need to be revised to either consolidate this function in the Ministry of Environment or maintain the ministry's authority to delegate such powers. Currently, MEM and the National Electricity Council (CONCEL), among other agencies, are accredited by the Ministry of Environment to issue environmental licenses and monitor environmental

management in their sectors. However, this creates conflicting interests, and there must be stronger mechanisms for oversight by the Ministry of Environment. In addition, audits should be conducted of older projects that began without environmental licenses, to identify unremediated impacts and improve their environmental management.

- **Prior consultation.** Although the Environmental Management Law establishes rights of prior consultation, information, and participation, the implementation of these rights is inadequate. This is partly due to the timing problem previously noted in the SUMA legislation. In addition, the regulations on prior consultation and public participation in the petroleum sector (and other sectors) need to be strengthened to ensure a genuine process that balances the national interest in oil projects with those of local populations, indigenous peoples, and Afro-descendants. As part of this process, it is important to identify the levels at which community consent is required to ensure respect for the rights of Amazonian peoples and nationalities recognized in ILO Convention 169.

### **3.2 Improving the technical and environmental operations of Petroecuador**

#### *Environmental remediation*

Petroecuador should prepare an immediate plan, with budgets and schedules, to:

- (a) Improve its infrastructure, including primary and secondary pipelines, pumping systems, production platforms, and other installations. Some pipelines should be put underground to reduce spills and acts of sabotage. The company should also establish integrated systems for crude oil separation and automatic systems to control flows and close valves. Private firms should also increase infrastructure investments, particularly to reduce spills.
- (b) Achieve 100 percent reinjection of produced water, both by Petroecuador and private firms, and put in place a dynamic system that can handle rapidly increasing demands.
- (c) Clean up unremediated oil waste pits and other contaminated areas, while systematically gathering information on such sites. At about US\$80,000 each, the cost to recover the 340 documented pits (there may be as many as 600) would be less than the environmental restoration budget of the Special Fund to Foster Productivity and Scientific and Technological Development (CEREPS). The cost of restoring wetlands, lagoons, and rivers affected by discharges of produced water and waste pit overflows is more difficult to estimate and must be done on a case-by-case basis.
- (d) Identify, classify, and remediate waste pits for drilling mud. There have been substantial reductions in the toxicity of drilling mud and improvements in its disposal, but there still are an undetermined number of older pits that need to be analyzed and remediated.
- (e) Reforest degraded areas near petroleum operations. These efforts should actively involve local communities and complement community forest management, but avoid creating forest plantations.

#### *Productive and environmental investments*

Petroecuador should make productive investments that have a positive economic and environmental impact, including:

- (a) Capturing some of the 52 percent of associated natural gas that currently is vented or flared. In the past, transportation costs made such projects unfeasible, but with higher crude oil prices some previously discarded project concepts could be revived as part of an integrated plan that includes secondary recovery of crude oil and more intensive use of the Shushufindi natural gas plant. In addition, the capture of flared gas can be financed from Clean Development Mechanism projects, the methodology for calculating greenhouse gas emissions has been approved.<sup>26</sup> This would increase the domestic supply of LPG and reduce the need for imports.
- (b) Upgrading refineries to improve fuel quality, process wastes properly, and reduce pollution. Rehabilitation of the Esmeraldas refinery should focus on an immediate first phase that would increase production capacity by 15 percent and improve systems to manage discharges and process wastes. A second phase should improve production of light fuels and further reduce wastes and pollution. The antiquated La Libertad refinery should be replaced by a new, modern refinery.<sup>27</sup>
- (c) Reopening abandoned wells. While mainly aimed at extracting more oil with the most recent technologies, it would also allow correction of cases where wells were not closed properly.
- (d) Establishing a plan to phase out the dumping of formation waters.<sup>28</sup>

### *Financing*

Petroecuador's financial autonomy should be restored to help correct the underfunding and decapitalization that occurred when the company's operating and investment budgets were set by the Ministry of Economy and Finance. This will go a long way toward improving its infrastructure and its capacity for environmental management. Petroecuador should also seek to optimize financing from the CEREPS fund, 5 percent of which (about US\$50 million a year) is allocated for environmental remediation in the oil sector, and the US\$1.5 billion FEISEH fund, 70 percent of which is intended for oil and electricity sector investments. These and other potential funding sources provide a solid foundation for undertaking the measures suggested in this study.

### *Comprehensive reorganization of Petroecuador*

In addition to financial autonomy, Petroecuador should become more administratively independent to help avoid political pressures from within the government that could hamper environmental performance. The environmental protection unit of Petroecuador needs to be given the authority to design policies and implement plans and programs, while the environmental units in the subsidiaries should be strengthened enough to effectively implement

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<sup>26</sup> Petroecuador has become an active member of the Bank's Gas Flaring Reduction Initiative.

<sup>27</sup> The Bank's Energy Strategy Study suggests that given the urgency for the upgrading of the Esmeralda Refineries, Petroecuador should immediately design and execute a plan to upgrade the refineries; whereas to replace the LA Libertad Refinery, the same study suggests that the private sector should be involved.

<sup>28</sup> Pluspetrol, the operator of the jungle fields in Peru, has agreed to eliminate this practice by 2008.

the policies. To avoid conflict of interest, Petroecuador should not be responsible for contracting or administering contracts with private companies.

The company should rapidly and thoroughly update its existing plans for environmental management, emergencies, and closure of facilities, and create new plans in areas where they do not currently exist. The subsidiaries' operational units should acquire the materials, equipment, and expertise needed to be completely independent and dependable in handling emergencies. To avoid creating incentives to cause spills, only minor tasks should be left in the hands of private remediation companies. A plan should be implemented to professionalize and train staff in environmental management throughout the chain of operations. Petroecuador must, in practice, be able to operate under the same standards and regulations as private operators.

**Box IV.2. PEMEX Improved Environmental Performance**

A fundamental aspect of environmental management by *Petróleos Mexicanos* (PEMEX) has been where this function fits within the company's organization and how this institutional structure has evolved in response to emerging challenges over time.

With the creation of the first integrated legal framework for environmental issues in the early 1990s, the company's priority was on analysis of its regulatory compliance and adoption of best practices. For this purpose the company established the Industrial Safety and Environmental Protection Audit Office, whose environmental role was the preparation of environmental audits in the main offices of all the company's business lines.

Subsequently, toward the end of the 1990s, a series of catastrophic accidents made it clear that management of safety and environmental protection had to be systematized, leading to the creation of the Corporate Office of Industrial Safety and Environmental Protection.

After having accomplished the large-scale introduction of a first generation of administrative systems, the company decided to incorporate responsibility for safety and environmental protection into operational decisionmaking. Thus, in 2004 the Corporate Office for Operations was created with the explicit mandate of carrying out all oil operations in accordance with safety and environmental protection criteria.

This organization is reflected in each of the company's four lines of business: exploration and production, refining, gas, and petrochemicals, in which the personnel responsible for safety and environmental protection report to the directors of those areas.

<i>Issue</i>	<i>Example</i>	<i>Context</i>	<i>Elements of Successful Management</i>
Restoration of contaminated sites	Mining Unit, Texistepec, Veracruz	Restoration measures to eliminate environmental problem through: <ul style="list-style-type: none"> <li>• Neutralizing acidic water in reservoirs. Completed.</li> <li>• Construction of stabilization cells for 525,000 cubic meters of solid waste. Completed.</li> <li>• Capping 2,800 sulfurous wells. In process.</li> </ul>	<ul style="list-style-type: none"> <li>• Earmarking of 440 million pesos and administration of another 385 million pesos to complete the remediation project.</li> <li>• Organization and integration of a group of specialists from diverse fields.</li> <li>• Appropriate management of approvals by environmental, federal, and</li> </ul>

		<ul style="list-style-type: none"> <li>• Elimination of natural crude oil deposits (<i>chapopoter</i>). In process.</li> <li>• Elimination of acidic residues from access channels and <i>chapopoter</i>. In process</li> <li>• Recovery of crude oil in reservoirs. In process</li> </ul>	<ul style="list-style-type: none"> <li>• state authorities.</li> <li>• Use of local labor to reduce environmental complaints by the community.</li> </ul>
Reduction of air pollution	Reduction of sulfur oxide (SOx) emissions by facilities of PEMEX–Exploration and Production, and PEMEX–Gas and Basic Petrochemicals	<ul style="list-style-type: none"> <li>• Emissions were reduced from 936,900 tons in 2001 to 675,100 tons in 2006, which represents an annual average reduction of 6.3 percent.</li> </ul>	<ul style="list-style-type: none"> <li>• Allocation of US\$1.2 billion for installation of 10 compression units to increase the capture of associated gas and eliminate the flaring of sour gas (hydrogen sulfide) in the Northeast Marine Region (RMNE)</li> <li>• Appropriate management of the US\$400 million PPB investment program for the installation and operation of sulfur recovery plants with Super Claus technology, achieving 99 percent efficiency in sulfur recovery, which exceeds both national (NOM-137-SEMARNAT-2003) and international standards.</li> </ul>
Creation and application of information systems for corporate safety and environmental protection	Information System for Safety and Environmental Protection (SISPA)	<p>SISPA is an information tool designed for PEMEX with the following characteristics:</p> <ul style="list-style-type: none"> <li>• Respond in a timely and coordinated way to emergencies in PEMEX.</li> <li>• Standardize the number and content of reports on issues of industrial safety and environmental protection.</li> <li>• Reduce the time required to produce reports.</li> <li>• Automatically calculate performance indicators.</li> </ul>	<ul style="list-style-type: none"> <li>• Recognition of the problems caused by using different sources of information in the subsidiary agencies.</li> <li>• Having specialized technical and information teams to develop ad hoc algorithms and an information platform for PEMEX.</li> <li>• Technical support and assistance from diverse parts of the company and its subsidiaries to develop the system.</li> </ul>
Environmental accountability and transparency	Public reports on the environment	<p>The environmental performance of the oil companies provokes public mistrust. The voluntary publication of results allows PEMEX to:</p> <ul style="list-style-type: none"> <li>• Establish a channel for communication with the</li> </ul>	<p>Some management aspects that have proven to be factors in the success of this initiative are:</p> <ul style="list-style-type: none"> <li>• External auditing of all published information.</li> <li>• Adherence to international standards for publication of</li> </ul>

<p>public.</p> <ul style="list-style-type: none"> <li>• Make a public commitment to transparency.</li> <li>• Improve its environmental reputation among certain groups of stakeholders.</li> </ul>	<p>reports on sustainable development.</p> <ul style="list-style-type: none"> <li>• Concrete answers to questions from representatives of civil society organizations</li> <li>• Public recognition of mistakes and successes.</li> </ul>
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### 3.3 Conflict management, benefit sharing, and protected areas

#### *Social conflicts and benefit sharing*

Currently, responsibility for community relations and conflict management is not clearly defined and ends up being managed directly by Petroecuador and private companies. This often complicates negotiations, yields few effective results, and ultimately deepens conflicts. The government must reassert its leadership as the arbiter of social policy, conflict management, and benefit sharing. To promote this process, a unit should be created to coordinate the policies and actions of the government, environment, and energy ministries.

Rigorous consultation and participation mechanisms are needed to address the social and environmental aspects of development planning, intercultural concerns, and conflict management. There must be dialogue among the national government, local governments, indigenous people, and other local populations. To regain their trust, the government should immediately begin to change the practices of oil operations in northeastern Ecuador, restore degraded lands, and develop proposals for comprehensive local development.

The Institute for Ecodevelopment of the Amazon Region (ECORAE), in addition to other benefits from petroleum sector activities, should be managed more rigorously and transparently, with participation by local communities and governments and a system for monitoring and disseminating results.

The government should immediately take steps to:

- Conduct a strategic assessment of the oil sector in the Amazon.
- Coordinate territorial planning in the south-central Amazon, including designation of selected exclusion zones where oil operations will not be allowed.
- Formulate new laws and regulations to respect the collective rights of indigenous peoples and monitor legal compliance with the Constitution, new and existing laws and regulations, and ILO 169.
- Strengthen the capacity of indigenous communities to monitor compliance of oil-related activities with environmental regulations.
- Agree on a policy for sharing oil benefits with local governments and indigenous peoples and establish a single, transparent, and automatic mechanism to implement it.
- Assess the use of ECORAE resources, ensure their transparency, and incorporate them along with other resources into the new negotiation strategy.

- Strengthen the role of CODENPE as an executor of public policies and advocate for indigenous rights in relationship to the petroleum sector.
- Take a direct role in conflict management and benefit sharing, promote tripartite dialogue (government, industry, and communities), and negotiate with public and private companies to channel resources through a single benefit-sharing mechanism.
- Strengthen the management capacity of indigenous communities to monitor implementation of oil operations, including the creation and support of social audit mechanisms.

*Protected areas, primary forest, and indigenous territories*

In protected areas the government should focus initially on traditional areas of exploitation and ensure that all the necessary cleanups are carried out and that all operations comply with environmental regulations before making any decision on expanding into new areas. While these steps will go a long way toward diminishing tensions over protected areas, it will not eliminate the conflict over the Ishpingo-Tiputini-Tambococha (ITT) oil fields, which overlap with Yasuni National Park.

In other areas of primary forest or indigenous territories, no decisions on new operations should be taken until existing problems related to these areas are addressed, a strategic assessment has been done, and comprehensive regional development plans have been developed, and a process of prior consultation and participation has been carried out. These measures must include active and transparent participation of CODENPE and ECORAE (see Box IV.2). In some areas of high environmental and ecological sensitivity, pipelines should be buried underground (this would cost an estimated \$100 million).

**Box IV.3. Principal Amazon Development Organizations in Ecuador**

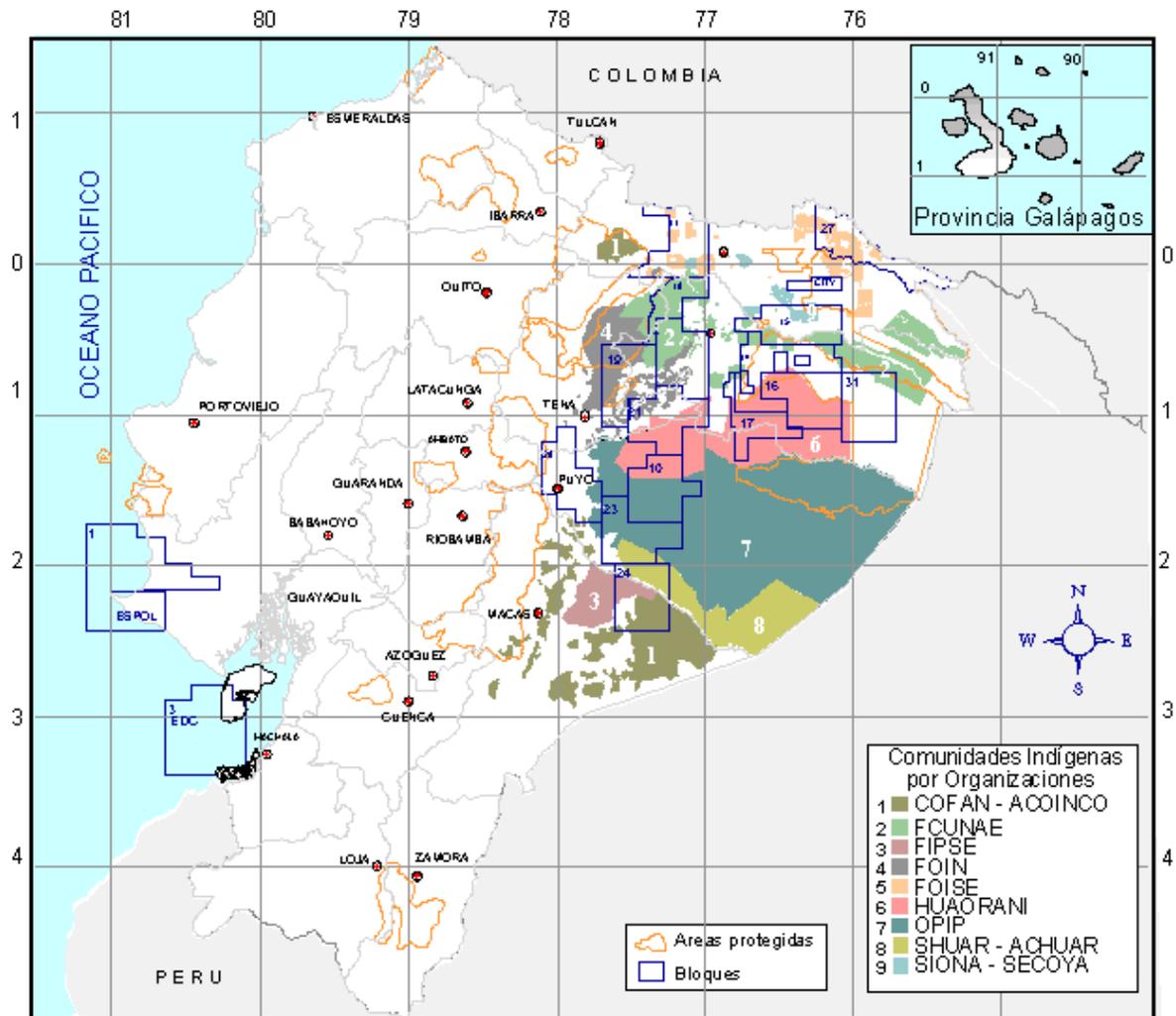
There are two main public institutions that work on development of the Amazonian region, the Council for the Development of the Nationalities and Peoples of Ecuador (CODENPE) and the Institute for Ecodevelopment of the Amazon Region (ECORAE).

After the 1998 constitutional reform, CODENPE was created to handle budget allocations and disbursement of financial resources for indigenous development. CODENPE invests in the Amazon region through participatory development plans that prioritize investments, mainly in physical infrastructure. The dissemination of collective rights, participatory planning, and the management of indigenous peoples' organizations for self-development has resulted in an increase in participation in decisionmaking. Part of CODENPE's budget is assigned to investments at the national level, with the largest amount going to infrastructure and support to the management of indigenous municipalities. However, investments by CODENPE in the Amazon region have been limited and its involvement in oil policy matters has been minor.

Indigenous (and nonindigenous) populations in the Amazon region are also beneficiaries of development investments from ECORAE, which transfers funds between the local governments of six Amazon provinces, with 28 percent for provincial councils, 57 percent for municipalities, 5 percent for the parish council, and 10 percent for ECORAE's execution costs. ECORAE carries out projects and programs with a budget of US\$2.5 million (Andrade 2002) for productive and infrastructure projects. Evidence suggests that ECORAE was lacking a transparent strategy and that political interests were defining resource allocation priorities, but since 2003 there have been efforts to reorganize the institute, improve its transparency and governance, reinforce its participatory decisionmaking processes, and reformulate its policies in accordance with the ecodevelopment principle that it advocates (Andrade 2004).

# Map IV.1

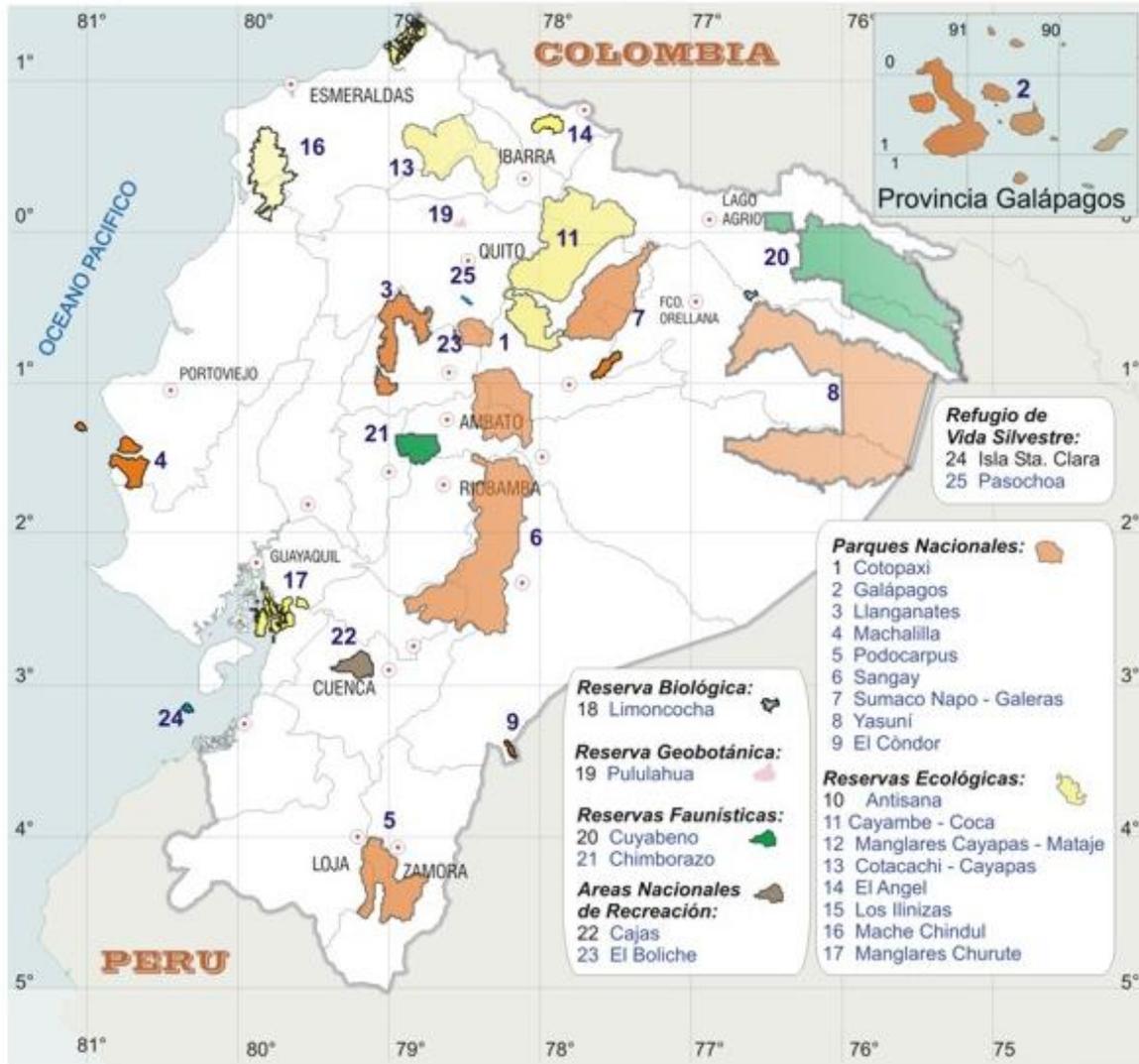
## Comunidades Indígenas



ACOINCO (OINCE): Org. de Indígenas Cofanes del Ecuador	FIPSE Fed independiente del Pueblo Shuar del Ecuador
OPIP Organización de Pueblos Indígenas del Pastaza	FOISE Fed de Org Indígenas de Sucumbios del Ecuador
FCUNAE Fed. de Comunidades y Unión de nativos Amazonía del Ecuador	FOIN Fed de Org Indígenas Quichuas del Napo

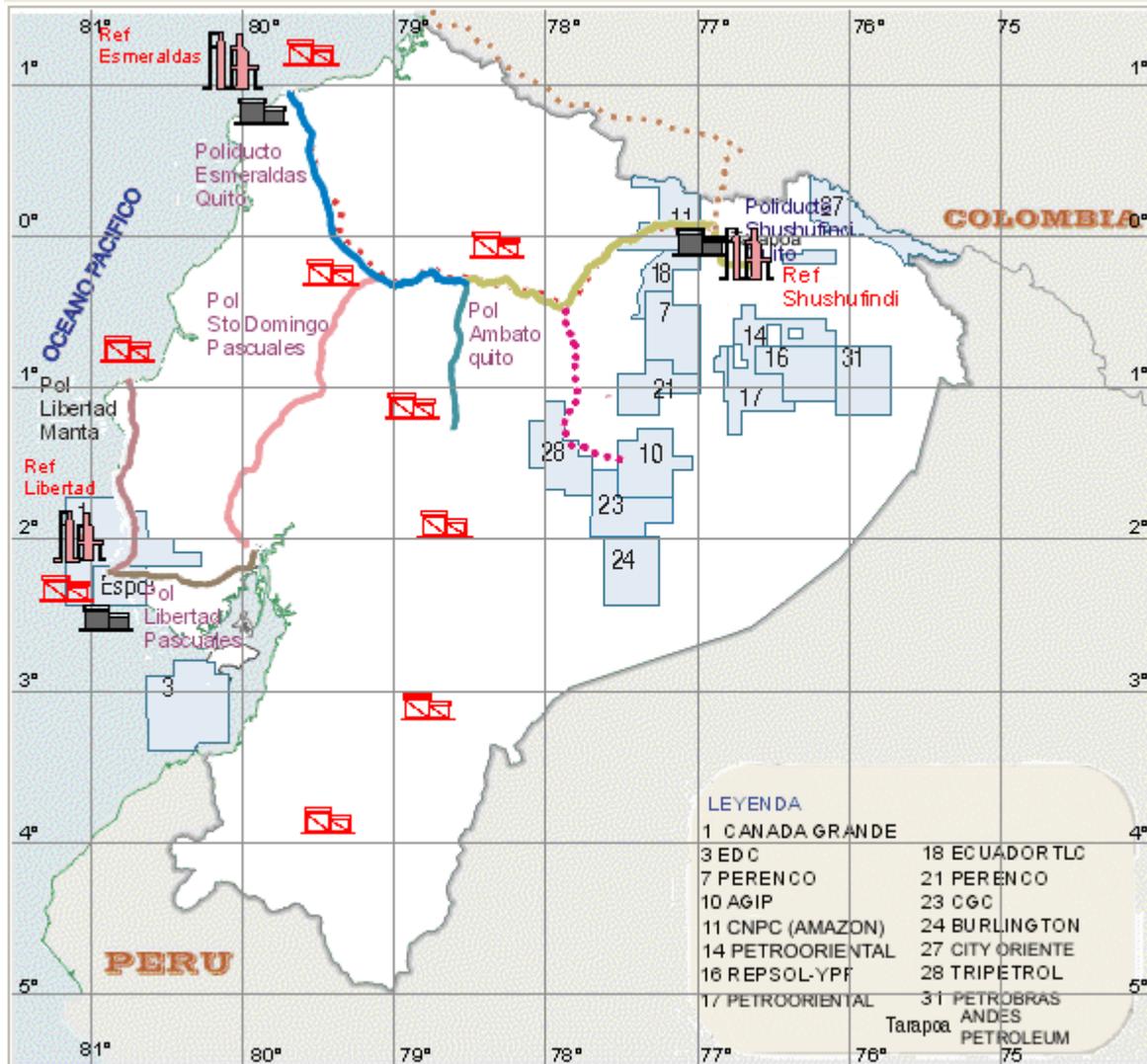
Map IV.2

## Áreas Protegidas



Map IV.3

## Oil Concessions, Pipelines, Terminals, Refineries, and Storage Facilities



## **V. Forest Resources**

### **1. General context**

There are about 10.8 million hectares of forest ecosystems in Ecuador, covering more 38 percent of the country's land area. They play a vital role in conservation and environmental quality, support the livelihoods of many indigenous people and rural communities, and if managed properly could be a powerful tool in fostering sustainable development and reducing rural poverty. However, government policies and programs do not adequately recognize or protect the value of Ecuador's forests, which results in forest resources being underused at the same time that they are being destroyed and degraded.

The current deforestation rate in Ecuador is 1.5 percent per year (more than three times the regional average), while the forest sector's contribution to gross domestic product is less than 1.2 percent. Some of the main problems in the forest sector include strong pressure to convert them to other land uses (such as agriculture, pasture, oil extraction, and mining); land tenure conflicts and poorly defined property rights; limited capacity of communities and other local landowners to manage forests sustainably; and poor governance of public institutions and an inadequate legal framework.

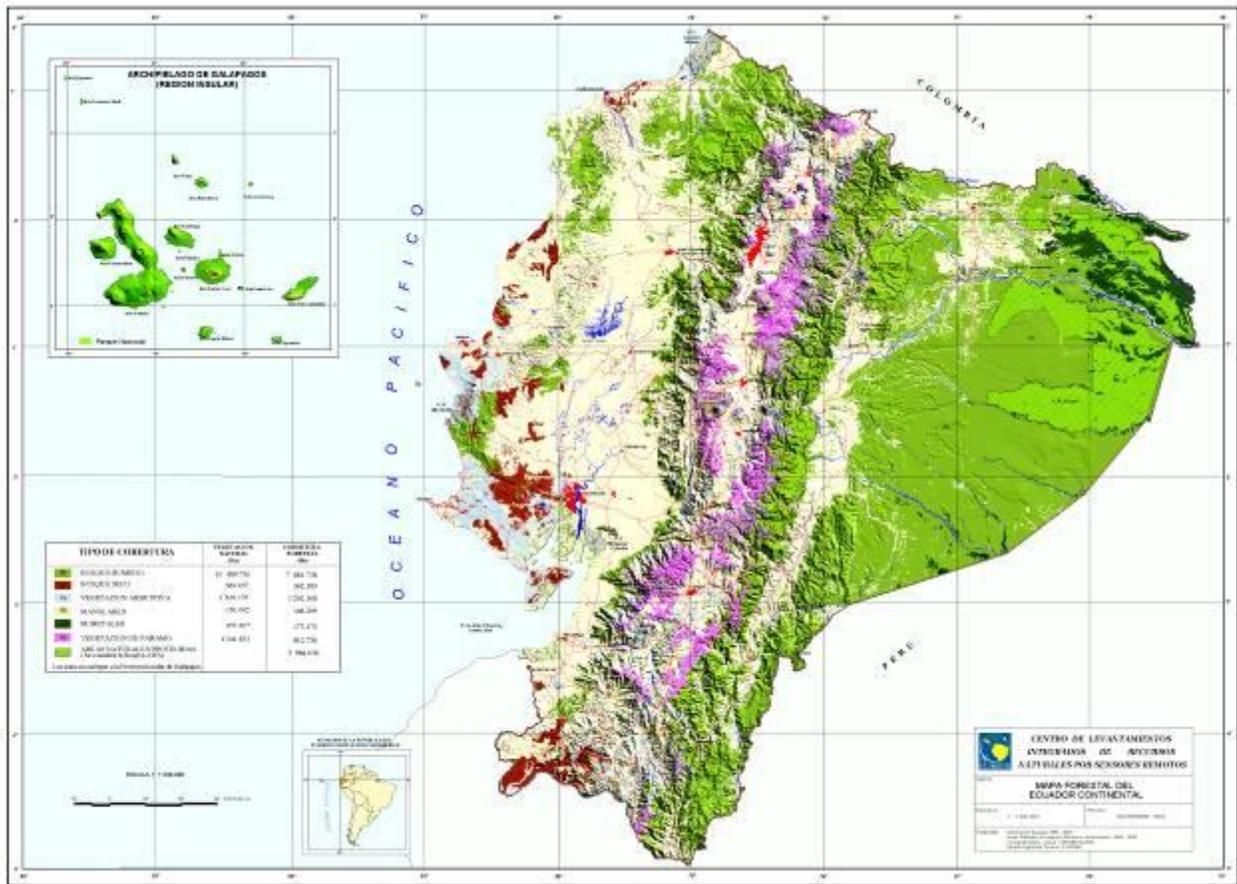
Policy, institutional, and legal reforms are needed to address these issues and conserve forest ecosystems while also making the most of their economic, social, and environmental value. There must be clear recognition of the importance of forest ecosystems to Ecuadorian society and economic development and of the close interconnections between forestry and other economic activities. There must be better governance, accountability, and transparency in public forestry institutions combined with rational, output-oriented regulations and incentives that help ensure sustainable use and conservation of forest resources and protection of environmental services.

### **2. Structure and Characteristics of Ecuador's Forest Resources**

Tropical moist forests account for almost 90 percent of Ecuador's forests, mangroves and other wetlands account for another 5.2 percent, and tropical dry forests for 4.8 percent (Figure V.1). It is estimated that 5.7 million hectares of the country's natural forests are suitable for productive forestry, but due to poor accessibility and tenure insecurity only 10 percent of those forests (less than 600,000 hectares) can currently be managed on an economical and sustainable basis (FAO 2007). As a result, the forest sector's contribution to gross national product has barely reached 1 percent in the last 10 years (Echeverría 2004). In addition, there is a negative balance of trade in forest products that reached almost US\$82 million in 2003, mainly due to imports of pulp and paper products (Vazquez 2005). Domestic consumption of forest products exceeds production from both natural forests and plantations by as much as 54 percent (ITTO 2004).

Most forest areas in the country are controlled by indigenous communities or small farmers, at least half of whom lack secure land tenure. About 44 percent of forested lands (6.4 million hectares) are owned by communities belonging to the country's 14 principal indigenous groups. Although nearly 3.9 million hectares of forests are found on small farms, they are highly fragmented, with an average size per property of only 16 hectares.

**Figure V.1. Natural Forest Cover in Ecuador 2000**



Source: CLIRSEN (2003).

Public forests cover 4.0 million hectares in three main categories: Protected Areas (PAs); National Protective Forests (which serve to protect soil, wildlife, watersheds, and other sensitive areas or important functions); and National Forest Patrimony (*Patrimonio Forestal del Estado*) (Table V.1). These categories overlap with each other and with lands that have been titled to indigenous communities. Nearly all of the National Forest Patrimony is settled by indigenous and nonindigenous communities (Morales 2005), and therefore virtually all government-controlled or administered forests are located in PAs.

**Table V.1. Estimated Forest Area by Tenure Classification**

<b>Land Tenure Regime</b>	<b>Forest Area (000 ha)</b>
Protected Areas	3.98
National Protective Forests	2.34
National Forest Patrimony (PFE)	2.06
Farms	3.88
Forests in Indigenous Territories	5.00

*Note:* Some forests are counted in more than one category.

*Source:* FAO (2007).

### **3. Why Are Forest Resources so Valuable to Ecuador?**

The benefits provided by forest ecosystems range from biodiversity conservation and improved water resources to timber and non-timber forest products that generate direct income and foster economic development in rural areas. Some of the country's poorest communities, including many indigenous people, are heavily dependent on forests for income and subsistence. It is estimated that as much as 30 percent of household income in poor rural communities is forest related, mainly from timber extraction, which has increased dramatically in some areas over the past 15 years (Torres 2005).

Forest ecosystems also offer important non-timber goods and services to both rural and urban areas. Examples include the more than 480 plants recognized to have medicinal properties (used by most indigenous communities); bamboo and palm wood (*pambil*); fruits such as the *tagua* nut (vegetable ivory); *cabuya* fiber used for ropes, bags, and sacks; and *paja toquilla* used to make Panama hats. Forests can also help conserve watersheds, regulate hydrological flows, improve water quality, control erosion, and mitigate the frequency and severity of floods and landslides. These crucial environmental services and functions of forest ecosystems are usually undervalued if not ignored, and need to be better incorporated into land use policies and programs.

### **4. Degradation and Depletion of Forest Ecosystems: Main Causes and Consequences**

Despite their important environmental functions and potential contribution to economic development and poverty reduction, forest resources have not been sustainably managed and are becoming severely degraded and depleted. Estimated deforestation rates vary, but are very high relative to other countries in the region, and suggest that the rate could be increasing. Table V.2 shows an FAO estimate of 1.2 percent annual deforestation in the 1990s. More recent estimates report a loss of 1.78 million hectares between 1991 and 2000, or close to 1.5 percent per year, with tropical dry forests disappearing at the even more alarming rate of 2.18 percent per year. According to the World Bank's *World Development Indicators 2007*, Ecuador's forests declined from 11.8 million hectares in 2000 to 10.8 million in 2005.

**Table V.2. Forest Cover and Deforestation Rates in Selected South American Countries, 1990–2000**

Country	Total Land Area ('000 ha)	Forests		Annual Deforestation (%)
		Area ('000 ha)	Percent of Total Area	
Argentina	273,669	34,648	12.7	0.8
Bolivia	108,438	53,068	48.9	0.3
Brazil	845,651	543,905	64.3	0.4
Colombia	103,871	49,601	47.8	0.4
Ecuador	27,684	11,680	42.2	1.2
Peru	128,000	65,215	50.9	0.4
Venezuela	88,206	49,506	56.1	0.4

*Source:* FAO (2002).

The five main causes for this decline in forest ecosystems are (a) pressure to convert forests to agricultural and livestock use and impacts from oil extraction and mining activities; (b) poor definition of land tenure rights, land conflicts, and inadequate land use policies and regulations; (c) weak government institutions and a poor policy and regulatory framework; (d) high demand for forest products; and (e) limited capacity by landowners to manage their forests sustainably.

Until recently, agrarian reform policies encouraged private owners of lands allocated to them by the government to convert forests to agriculture. The opportunity cost of conserving forests and the demand for agricultural lands in highly populated areas have also played a critical role in fostering forest conversion. Recent studies conducted in the Province of Pastaza show that the opportunity costs for the management of natural primary forests are considerably lower than those of secondary forests, grasslands for cattle ranching, and various agricultural crops. Oil extraction and mining cause only modest direct deforestation, but have very substantial indirect impacts due to the construction of roads that have facilitated colonization in tropical forests in the northeastern and Amazon regions. The impact of colonization in primary forests frequently begins with unsustainable extraction of timber that eventually results in conversion to secondary forests or complete clearing for agriculture or cattle ranching.

Perhaps the most fundamental cause of deforestation and forest degradation is the absence of sound land use policies and regulations and lack of clearly defined land tenure. These important issues transcend environmental and forestry activities and affect sectors such as agriculture, housing, energy, and mining. Although the 1999 Environmental Management Law established a National Strategy for Land Use Zoning, the relevant government agencies have not been able to develop a viable agreement to implement the strategy. This institutional vacuum has led to agricultural expansion and even the authorization of oil drilling activities within protected areas.

The Ministry of Environment and the National Institute for Agrarian Development (INDA) have the legal mandate to grant landownership rights, but the current forestry law states that no ownership can be granted in the National Forest Patrimony (PFE). However, most of these areas have been occupied by local peasants over the years. It has been estimated that about 2 million hectares of the PFE are in the possession of 4,000 families with unresolved tenure. The law allows concessions within the PFE to be granted to private companies, but none has been awarded since the early 1990s because most of the land is already occupied.

The sustainable management and conservation of natural resources has traditionally been a low priority on the government agenda, where the actual and potential role that forests can play in maintaining environmental services and contributing to reducing poverty in rural areas has been underestimated or ignored. As a result, the government institutions responsible for the administration of forestlands and the environmental sector are very weak; they have an inadequate structure, are understaffed, and operate under a limited budget, insufficient to fulfill their mandate.

Despite this adverse political and institutional setting, in 1995 the Ministry of Environment formulated a progressive Forests, Natural Areas, and Wildlife Policy that in turn led to the creation in 2000 of the Strategy for the Sustainable Development of Ecuador's Forests (*Estrategia de Desarrollo Forestal Sustentable del Ecuador*, EDFSE). Although still very broad, this strategy sets the conditions for a modern government administration aimed at reducing deforestation and promoting conservation, recovering degraded lands, and improving the inclusion and participation of local stakeholders (for example, forest landowners and settlers) in the design and implementation of public forest policies.

In its efforts to operationalize the EDFSE, in 2000 the Ministry of Environment designed and initiated the operation of the National Forest Control System (*Sistema Nacional Tercerizado de Control Forestal*) through which the government delegated many technical, administrative, and law enforcement activities to civil society and other national and subnational actors. Although it proved to be effective in controlling the increasing and widespread problem of illegal logging (between 17 and 54 percent of harvested timber is traded illegally), the system was declared unconstitutional and was cancelled in 2004 by the Constitutional Tribunal, mainly as a result of pressure from illegal loggers and other groups that benefit from the market for illegally logged timber.

In addition to the EDFSE, important efforts were made during the early 2000s to support the new policies with a consistent legal framework to ensure the sustainable management and conservation of forests and biodiversity. Although drafts of new forestry and biodiversity laws were formulated, these were not sufficiently consulted with civil society and did not receive sufficient political support partly due to the political turmoil of the early 2000s. As a result, the forest sector is still currently ruled by an obsolete legal framework from the early 1980s that overregulates commercial forestry activities and contains perverse incentives such as a ban on the export of roundwood, requires payment of a stumpage tax and other logging and timber transport taxes, and links those taxes to the budget of the Ministry of Environment.

A final but no less important cause of deforestation has been the interaction of the constant increase in local demand of wood products, the lack of capacity of government institutions to enforce sustainable harvesting practices and control illegal logging in natural forests, and the

limited capacity and incentives of local forest smallholders and indigenous communities to use their commercial forests under sustainable management regimes. Demand for wood products from natural forests, for example, has almost doubled supply in the last five years and this is causing an increasing pressure to high-grade and overharvest many forested areas, particularly those that are more accessible. With the elimination of forest control systems, illegal logging has also increased dramatically in the last few years, to the point where illegal timber is outcompeting legal timber (illegal timber is 31 to 37 percent cheaper than legal timber). In addition to these conditions, a critical factor is the limited technical capacity, social capital, and access to credit and financial services that poor forest producers and landowners have. Such weaknesses are an important cause of opportunistic and sometimes corrupt practices where timber, oil, and tourism industries engage with local leaders and indigenous authorities to get permits to enter their territories and exploit their resources illegally and with a limited benefit to local inhabitants.

## **5. The Way Forward: Strategic Actions for Successful Policy and Institutional Reforms in the Forest Sector of Ecuador**

Policy, institutional, and legal reforms are needed to revert the rapidly advancing degradation of forest ecosystems, while also taking advantage of their other economic, social, and environmental values. Such reforms should be mainly targeted to (a) strengthen and elevate the priority of forest sector and other related policies; (b) reform the legal framework to ensure the sustainable use and conservation of forest resources; and (c) improve the governance, accountability, and transparency of public forestry institutions.

### ***(a) Consolidate, Strengthen, and Elevate the Priority of Natural Resources***

#### ***Management and Conservation Policies***

The important role of forest ecosystems in maintaining vital environmental services and contributing to economic development and poverty alleviation in many rural areas of Ecuador needs to be recognized at the highest political level, and critical actions need to be taken to improve the performance of government institutions to ensure the sustainable management and conservation of these resources. The existing Sustainable Forest Strategy of Ecuador (EDFSE) contains the basic principles and guidelines to promote a sound development of the forest sector. This strategy, however, needs to broaden its scope, gain the support of a larger political and social audience—in many instances exogenous to the forest sector—and to be based on a more comprehensive and consistent legal framework to make it operational. Forest management and conservation policies also need to be mainstreamed into a broader intersectoral land use political strategy that integrates all related sectors (for example, agriculture, energy, mining, and housing), and also receives higher political attention. Specific actions that the government could initiate to achieve these goals include:

- (i) **Revise, broaden the scope, and elevate the political rank of the Sustainable Forest Strategy of Ecuador (EDFSE).** The EDFSE needs to be revised to recognize the crucial role that local communities play as the major actors for the management and conservation of natural resources and the maintenance of vital ecosystem functions for the Ecuadorian society. The strategy also needs to recognize the multifunctional role of forest in providing a variety of goods and services and to

broaden its scope to alternative uses of forest resources that include a variety of agroforestry practices, extraction of non-timber forest products, and of services such as ecotourism, water production, and carbon sequestration. Given the strategic role that forest resources play in the economy and well-being of the people of Ecuador, it is important that this strategy is given a higher priority by the government by elevating its rank to that of a **National Forestry Program**, which would be designed, implemented, and monitored at the highest political level.

- (ii) **Develop a comprehensive National Land Use Planning Strategy that integrates the different productive sectors playing a role in rural areas (that is, agriculture, oil, mining, forestry, and conservation).** Forestry and conservation land use policies need to be first defined intersectorally and then accompanied by territorial zoning and land regularization programs carefully designed to improve land use planning, resolve land tenure conflicts, and recognize property and customary rights of local indigenous and non-indigenous communities and other small landowners or settlers. Such programs need to be based on a multisectoral approach and take into account the role of both sectional and municipal governments, and other local stakeholders. Although the Environmental Law of Ecuador designates the Ministry of Environment as the entity to design and implement the Land Use Planning Strategy, it would be desirable that this important mandate is conducted within the institutional context and under the oversight of the National Council for Sustainable Development (*Consejo Nacional de Desarrollo Sustentable*, CNDS), which is an advisory body to the presidency, where all line ministries and local governments are represented.
- (iii) **Develop an intersectoral land regularization policy and programs.** Once a land use planning strategy is launched and territorial zoning plans are developed in forested areas, formal land regularization programs that focus on conducting cadastres and facilitating land titling and registry procedures in rural areas are an important priority. Important policy decisions will have to be made regarding criteria and procedures to regularize lands in the three major types of forest land tenure regimes: National Protective Forests, Public Forest Patrimony (PFE), and Protected Areas. The Ministry of Environment is responsible for conducting land regularization in forested areas, while the Ministry of Agriculture (through the National Institute for Agrarian Development, INDA) conducts regularization in agricultural lands. Since borders among these different types of land tenure regimes are not always clear, close coordination between the two agencies would be crucial in conducting this task. In recognition of the complexity of agreeing and implementing such regularization policies, it would be desirable that the process is also overseen and supervised by the CNDS.

International experience shows that a clear definition of property rights accompanied by the recognition of customary laws and traditional forms of government of indigenous and other local communities, and the application of effective participatory land use zoning instruments are critical elements to ensure the sustainable management and conservation of forest landscapes.

- (iv) **Develop incentives and programs to support forest communities to improve the sustainable and productive management of their forests resource base.**

Devolution of property rights to indigenous and other local communities, and the implementation of different forms of co-management of public forestlands with forestland settlers has been a trend, not only in Ecuador, but in many other countries of the region (for example, Bolivia, Brazil, and Mexico, see Box V.1.) and elsewhere (for example, China and India). In their efforts to transfer this responsibility to local landowners, however, governments have to recognize the need to support local communities to improve their capacity to manage their forests sustainably and generate forest-related incomes. Governments need to be involved in strengthening, and sometimes helping, communities build their organizational (that is, social capital) and technical (that is, human capital) skills, and improve access of forest producers to financial services, credit, and market information. This is particularly important in areas with natural forests of high commercial value where the aim is to promote the commercial use of forest products and the integration of production chains that would link producers to local, regional, or international markets. Social, human, and financial capital is also needed by communities to improve local land use planning and territorial zoning, and the management of natural forests for subsistence uses such as the extraction of timber and non-timber forest products (for example, firewood for home use, timber for home building, and medicinal plants), and the generation of critical ecosystem services (for example, water, control of soil erosion and prevention of natural disasters, and carbon sequestration). Given the large area of forests controlled by poor indigenous communities (more than 50 percent) and small farmers that lack the technical capacity to manage these resources, an important action that is urgently needed in Ecuador is the formulation and execution of technical assistance and training programs, which also includes access to financial resources and services.

This program needs to be aimed at generating income and employment opportunities for local communities by improving the capacity and effectiveness of local forest producer organizations to increase sustainable production and integrate their enterprises into production chains with other private sector actors. Some important topics that would need to be considered in the design of such program include: (a) the development of management plans models that can be realistically implemented by indigenous and other peasant communities and that do not become an obstacle for legal compliance; (b) develop incentives to promote the market of legal forest products coming from forest communities and fight illegal markets; (c) promote the production and consumption of non-timber forest products; (d) provide permanent technical assistance to forest communities to improve their sustainable management, production, and commercialization of forest products; and (e) promote access of forest communities to credit and financial services, through existing mechanisms such as the National Environmental Fund (*Fondo Ambiental Nacional*).

**Box V.1. Community Forestry in Mexico: A Success Story on Sustainable Management of Forest Ecosystems by Indigenous Groups Assisted by Government Programs**

More than 250 million people of forest communities live in the world's forests and depend on them for their livelihoods. In the last 10 years, governments of many countries have recognized the important role these communities play as main actors in the sustainable management and conservation of forest

ecosystems. Currently, more than 22 percent (more than 350 million hectares) of forestlands in developing countries are owned or controlled by such communities. This has resulted from a trend in devolution of tenure rights by governments to local groups, which is expected to continue for several years.

Communities, however, have a great need for policies that assure them real access to the forests around them, and that offer them technical, financial, commercial, and organizational support to improve their capacities to manage these resources more efficiently, not only for their own benefit, but also for the benefit of society and of the forest itself.

Although there is an increasing number of successful community forest management experiences, there are very few cases where communities have gained the level of access to their own forest resources and as much entrepreneurial capacity as in Mexico. A unique condition in that country is that more than 80 percent (44 million hectares) of its forestlands are owned by *ejidos* (land reform groups) and indigenous communities. This collective form of landownership resulted from a long forestland devolution process that began after the 1910 revolution and was supported by an agrarian reform that continued until the 1990s.

Recent studies show solid evidence that Mexican forest communities have been able to manage their forests and learn complex processes of industrial production when they have received appropriate technical and financial support, and when they have sufficient forest resources. The evidence shows that community forest enterprises can be profitable and that in regions where community-managed forests predominate, forest cover is maintained at rates similar to that of protected areas. Perhaps the most important lesson is that community forest management can also contribute to social peace in regions with deeply entrenched social conflicts.

The role of the government in supporting the devolution process and investing in large-scale technical assistance and training programs, although not always consistent, has been crucial in improving the technical capacity of local communities to manage their forests and transform and commercialize their forest products. One of the most successful government interventions in this sector has been the World Bank-supported Community Forestry Program (PROCYMAF), which has been active since 1998. This program focuses on offering specialized technical assistance, training, and extension services to forest communities in six states, recognizing different forms and levels of vertical integration of community forestry enterprises. Relevant results of this program include the development of a significant number of community enterprises that are now engaging in local and international markets of specialized and “green”-labeled products, and which have increased family incomes and employment opportunities, are investing in vertical integration of their enterprises, and are also generating communal social benefits (such as health clinics, schools, and welfare programs for the elderly). The success of these programs has been related to the fact that they have been designed using a bottom-up approach and in response to local needs and respecting cultural characteristics and community idiosyncrasies.

### ***(b) Reform the Legal Framework to Ensure the Sustainable Use and Conservation of Forest Resources and Ecosystem Services***

A new regulatory framework needs to be designed through a broad participatory process that includes both national stakeholder organizations and forest landowners, indigenous communities, and other local civil society organizations. Regulations should be designed based on the

intersectoral land use policy strategy mentioned above and consistent with the EDFSE. This legal reform should address the need to:

- (i) **Introduce incentives and other mechanisms to promote and regulate a market for the payment of environmental services.** It is important that these reforms are designed to stimulate a private market of environmental services that respond to real demands of consumers of environmental services generated in forest ecosystems, and that the local communities that are responsible for generating these services by conducting sustainable management or conservation practices of forest resources are directly compensated for these actions. For the strategy to operate in a sustainable manner, a well-designed and transparent monitoring and evaluation scheme needs to be implemented.
- (ii) **Introduce incentives to promote the sustainable management of forest resources by indigenous communities.** Current incentives are centered on the transformation of raw timber products that mainly benefit private industry and not poor forest communities. New incentives need to be designed to promote and ensure the sustainable management of forest resources by these communities and to improve their access to technical assistance, credit, financial services, and markets.
- (iii) **Eliminate the stumpage tax.** This tax creates a perverse incentive in at least two ways: it makes the Ministry of Environment dependent on the revenues from forestry practices in public lands, creating the incentive to authorize and not properly enforce sustainable forestry practices; and it promotes illegal logging practices of forestry producers that want to avoid paying this tax. Eliminating this tax, however, implies that the Ministry of Environment would need to get all of its budget from the federal government. Negotiating this fundamental change in the legislation will require the preparation of a strong technical justification to be lobbied and discussed with Congress, and the political will of the government to introduce this reform.
- (iv) **Eliminate the ban on export of roundwood.** As previously discussed in this document, there is enough evidence that the ban on exporting raw logs has contributed to artificially maintaining a low value of locally produced timber that is mostly and directly affecting local producer groups. Eliminating this prohibition would introduce a healthy incentive to produce and also consume local forest products.
- (v) **Introduce mechanisms to regularize tenure to settlers of forestlands located in areas of the National Forest Patrimony (PFE) and Protected Areas.** Based on the recognition that most forested areas under the PFE are already inhabited by local communities and other peasant settlers, provisions need to be included in the new legislation to ensure that property rights in these areas can be regularized. In protected areas, different forms of co-management agreements can be explored with local settlers.
- (vi) **Promote international standards and indicators of sustainable forest management, and recognize and support third-party certification schemes.** Important efforts have already been made in Ecuador to adopt international standards and indicators and to adapt these to national conditions. Third-party certification has also been conducted successfully in several forest areas in the country. The new legislation should include incentives to promote these instruments to improve sustainable forest management, which have proven to be successful in other parts of the world.

### ***(3) Improve the governance, accountability, and transparency of public forestry institutions***

Forest institutions need to be strengthened and modernized in response to the objectives of the EDFSE and the current strategies for deconcentration and decentralization of forestry-related responsibilities to local governments and national and local civil society actors. New government institutions need to be designed and structured in response to local needs and conditions required to operationalize sectoral programs and ensure an effective law enforcement strategy. Some recommendations to strengthen these institutions include:

- (i) **Increase the quantity and quality of technical staff, and improve their coordination across and between central and local offices, and with local governments.** In the context of a new decentralized and more effective institution that focuses on law enforcement and promotion of sustainable forest practices, the Ministry of Environment needs to invest in hiring, retaining, and training high-level technical staff, and establishing a good coordination and communication strategy with all related internal and external administrative units.
- (iii) **Create a National Forestry Information System.** This important system should cover a wide variety of topics related to the management and conservation of forest ecosystems (for example, the regulatory framework, the disclosure of forest management plans and timber harvesting permits, forest inventories, market information for timber and non-timber forest products, sustainable forest management standards and monitoring indicators, and biodiversity and conservation information).
- (iv) **Increase public participation in decisionmaking processes.** Regardless of their importance and quality, many government initiatives lack popular support due to the limited involvement of local stakeholders in their design and application. A modern Ministry of Environment would greatly benefit by improving the participation of national and local stakeholders in the decisionmaking process. This could be achieved by the creation of a multi-stakeholder National Consultative Forestry Council that could also have local counterpart Councils in sectional and municipal governments.
- (v) **Improve and operationalize the Decentralized Forest Control System (*Sistema Nacional Descentralizado de Control Forestal*, SNDCF).** An important initiative to be considered is the new Decentralized Forest Control System (*Sistema Nacional Descentralizado de Control Forestal*), which aims at expanding the scope, and increasing the participation, of local governments and civil society of the former *Sistema Tercerizado de Control Forestal*. Independent, civil society mechanisms to oversee compliance with regulations and reduce illegal logging such as *Vigilancia Verde* should also be more actively supported and expanded.

## VI. Conservation

The information presented in this section supports the fact that conserving biodiversity and making sustainable use of its components is directly related to the possibility of enhancing the quality of life of current and future generations in Ecuador. Conservation and sustainable use are strategic elements in combating poverty and creating new economic opportunities and jobs, especially for the rural populations of the country. The close relationship among environmental services, economic development, and the welfare of the population is perhaps the most important element to justify the valuation of those services and to propose innovative mechanisms to ensure the necessary financing for the protection of the ecosystems.

Therefore, the national antipoverty policies and plans should incorporate in a more intentional way actions and financial resources that contribute to the conservation of biodiversity and the sustainable use of its components, by strengthening and diversifying productive systems and the payment of direct incentives for conservation—especially to indigenous and Afro-Ecuadorian communities—which will simultaneously ensure a constant generation of income and the long-term maintenance of biodiversity on their collective lands.

### 1. National context

Ecuador is one of the most biologically diverse countries in the world, with an extraordinary variety of ecosystems and species that coexist in a relatively small territory. It is also a country with rich cultural and ethnic diversity that interacts with and depends on this biological wealth for its subsistence and development.

The country is divided into four geographic regions: the Amazon region, the Sierra (Andean highlands), the Coast, and the Galapagos Archipelago. Ecuador's biodiversity provides the population with access to natural resources and environmental services to promote its economic and social development. In this context, biological diversity represents a strategic resource to cement the sustainable development of Ecuador, and is the foundation for the generation and strengthening of different productive activities that make it possible to improve the quality of life, increase incomes, and contribute to the security of the population.

Compared to other mega-diverse countries in Latin America and other regions of the world, Ecuador, within its small territory, is home to an important number of species belonging to the main taxonomic groups. Based on the most recent inventories, Ecuador ranks fourth for vertebrates (in general), third for amphibians, fourth for birds, seventh for reptiles, seventh for butterflies, and fifth for *Papilionidae* butterflies (Table VI.1).

**Table VI.1. Ecuador’s Biodiversity Compared to other Mega-diverse Countries: Number of Species per Taxonomic Group**

<b>Vertebrates (except for fish)</b>	<b>Amphibians</b>	<b>Birds</b>	<b>Reptiles</b>	<b>Butterflies (overall)</b>	<b>Papilionidae Butterflies</b>
Colombia <b>3,374</b>	Colombia <b>583</b>	Colombia <b>1,815</b>	Australia <b>755</b>	Peru <b>3,532</b>	Indonesia <b>121</b>
Brazil <b>3,131</b>	Brazil <b>517</b>	Peru <b>1,703</b>	Mexico <b>717</b>	Brazil <b>3,132</b>	China <b>104</b>
Indonesia <b>2,827</b>	<b>Ecuador</b> <b>457</b>	Brazil <b>1,622</b>	Colombia <b>520</b>	Colombia <b>3,100</b>	India <b>77</b>
<b>Ecuador</b> <b>2,606</b>	Mexico <b>284</b>	<b>Ecuador</b> <b>1,616</b>	Indonesia <b>511</b>	Bolivia <b>3,000</b>	Brazil <b>74</b>
Peru <b>2,586</b>	China <b>274</b>	Indonesia <b>1,531</b>	Brazil <b>468</b>	Venezuela <b>2,316</b>	<b>Ecuador</b> <b>69</b>
Mexico <b>2,501</b>	Indonesia <b>270</b>	Venezuela <b>1,360</b>	India <b>408</b>	Mexico <b>2,337</b>	Myanmar <b>68</b>
China <b>2,404</b>	Peru <b>24</b>	India <b>1,258</b>	<b>Ecuador</b> <b>402</b>	<b>Ecuador</b> <b>2,200</b>	Colombia <b>59</b>
India <b>2,222</b>	India <b>206</b>	Bolivia <b>1,257</b>	China <b>387</b>	Indonesia <b>1,900</b>	Peru <b>59</b>

*Sources:* Mittermeier, Robles, and Goettsc (1997); Titira (2007); Granizo and others (2002); Coloma, Quiguango-Ubillús, and Ron (2000); and Torres-Carvajal (2007).

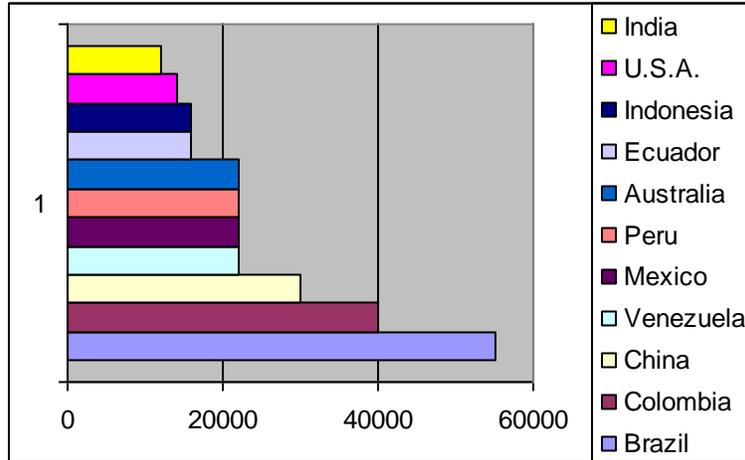
Ecuador also contains an important amount of endemic biodiversity for three taxonomic groups: the country ranks seventh in the world for amphibians, ninth for reptiles, and sixth for butterflies (Table VI.2), and it ranks eighth in the world in terms of plant diversity (Figure VI.1).

**Table VI.2. Ecuador's Biodiversity Compared to other Mega-diverse Countries: Number of Endemic Species of Amphibians, Reptiles, and Butterflies**

<b>Endemic Amphibians</b>	<b>Endemic Reptiles</b>	<b>Endemic Butterflies</b>
Colombia <b>367</b>	Australia <b>616</b>	Indonesia <b>700</b>
Brazil <b>294</b>	Mexico <b>369</b>	Philippines <b>352</b>
Madagascar <b>176</b>	Madagascar <b>274</b>	Peru <b>350</b>
China <b>175</b>	India <b>187</b>	Colombia <b>300</b>
Australia <b>169</b>	Brazil <b>172</b>	Madagascar <b>250</b>
Mexico <b>169</b>	Indonesia <b>150</b>	<b>Ecuador</b> <b>200</b>
<b>Ecuador</b> <b>138</b>	China <b>133</b>	Mexico <b>200</b>
Papua New Guinea <b>134</b>	Philippines <b>131</b>	Brazil <b>200</b>
United States <b>126</b>	<b>Ecuador</b> <b>114</b>	China <b>200</b>

*Source:* Mittermeier, Robles, and Goettsch (1997).

**Figure VI.1. Estimated Number of Species in Countries with the Highest Diversity of Plants**



*Source:* Mittermeier, Robles, and Goettsch (1997).

Unfortunately, there are strong pressures that are affecting biodiversity, including the over-exploitation of renewable natural resources, the conversion and fragmentation of the forests, the disorderly expansion of the agricultural frontier, the introduction of invasive species, and the direct and indirect environmental impacts of productive activities. The use and exploitation of the country's natural capital is increasingly destructive and predatory, contributing to the exhaustion of that natural capital and putting sustainable development at risk. This section identifies a set of priority actions that will help strengthen the conservation and sustainable use of biodiversity in Ecuador.

## **2. Biodiversity: A Strategic Resource for Ecuador**

Biodiversity constitutes a strategic resource for Ecuador's development, given the fact that it generates significant tangible and intangible benefits for society. Furthermore, because conservation of biodiversity principally involves conservation of natural habitats and ecosystems, biodiversity conservation also produces enormous positive externalities that are not, strictly speaking, attributable to diversity itself. These environmental goods and services include climatic stability, carbon sequestration, watershed protection, and control of erosion and sedimentation. These natural resources also help capture solar energy and produce biomass, store and recycle nutrients, and aid in the biological control of pests. Thus, preservation of certain vital resources that have often been considered inexhaustible, like soil, water, and air, can be enhanced through the same conservation measures needed to protect biodiversity.

Many productive activities like agriculture, fishing, aquaculture, and tourism are based, to a large degree, on biological resources and the environmental services generated by biological diversity and healthy ecosystems. Naturally occurring ("wild") species and varieties are a source of new medicines, oils, and fibers; and the improvements in raising crops for food requires genetic material contained in the various locations maintained and developed by farmers and indigenous communities, and in the wild relatives of the cultivated and domesticated species in natural areas.

While it is difficult to disaggregate the benefits of biological diversity per se from biological resources, the economic sectors that are related to and often benefit from biological diversity

(agriculture, fishing, forestry, and tourism) accounted for roughly 20 percent of Ecuador's GDP between 1996 and 2000. Similarly, 16.7 percent of Ecuador's exports and 32 percent of its agricultural and marine exports in 2000 corresponded to native biological resources.

All of the economic sectors studies (agriculture, fishing, forestry, and tourism) benefit from the enormous biodiversity existing in the country. In the agricultural sector, exports of native products, such as fibrous vegetables, like the *paja toquilla* (toquilla straw); fruits like the tree tomatoes, uvillas, and chirimoyas; and short-cycle products like potatoes, corn, and quinoa, represented 5 percent of the country's exports in 2000. Similarly, almost all of the production of the fishing sector is based on the extraction of bio-aquatic resources originating in the marine-coastal and fresh-water ecosystems of the country. Close to 300 marine species contribute to the sector, although two species (tuna and shrimp) account for the majority of seafood exports of the country. The forestry sector also depends to a great extent on the resources found in native forests. In 2004, the forestry sector accounted for 2.7 percent of Ecuador's GDP, and 63.7 percent of the wood was extracted from native forests. Currently, the tourism sector contributes 2.3 percent of Ecuador's GDP, and as with other economic sectors, its growth is based on the country's extraordinary biodiversity, which is its main attraction.

### **3. Biodiversity in Danger**

Unfortunately, the existence of serious environmental problems in Ecuador is causing the deterioration of natural ecosystems, the extinction of species, and the loss of genetic diversity of both wild and cultivated organisms. Not only is the destruction of habitats causing a reduction in biological diversity, but it is also causing accelerated loss of traditional knowledge and practice, and the social and cultural disintegration of the indigenous and local communities.

Ecuador's forests are disappearing at rate of nearly 1.5 percent a year, more than three times the overall rate for Latin America. According to the World Bank's *2007 World Development Indicators*, in 2000 forest coverage in Ecuador was 41.7 percent (11.8 million hectares), but by 2005 it had fallen to 38.2 percent, representing a loss of nearly 1 million hectares of forest (World Bank 2007).

Although the lack of scientific information prevents a precise evaluation of the state of biodiversity in the country, it is evident that the main cause of the reduction in biological diversity is the destruction or deterioration of habitats. Still, the over-exploitation of resources, the introduction of exotic species, and environmental pollution are also causing the disappearance of flora and fauna species in Ecuador.

The aquatic, continental, and marine ecosystems have also suffered growing deterioration due to excessive fishing, the introduction of exotic species, and water pollution caused by agricultural, mining, and hydrocarbon-related activities. Similarly, the displacement of native crops and the "modernization" of agricultural practices are causing the accelerated disappearance of the genetic resources stored in the cultivated species and varieties.

### **4. The National System of Protected Areas**

The protected areas are the primary tool for on-site conservation of biodiversity. The *National System of Protected Areas* (SNAP) of Ecuador is currently made up of the 35 protected areas which comprise the *State Patrimony of Natural Areas* (PANE), which is administered by the

*National Department of Biodiversity and Protected Areas (DNBAP)* of the Ministry of the Environment.

Although the 35 protected areas that make up the PANE cover approximately 18.7 percent of the national territory, not all of the land and marine-coastal systems of the country are represented, and a number of ecosystems are underrepresented. An analysis of conservation gaps and priorities for land-based biodiversity in continental Ecuador revealed that 7 of the 46 types of vegetation are not represented and many types are currently underrepresented in the PANE. For example, the eastern dry mountain forest is not represented in any of the existing protected areas, while the inter-Andean dry and humid vegetation and the eastern and western dry forests are underrepresented.

Gaps and underrepresentations are even more serious for the marine and coastal ecosystems of the country. Only 8 protected areas in continental Ecuador's PANE include marine-coastal elements, and only two have areas that extend off the coast. These areas cover a total of 76,814, hectares, and various ecosystems are not represented within the PANE. In sum, additional efforts are still needed to consolidate and complete the ecological and biological representativeness of the SNAP, for both land and marine-coastal ecosystems.

## **5. Development of the Conservation Sector**

Ecuador has made progress in the area of conservation. The current Constitution establishes the rights and principles of environmental responsibility and a number of environmental norms. Sectoral and thematic policies and strategies have also been formulated. For example, there are proposals to improve the management of the National System of Protected Areas (SNAP); a number of forestry plans and programs have been tried; and several studies have been conducted on climate change and possible adaptation and mitigation measures.

The country is also a signatory to many international agreements and treaties regarding environmental issues. There is a higher degree of awareness of and sensitivity to environmental issues, and a growing collective consciousness in society and the media about environmental co-responsibility. The subnational (local and provincial) governments, especially those with more resources and capacity, have been taking on environmental responsibilities in addition to those they have traditionally concentrated on, such as solid waste management and basic sanitation. At the local and community level, environmental consciousness has grown and more responsible practices have been introduced or strengthened in the use and management of natural resources. Gradually, some companies and industries and some large and small producers, out of their own need to access more demanding markets and to reduce costs, have incorporated practices of productive and energy efficiency, with certain environmental precautions, and have ceased or reduced the use of pesticides and dangerous substances. Some small but growing segments of farmers and consumers have opted for agro-ecological techniques and organic products.

Despite this long list of achievements, environmental issues do not receive the attention they deserve given their social and economic importance. The sectors that are supposedly the most economically dynamic—agro-exporters, fishing, mining, and petroleum—despite the enormous wealth that they extract and accumulate, which demands greater environmental responsibility and concern, are examples of poor practices and mismanagement. There are no sanctions for degradation or incentives to adopt best practices, and the resources are exploited as if they were

inexhaustible. Similarly, tourism activities—which in Ecuador have enormous potential based on the extraordinary diversity of ecosystems, landscapes, and cultures—also often adopt extractive, exclusive, and destructive practices that go against the environmental, economic, and social sustainability, which they should be promoting for their own benefit.

## **6. Current and Future Challenges to Conserving Biodiversity in Ecuador**

Based on current and future challenges, and on the priorities of the new presidential administration, the following five strategic areas have been identified that would help strengthen environmental management in general and biodiversity conservation in particular: (a) a reform and strengthening of the institutional, policy, and legal framework; (b) effective decentralization of environmental management, (c) consolidation of the National System of Protected Areas; (d) strengthening of management tools, and (e) the development of economic instruments for conservation.

### ***(a) Reform and strengthening of the institutional, policy, and legal framework***

#### Institutional framework

The application of policies of conservation and sustainable use of biodiversity requires a profound institutional reform, oriented primarily toward strengthening the national environmental authority, consolidating the *National Decentralized and Participatory Environmental Management System*, and the incorporation—in a cross-cutting, holistic way—of environmental policies and standards in all economic and social sectors of the country.

Two options are identified for institutional strengthening: (a) strengthening the existing institutions, primarily the Ministry of the Environment as the highest national environmental authority, and (b) establishing a new institutional framework that contributes more efficiently to environmental management in general and biodiversity conservation in particular. In any case, it is important to consolidate an intersectoral space for the coherent and integrated formulation of a national environmental policy, for the medium and long term, which is not regarded as the “agenda of the greens,” but rather which makes it possible to build a true sustainable development agenda, shared by the entire Ecuadorian society. This space could be created through strengthening the *National Coordination Commission* and the *National Planning Secretariat* (SENPLADES).

The *Environmental Policy* of the new administration also proposes to reform and strengthen environmental institutions in Ecuador. This institutional reform should be aimed at strengthening the definition of environmental policies, activities of enforcement and sanction (perhaps through the creation of an autonomous enforcement agency), and the holistic management of renewable and nonrenewable natural resources in the country.

Institutional reform proposals should include recommendations to improve the management of biodiversity and especially management of protected areas and native forests, through (a) strengthening the current National Departments and Regional Districts, or (b) creating a specialized entity that has greater financial and administrative autonomy (for example, a *National Institute of Biodiversity and Protected Areas*). In the first case, the priority would be on strengthening the National Department of *Biodiversity and Protected Areas*, as the ministerial

entity currently responsible for the management of biodiversity and for the *National System of Protected Areas* (SNAP).

Institutional strengthening for the management and care of biodiversity should include, among other things, strong political support to the work of the SNAP, as a true national priority, increasing the general national budget for the effective management of protected areas, and greater administrative and financial autonomy of the responsible institution (which would permit re-investing the resources generated by the SNAP). In any case, it is recommended that emphasis be placed on the integral management of ecosystems, linking in a coherent way the management of protected areas with the management of water, fish, and bio-aquatic resources of the country.

Taking into account the processes of decentralization and the transference of environmental authority in the country, a key recommendation is to strengthen the *Environmental Management Units* or other similar instances of the subnational governments, in order to ensure their effective participation in the conservation and sustainable use of biodiversity, within the context of a *National Decentralized and Participatory Environmental Management System*. In particular, it is recommended that technical assistance be provided to build capacity for the design and implementation of *Biodiversity Action Plans*—at local and regional levels—for the operational application of the *National Biodiversity Strategy*.

#### Policy framework

Although Ecuador has a broad political framework for biodiversity conservation, one of the main challenges is in incorporating biodiversity conservation and sustainable use in the policies, plans, and programs of other sectors. Efforts should be focused primarily on the formulation and application of biodiversity conservation policies in the energy sector, especially in the subsector of hydroelectric power. At the same time, financial incentives should be offered to the energy sector for activities to protect and manage the hydrographic basins and especially the high Andes systems (plateaus and mountainous forests) through the design and application of mechanisms to compensate for environmental services.

It is also important to strengthen conservation policies and environmental regulations in the oil and mining sectors, in order to reduce their negative impact on biodiversity. In particular, it should be expressly prohibited to develop new petroleum and mining projects in the protected areas of the country, including the protector forests, and at the same time, the Government of Ecuador (GOE) should promote conservation-friendly financial benefits in protected areas (for example, carbon sequestration). In addition, the GOE should analyze the application of voluntary measures by the companies for the conservation of ecologically similar or equivalent areas in areas outside of their operations, in order to avoid a net loss of biodiversity (biodiversity offsets).<sup>29</sup>

It is also important to encourage strict application of environmental policies, regulations, and standards in other areas of the national economy, like the fishing, agricultural, forestry, and

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<sup>29</sup> A broader discussion of this mechanism needs to take place between the State, the private sector, NGOs, and local communities to evaluate its potential benefits and risks, keeping in mind the difficulties in identifying and comparing ecologically similar areas and the fact that in very unique areas the damages to biodiversity can be irreparable.

tourism sectors, in order to ensure the sustainability and competitiveness of those activities. Thus, in the agricultural sector it is a priority to support the development of conservation policies, environmental regulations, and the application of good environmental and social practices. In particular, the conversion of native forests to other uses should be expressly prohibited, especially into plantations of African palm and other monocrops, which are aggressively spreading in many forested areas of the country.

In addition, the policies and oversight and control mechanisms in the forestry sector should be strengthened in order to ensure the responsible use of native forests and reduce the negative impacts of forest exploitation. Reforestation plans and programs using native species should be encouraged, especially in degraded areas, in order to contribute to the protection of river basins, the recuperation of soil, carbon capture, and the production of wood and non-wood resources. It is also important to evaluate the economic and social viability of instituting a national policy on *avoided deforestation*—both in the negotiations within the *United Nations Framework Convention on Climate Change* and in other voluntary mechanisms to reduce carbon emissions—which will make it possible to ensure the conservation of native forests (especially the forest of the northwest and southeastern parts of the country), through the payment of direct incentives to their owners, recognizing their contribution to carbon capture and the opportunity cost of conservation.

In the tourism sector, biodiversity conservation and sustainable use policies should be incorporated into the new *National Tourism Plan*, led by the Ministry of Tourism. In particular, the development of basic infrastructure should be financed, along with capacity building and the development of small and medium-sized service enterprises for visitors to the protected areas with the greatest tourism potential, while promoting sustainable development in surrounding communities.

### Regulatory framework

In terms of the development of the legal framework, the priority should be to complete the regulations of the *Environmental Management Law* (1999) in order to regulate and consolidate the decentralized and participatory system of environmental planning and management in the country; and to formulate a new Biodiversity Act or other specific legal instrument that will help order the structure and administration of the *National System of Protected Areas* (SNAP) and put into practice the principles and objectives of the *Convention on Biological Diversity*, the *Regional Biodiversity Strategy of Andean Tropical Countries*, and the *National Biodiversity Policy and Strategy*.

It is also important to encourage the development and application of new legal instruments that will help to close the legal gaps that prevent the regulation of certain activities, which are very important for the conservation and sustainable use of biodiversity (like the control of genetically modified organisms and the introduction of exotic species), access to genetic resources, and the protection of traditional knowledge of indigenous and Afro-Ecuadorian peoples and other local communities. Further, it is necessary to develop a number of legal instruments to facilitate the co-management of protected areas and the generation and reinvestment of funds for the effective management of protected areas, including outsourcing and service concessions.

### ***(b) Effective decentralization of environmental management***

Decentralization is one of the main challenges in improving environmental management in Ecuador. Nonetheless, the transference of authority and responsibility for environmental issues has been limited by various factors, including difficulties in complying with the requirements of the current Constitution, and the lack of capacity among sectional governments to effectively assume this responsibility. Despite these difficulties, many provincial councils and municipalities have assumed a number of environmental mandates included in the transference agreements signed between the national government and the sectional governments.

The existence of 22 provincial councils, 219 municipalities, and over 1,000 parish boards in the country requires a huge effort of interinstitutional coordination. In this context, the transfer of many responsibilities related to the conservation and sustainable use of biodiversity—among them those related to the management of forests, forest plantations, and the management of wild flora and fauna—make it necessary to focus efforts on strengthening the *Environmental Management Units* or other similar entities in subnational governments in order to ensure their effective involvement in a *National Decentralized and Participatory Environmental Management System*—at the regional and local levels—for the operational application of the *National Biodiversity Strategy*.

### ***(c) Consolidation of the National System of Protected Areas***

As mentioned, the National System of Protected Areas (SNAP) is the primary tool for the in situ conservation of biodiversity and, therefore, consolidating the system is a national priority, in accordance with the precepts of the current Constitution. The new SNAP Strategic Plan identifies the following key actions:

- Consolidate and complement the structure of the SNAP in order to fill any gaps that are identified.
- Develop ecological and socio-environmental investigation and monitoring systems in the SNAP, in order to evaluate the fulfillment of the objectives related to conservation.
- Public positioning of the importance of the protected areas in order to achieve the political and financial support of key actors and the society at large.
- Establish and consolidate the legal and policy framework in order to comprehensively regulate the SNAP.
- Resolve land tenure conflicts in the PANE and consolidate the existing protected areas.
- Strengthen the National Environmental Authority as the guiding and coordinating entity for the SNAP.
- Strengthen the financial sustainability of the SNAP.
- Strengthen the policies, legal instruments, and procedures for the monitoring of extractive activities in the protected areas and their buffer zones.
- Strengthen the participation mechanisms in the management of the protected areas of the SNAP.

In the first stage, efforts should be focused on four priority issues: the structure of the SNAP, its financial sustainability, the management of tourism in protected areas, and the titling of land in the areas surrounding the protected areas.

### **The structure of the SNAP**

It is recommended that the System's jurisdiction be expanded to include the protected areas declared by the sectional governments, the community conservation areas established by indigenous peoples, Afro-Ecuadorian groups and other local communities, and the private protected areas established by individuals or institutions. In order to implement this change, the *Forestry, Natural Areas and Wildlife Act* has to be reformed or a new *Biodiversity Act* or other specific legal instrument has to be passed (for example a *Law of Protected Areas*).

The new structure of the SNAP will make it possible to increase the amount of surface area that is protected, make it more ecologically representative and enhance the connectivity of the system, maintain the integrity and functionality of the ecosystems, and ensure the provision of environmental goods and service for the sustainable development of the country. This will be achieved through participation and co-responsibility on the part of a wide range of social stakeholders and through the application of various models of governance that reflect the diverse social and cultural conditions of the country.

### Financial Sustainability

It is important to maintain and increase the State's annual investment in the protected areas, and to diversify the SNAP's own sources of income, taking advantage of innovative mechanisms like compensation for environmental services, the provision of complementary tourism services, and the optimization of the fees for infrastructure installed in protected areas (that is, antennas), ensuring that the resources generated are reinvested in the management of these areas and maintaining the principle of subsidies of the SNAP in order to distribute resources to those areas which, due to their unique circumstances, cannot achieve financial self- sustainability.

In addition, the capitalization of the Protected Areas Fund is recommended, which is administered by the National Environmental Fund (FAN), until reaching at least \$65 million, which will allow it to cover, with the interests of the fund, the basic recurring costs of the 33 areas that currently make up the *State Natural Areas Heritage* (PANE) in continental Ecuador.

It is also important to develop a system of financial information and planning that ensures the generation, systematization, updating, and diffusion of information, in order to improve the coordination, the monitoring, and the follow-up of the investments of the State and other stakeholders in the protected areas of the country. Also, economic valuation studies should be conducted on the goods and services generated by the protected areas, in order to make their contribution to the economic and social development of the country more visible, as well as their relevance for antipoverty strategies.

#### **Box VI.1. Bolivia-Noel Kempff Mercado Climate Action Project: A Case of Financial Sustainability in a Protected Area**

In 1997, a unique partnership was forged among the Government of Bolivia and The Friends of Nature Foundation (FAN) in Bolivia, The Nature Conservancy (TNC), two U.S.-based electric utility companies (American Electric Power and PacifiCorp), and a major international petroleum company (BP Amoco). They agreed to work together to protect the threatened tropical forest in the Department of Santa Cruz for at least 30 years. The main purpose of the project is to sequester CO<sub>2</sub> and store carbon that would otherwise be released as a result of logging activities in the area. At the same time, the project preserves one of the richest and most biologically diverse ecosystems in the world and fosters sustainable development in local communities.

The project aims to avoid emissions of 7 million to 10 million tons of carbon, or 25 million to 36 million

tons of CO<sub>2</sub> during its 30-year life. The project has several components, including park expansion and protection, ecotourism, local community development, a for-profit venture to generate revenue for the park, monitoring and verification activities, and support to the Government of Bolivia's climate change program. Direct cash contributions from industry and grants from the TNC and other sponsors totaled US\$10 million for the project life, with an agreed annual contribution from the Government of Bolivia of US\$250,000.

*Source: Selling Forest Environmental Services. Market-based Mechanisms for Conservation and Development, edited by Stefano Pagiola, Joshua Bishop, and Natasha Landell-Mills, 2004.*

## Tourism

The consolidation of the SNAP also implies strengthening the management of the protected areas so that its conservation goals can be reached, including the management of recreation and tourism activities. One of the main objectives of many protected areas is to provide recreational and tourism opportunities to visitors. At the same time, the development of recreational and tourism activities can contribute significantly to the financial sustainability of those areas. In fact, tourism accounts for 95 percent of the self-generated income of the protected areas in Ecuador.

Managing tourism in the protected areas is a valuable opportunity to integrate biodiversity conservation with the development and antipoverty strategies in Ecuador. Tourism in protected areas is an activity that can generate benefits for conservation, the private sector, and the local communities. Nevertheless, it can also become a threat to biodiversity if it is not properly managed and controlled.

Unfortunately, reinvestment (both in terms of current expenses and capital costs) to cover the costs of managing tourism has been nonexistent or insufficient in the protected areas studied, in part due to the complex flow of resources among the different ministries—or within the Ministry of Environment itself. In most of the country's protected areas, there is no budget for managing tourism according to their real needs, and the negative impacts of the activity are not taken into account, with the related assumption that no resources have to be invested to minimize those impacts. Nevertheless, to prevent the degradation of the natural capital and improve the experience and safety of the visitors, as well as the conditions under which tourism activities are managed, increased investments are needed to guarantee an effective management of tourism in protected areas.

The income-generation mechanisms (like the entrance fees paid by visitors) are not based on a technical calculation that takes into account the true costs of tourism administration or the willingness of tourists to pay. In addition, the SNAP is losing significant revenue due to the lack of facilities for charging entrance fees and to limitations in the mechanisms for effective collection (including the outsourcing of fee collection), all of which are tied to the lack of a clear legal framework to solve these problems.

There are also legal limitations that reduce income generation from the provision of other services that are compatible with the management of the tourist sites (that is, food services, guided hikes, or bicycle rentals). These could benefit not only the areas themselves (through outsourcing, delegation, rental, or concession of goods and services), but also the surrounding

communities and private enterprises that can offer these services, which will enrich the experience of the visitors.

#### Land tenure in the areas surrounding the protected areas

Among the priority actions for strengthening the SNAP, it is recommended that a special land titling program be encouraged for the properties surrounding the protected areas, which will make it possible to consolidate the land tenure status and improve the management of natural resources in these areas. For the successful execution of this program, it will be necessary to improve the interinstitutional coordination among the Ministry of the Environment, the Ministry of Agriculture and Livestock, and the National Institute of Agrarian Development. The pilot experiences in similar land titling programs that were successfully implemented in the country in recent years can serve as the basis for the design and execution of this program.

#### ***(d) Strengthening management instruments***

The Territorial Zoning Plan (*Plan de Ordenamiento Territorial*) should be implemented, which, according to the Environmental Management Act, should be coordinated by the Ministry of Environment and the National Planning Secretariat (SENPLADES). This process could be carried out, in the initial stage, in the priority regions identified in the National Biodiversity Strategy: The Amazon Region, Esmeraldas and northeast Pichincha, the Gulf of Guayaquil, the south, and the Galapagos.

It is also recommended that socio-environmental information and monitoring systems be implemented to periodically evaluate the state of natural resources, locally and nationally. In this sense, it is important to strengthen the systems of social and economic information, like the *Integrated System of Social Indicators of Ecuador* (SIISE), incorporating environmental indicators (especially on biodiversity) in order to generate socio-environmental indicators that will facilitate an integrated monitoring of the social, economic, and environmental conditions in the country, at different scales.

#### ***(e) Development of economic instruments for conservation***

Finally, it is recommended that technical and financial assistance be provided to strengthen the economic management of biodiversity, through processes of valuing the goods and services generated by natural ecosystems, and by developing economic instruments that promote conservation, sustainable management, and technological conversion. In particular, efforts to develop and validate new economic instruments should be prioritized, such as the compensation or payment for environmental services, conservation incentives, and the environmental and social certification of products and services.

Efforts must also be made to quantify and provide evidence of the contribution that biodiversity makes to the country's economy, as an important input for decisionmaking and accountability. Clearly, specifying the economic consequences that a loss of biodiversity will have in terms of human welfare (for present and future generations) can be a powerful incentive for the Ecuadorian society to develop strategies and actions that will foment the conservation and sustainable use of biodiversity.

Given the close relationship between biodiversity and the satisfaction of human needs, the conservation of natural capital should be considered a key element of the national economy. The provision of food, medicine, and construction materials, among other products offered by biodiversity, and the provision of environmental services generated by natural ecosystems, like water regulation, carbon capture, pest control, and the protection of scenic beauty, confirm that biodiversity is a strategic resource for the economic and social development of the country.

**Box. VI.2. Paying for the Environmental Services of Silvopastoral Practices in Nicaragua**

Agricultural landscapes can provide many valuable ecosystem services. They can contain high levels of biodiversity, sequester substantial amounts of carbon, and affect downstream water supplies. Many of these services are externalities from the farmers' perspective, and so tend to be underproduced. Recent years have seen numerous efforts to devise innovative mechanisms to induce farmers to adopt practices that generate higher levels of services. An approach that has received increasing attention is to pay farmers directly to provide ecosystem services. PES is a market-based approach to conservation based on the twin principles that those who benefit from environmental services (such as users of clean water) should pay for them, and that those who generate these services should be compensated for providing them. The approach seeks to create mechanisms to arrange transactions between service users and providers that are in both parties' interests, thus internalizing what would otherwise be an externality. In a PES mechanism, service providers receive payments conditional on their providing the desired environmental services (or adopting a land use thought to generate those services). Participation is voluntary.

The Silvopastoral Project is piloting the use of PES to generate biodiversity conservation and carbon sequestration by encouraging the adoption of silvopastoral practices in degraded pastures in three areas: Quindío, in Colombia; Esparza, in Costa Rica; and Matiguás-Río Blanco, in Nicaragua (Pagiola and others 2004). The project is financed by a US\$4.5 million GEF grant with the World Bank as the implementing agency. In Nicaragua, it is being implemented by Nitlapan, an NGO affiliated with the Central American University. To provide payments that are closely correlated to levels of service provision, the Silvopastoral Project developed indexes of biodiversity conservation and carbon sequestration under different land uses, then aggregated them into a single "environmental services index" (ESI). This approach is similar to the Environmental Benefits Index (EBI) used in the U.S. Conservation Reserve Program (CRP) (NCEE 2001). The ESI distinguishes 28 different land uses, though not all are found at Matiguás-Río Blanco (Table 2). The biodiversity conservation index was scaled with the most biodiversity-poor land uses (degraded pasture and annual crops) set at 0.0 and the most biodiversity-rich land use (primary forest) set at 1.0. Within this range, a panel of experts assigned points to each land use, taking into consideration factors such as the number of species, their spatial arrangement, stratification, plot size, and fruit production. Similarly, the carbon sequestration index assigns points to different land uses according to their capacity to sequester stable carbon in the soil and in hardwood. The index is scaled so that 1 point equals about 10tC/ha/year. Because payments in this case come solely from the GEF, only global benefits were included in the ESI.

## **VII. The Galapagos: A Unique and Valuable Resource**

### **1. Islands of Myth and Magic**

In the minds of most people, the Galapagos are instantly associated with Charles Darwin and the theory of evolution, land tortoises, and both land and sea iguanas. Scuba divers worldwide associate the Galapagos with schools of hammerhead sharks and other marine life. As such the Galapagos are truly a unique, world-renowned destination, and attract a growing number of visitors each year. Few people, however, actually know where the Galapagos are located (1,000 kilometers off the west coast of South America, straddling the equator), whether they are one or many islands (there are about 11 principal islands and many smaller islands totaling 7,970 square

kilometers; see Map 1), to which country they belong (the Galapagos are a province of Ecuador), or anything about their population (less than 30,000 people, mostly from mainland Ecuador, and mostly recent arrivals since the islands were largely unsettled until the mid-19<sup>th</sup> century). Although Darwin is well known and world famous, few realize that the old, bearded Darwin of the pictures appears very different from the young, 26-years-old British scientist who visited the Galapagos in 1835 for a month on the HMS *Beagle*. Darwin's most famous book, *The Origin of Species*, did not appear until nearly a quarter century later, in 1859.

From an economic perspective the unique history and character of the Galapagos has meant that there are substantial economic rents associated with tourism in the islands. The combination of a world-famous destination with a high-end (that is, rich) visitor clientele and a largely live-on-board visitor model with stays of from three days to one week, mean that a sizeable tourism industry has developed around these islands and tourism. When this is combined with the large number of nongovernmental organizations (NGOs) and research establishments with an interest in the Galapagos, as well as government agencies, the result is substantial economic activity built on the fame and uniqueness of the islands. This chapter exams the economic questions associated with the islands, the magnitudes of economic flows, and the distribution of those benefits among residents of the Galapagos, Ecuadorians more generally, and international visitors.

## **2. Islands Born of the Sea**

The Galapagos are islands born from the sea and are the result of an oceanic tectonic plate moving over a “hot spot” in the earth's crust, and are therefore volcanic in origin.

The Galapagos are unique in other ways. Fully 97 percent of the land area is protected and is included in the Galapagos National Park, which was established in 1936. (The surrounding waters are protected by the associated Galapagos Marine Reserve, established in the 1980s and significantly expanded in the late 1990s.) The Galapagos is one of the only major ecosystems in the world where reptiles are the apex species—including the famous land and marine iguanas, and land tortoises. The strict limits on human settlement mean that most visitations to the Galapagos (estimated at between 100,000 and 120,000 visitor arrivals per year in recent years) are done via boats or ships (usually carrying from 16 to 96 passengers) and that tourism has evolved into a high-end, quite sophisticated industry. Many visitors proceed directly from the airport to their boats for their multi-day visits and leave the same way. A short visit in Puerto Ayora and the Darwin Research Station may be included in the itinerary, but little time is spent onshore other than within the National Park at several of the 60-some approved terrestrial visitor sites. In addition, there are over 60 designated dive sites in the Galapagos Marine Reserve.

## **3. Organizational Framework**

Among the agencies that play a key role in Galapagos development are the following:

**The National Institute of Galapagos (INGALA)**, depends directly on the Executive branch and through a constitutional mandate (and the Special Law for Galapagos), has the responsibility for planning and policy formulation for the Galapagos. While INGALA has a role in creating incentives for investment in the islands and promoting their sustainable development, biodiversity conservation as part of the development goals has not been a prominent priority for

the institution. In addition, a key challenge for INGALA is that its mandate includes migration control.<sup>30</sup> Although this is a key issue that affects the stability of the islands, INGALA has limited capacity and resources to enforce any sort of migration control. In addition, there have been claims that INGALA's assignment of resources to municipal governments is done on the basis of political affiliations rather than on technical criteria (that is, population size, needs assessment, and so forth).

**The Ministry of the Environment (MOE)** is responsible for administering the Marine Reserve and the Galapagos National Park (GNP), which encompass 97 percent of the islands territory under conservation. The MOE directly appoints the Director of the GNP and set's forth a series of policies that have direct repercussion in the islands. The Ministry of the Environment, in its efforts to develop a vision for Galapagos, has recognized that the root of many problems in the islands lies in a lack of a coordinated sense of direction for the islands and a lack of a common definition and understanding of the overall island challenges. Thus, with the assistance of United Nations Development Programme, the MOE established the Galapagos 2020 initiative to coordinate efforts by key stakeholders. The MOE has also approved measures that have been questioned in the conservation spheres, such as the final endorsement of a proposal that would allow the introduction of large cruise ships such as the Discovery World Cruise (that is, increasing permitted ship size from a present ceiling of 90 some passengers to 500 or more passengers).

**Ministry of Tourism (MOT).** Since the biggest driver of the Galapagos economy is tourism, the MOT, often in coordination with the Ministry of Environment, set policies and the overall framework for the sector. The policies applied to Galapagos, however, often may come into conflict with: (a) *NGOs and conservation groups*, which question the strategy that promotes mass tourism (as demonstrated by the arrival of the Discovery World Cruise Ship) and which, they argue, could further aggravate the introduction of alien species and damage the fragile ecosystem of the islands; (b) *municipalities and local tour operators*, which consider that the current framework favors international- and mainland-based tour operators that capture the bulk of the profits from this highly lucrative sector, and where there is limited consumption of local services.

**SESA-SICGAL.** The Inspection and Quarantine System for Galapagos was established in the late 1990s. Its responsibility has been to prevent new arrivals of alien species, monitoring for possible new arrivals, and carrying out rapid responses to eradicate them before they spread. In 2001, the Galapagos office of the national Agricultural Health Service (SESA, reporting to the Ministry of Agriculture) was inaugurated and mandated to operate SICGAL. The SESA-SICGAL now has a group of approximately 40 highly trained technicians working at seven Galapagos entry points (air and sea ports), with counterparts working out of Quito and Guayaquil airports, and out of the Guayaquil seaport where cargo ships are loaded (start-up costs for SESA-SICGAL were provided largely by foreign donations). Unfortunately, though most of the legal and regulatory elements for the effective screening of goods and passengers traveling to

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<sup>30</sup> A major challenge is that people enter Galapagos legally but then do not leave when they are supposed to. Enforcement and deportation are costly. There is currently no incentive for employers to help INGALA identify and deport temporary residents who have overstayed their permit. Requirements for transient visitors to have a return ticket are not always enforced. Entry and exit are not closely tracked, particularly when people enter through unofficial channels, such as cargo boats, the military plane, or fishing vessels.

Galapagos are in place, they suffer from serious underfunding, lack of effective enforcement of basic legal requirements, and erosion of recently constructed facilities. Thus, SESA-SICGAL faces crucial shortcomings such as the fact that passengers on flights to Galapagos are not required to complete a declaration with regard to the live or organic goods transported to the islands. There is no system in place to enforce or fine multiple infractions of quarantine regulations, and there is little disincentive for trying to smuggle goods. In addition, airlines flying to Galapagos are not disinfecting planes prior to landing, despite being required to do so by law.

**The Charles Darwin Foundation and Conservation NGOs.** Until the mid-1990s, the only NGO with any permanent presence in the Galapagos was the Charles Darwin Foundation (CDF), which, since 1959, has focused exclusively on conservation issues in Galapagos.<sup>31</sup> Today, more than 10 international, national, and local NGOs are engaged in conservation efforts in the islands.<sup>32</sup> This illustrates that unlike any other protected area in the world, the Galapagos attracts an array of conservation groups that have established themselves in the islands. Though in general this expansion can be considered a positive development, it does create the potential for competing or conflicting agendas and for mixed messages to the local community and decisionmakers (for example, espousing a strong stand against migration while they themselves contribute to a growing population of the islands, and so forth), and a mix of different visions for the future, which can result in an overall loss of efficiency and credibility.

**Multilateral and bilateral agencies.** There is a plethora of donors and bilateral agencies which are providing large amounts of financial support and technical assistance to the Galapagos (some 63 projects at an estimated at US\$65 million are underway or pending approval). Again, this represents a staggering amount when compared to the average amount that is destined to any other protected area in the world by the international community. There is a consensus that the assistance programs lack adequate coordination, in spite of the establishment of the Galapagos donor round table by the MOE. The impact of all of the current and past interventions has also come into question since the environmental degradation has only increased in recent years.

**Municipal Governments.** On average, the local municipal authorities of Isabela, Santa Cruz, and San Cristobal tend to be more stable and have longer tenures than authorities at the national level. Nonetheless, in order to be reelected, municipal governments are often pressed to focus on the immediate demands of constituents, at the expense of a longer-term vision of sustainability or conservation of biodiversity (which rarely appears as a priority issue). As a result, short-term solutions to entrenched problems may be favored over protection of the environment. For example:

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<sup>31</sup> UNESCO, "Galapagos Islands World Heritage Site," Report to the World Heritage Committee on the Mission carried out from February to March 2006.

<sup>32</sup> These include: The Nature Conservancy, Conservation International, WWF, *Fundación Natura*, WildAid, SeaShepherd Society, FUNDAR, among others.

- The mayor of San Cristobal has unilaterally and publicly declared his municipality the “Sports Fishing Capital of the World,” in spite a ban on sports fishing in the islands.<sup>33</sup>
- The mayor of Villamil (Isabela Island) has obtained funds from the national budget to build a new, modern airport terminal for the 2,000 residents of this island, despite the fact that the airstrip cannot currently accommodate the commercial jet aircraft serving Galapagos. There is also an initiative to begin shuttle services from Quito and Guayaquil. This scheme has taken place in the absence of any regionwide transportation infrastructure planning, and is linked to discussions with representatives of a large luxury hotel chain.
- Some residents in the town of Puerto Ayora are tracing out new residential areas within the boundaries of the Galapagos National Park lands in an attempt to increase political pressure for the park to cede lands.
- The mayor of Puerto Baquerizo Moreno (island of San Cristobal) has spent large sums of money to build a boardwalk and docking station for passenger ships in an area known to be a breeding ground for sea lions (many would claim that this initiative was done in order to compete with the boardwalk already built at Puerto Ayora, and thus attract more tourists).

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<sup>33</sup> Sports fishing may be permitted under the Special Law for Galapagos, but no regulations have been adopted for this to come into effect, and until they are, it remains illegal.

#### 4. The Economic Story—the Division of Economic Rents

##### *Unique resources and economic rents*

The Galapagos are a truly unique ecological and economic resource—nowhere else in the world can one see such a diverse and interesting array of land and sea creatures in such an undeveloped and natural setting. Many species are endemic—found nowhere else in the world. There is no natural competitive site. Tourism arrivals, largely international visitors, have increased rapidly in the last 20 years (see Table VII.1). From less than 17,500 visitors a year as recently as 1985, the current visitor count is between 120,000 to 140,000 per year. Of these, the majority are international visitors (about 85,000 out of 120,000 total visitors in 2005). Basically all nonresidents are counted as tourists. One has to view the visitor numbers with some caution, however, since there has been a recent jump in the numbers of Ecuadorians coming to the Galapagos.

**Table VII.1 Total Tourists Arrivals (estimated/extrapolated)**

<b>Year</b>	<b>National Visitors (‘000)</b>	<b>Foreign Visitors (‘000)</b>	<b>Total (‘000)</b>
1980	4.0	13.5	17.4
1985	6.3	11.6	17.8
1990	15.5	25.6	41.2
1995	15.5	40.3	55.8
2000	12.6	54.3	66.9
2001	19.8	57.9	77.7
2005 (est)			115–120
2006 (est)			120–130

*Source:* Unidad de Turismo, GNP in Informe Galapagos, 2001–2002 (2002); informed sources.

Although technically counted as “tourists,” it is both cheap (\$6 per person) and easy for Ecuadorians to enter the islands as a “tourist,” even if they are arriving for work or business. In contrast, international visitors pay an entrance fee of \$100 per person on landing. See Tables VII.2 and VII.3 for the current fee structure for visitors, and the fee structure for the annual tour boat license.

**Table VII.2. Visitor Entrance Fees—Galapagos Natural Park**

<b>Category</b>	<b>Amount (US Dollars)</b>
Foreign tourists	100
Foreign tourists (under age 12)	50
Foreign tourists from Andean Community or Mercosur countries	50
Foreign tourists from Andean Community or Mercosur countries (under age 12)	25
Citizen or resident of Ecuador	6
Citizen or resident of Ecuador (under age 12)	3
Foreign tourists (nonresident) attending a national academic institution	25
National or foreign children under age 2	No fee

*Source:* TNC, Drumm (2006).

**Table VII.3. Boats: Annual Concession Fees (patentes) per Berth Based on Cupos**

<b>Type of Boat</b>	<b>Category/Class</b>	<b>Amount per Berth per year (US Dollars)</b>
Cruise	A	250
Cruise	B	200
Cruise	C	150
Day Tour	R	250
Day Tour	E	50

*Source:* TNC, Drumm (2006).

The rapid growth in tourism is linked to the rapid population growth in the islands—largely through in-migration. Whereas the resident population of the Galapagos was less than 1,000 as recently as the 1940s, it grew to 2,000 in the mid-1960s, to more than 15,000 in the 1980s, and is close to 30,000 people today. A number of the current population are nonresidents who are technically there for short, time-bound periods of time to provide specific services. Nonresidents of the islands can come in legally on temporary work permits that are valid from three to six months. These “short-term” workers staff many service sector jobs.

The Galapagos do not offer the usual “sun/sand/sea” package found in the Caribbean or many other vacation destinations, and those who come (and pay the large expenses associated with visiting) are motivated by the unique nature of the islands and its varied ecosystems, flora, and fauna, all protected by the National Park (which includes both the land and the marine areas). The very uniqueness of the islands allows tourism operators to charge a premium and offer premium services. It is felt that even with the high prices charged, and the considerable travel costs associated with getting there, the Galapagos still generates considerable consumer surplus for visitors, and that part of the economic rent associated with the unique nature of the islands is not being captured. (One way to think about an economic rent is that it is the premium that people would be willing to pay for something but that they are not usually charged. Rents are created by uniqueness and scarcity. Since there are limits on the numbers of visitors [especially on the live-on-board boats], normal market forces of supply and demand do not apply. These create economic rents for both the visitors and the providers of services [tour operators]).

A major management question, therefore, is **what are the sizes of the economic rents attributable to the uniqueness of the Galapagos, who captures these rents** (residents? Ecuadorian? others?), and what portion is not captured and leaves with international visitors. Also, **what are the other main economic activities** in the islands and what are the impacts of those activities on the ecosystem? Is there **a way to increase the share of economic benefits that goes to residents of the Galapagos?** Finally, is there a **carrying capacity issue with respect to tourism**, and what are the options and **tradeoffs between sea-based and land-based tourism?**

#### *Gross economic flows in the Galapagos*

It is estimated that **gross revenues** directly associated with tourism in the Galapagos total from \$285 million to \$391 million per year. Table VII.3 presents the various estimates/“guesstimates.” Not a great deal of economic analysis has been done on the Galapagos. An excellent recent paper by Taylor, Stewart, and Hardner (2006) presents some interesting work on economic multipliers and the impacts of local spending, and a just-completed (but not yet released) study by Bruce Epler 2007 should provide considerable detail on economic impacts once it is available. The estimates presented in Table VII.4 are the author’s own “back-of-the-envelope” calculations based on general information on visitor numbers, expenditures, and reasonable assumptions. While not exact amounts, the orders of magnitude of the different sectors are probably quite realistic.

**Table VII.4. Estimated Annual Gross Economic Flows Associated with the Galapagos**

Sector or Activity Creating the Economic Flow	“Guesstimate” of the Gross Economic Flow (millions of dollars per year, ca. 2005)	“Guesstimate” of Present Economic Rents in the Sector (millions of dollars per year)	Where the Money is Predominately Spent— International Level (I), National Level (N), or Local level (L)
Tourism			
International tourism	\$250–\$350	\$25 to \$35	N, I, L
National tourism	\$10	\$1 to \$2	L, N
Fishing	\$3–6	Probably zero or negative	L, N
Research and conservation	\$10	unknown	L, N, I
Public expenditures	\$12–\$15	0	L, N
TOTAL	\$285–\$391	\$26–\$37	

Source: Author’s estimates

**Tourism** (both international and national) is the biggest contributor to the Galapagos-associated economy. The estimate of a gross expenditure of \$260 million to \$360 million includes international and national airfares, boats and hotels, meals and other expenditures, guide fees and tips, and park admission fees. Although a sizeable portion of this money never enters Ecuador (especially international airfares and payments to international tour wholesalers), other parts, including domestic airfares (from either Guayaquil or Quito), wages to Ecuadorians, within-Ecuador visitor expenditures, other fees and expenses, plus add-on trips within Ecuador, do stay within the country.

Taylor, Stewart, and Hardner (2006) have produced an interesting paper estimating the economic impacts of visitor spending via the economic multiplier effect. That is, for each dollar spent in the Galapagos (or paid to residents who live and work there) increased demand is created in the economy. Of note in Taylor’s paper is the fact that the multiplier for national tourism (largely land based) of about 1.4 is actually larger than the multiplier for international tourism (largely sea based) of about 1.2, since a larger share of national tourist expenditures are spent locally and generate economic activity in the islands. However, since international visitors spend much more per person per day, their cumulative impact is much more important. Nevertheless, this does illustrate why island residents view land-based tourism quite favorably—it leaves more dollars in the Galapagos per tourism dollar spent.

**Fishing** within the Galapagos is a small but vocal sector, employs several hundreds of people on a full- or part-time basis, and produces gross revenues of several million dollars per year. The number of boats registered has more than doubled since 1998—from 218 boats in 1998, to 446 in 2005 according to National Park figures—and there are about 1,000 registered “fishermen” in the

islands. The actual value of the catch varies from year to year, and there have been shifts between fin fish and the lobster and sea cucumber catch (and continuing problems with illegal shark finning – harvesting only the fins of sharks). A “guesstimate” of the size of the fishing industry is from \$3 million to \$6 million per year, and it is not clear what portion of this stays in the Galapagos and what portion accrues to others—either on the mainland or internationally.

Conflicts continue between the fishermen and the regulations of the Galapagos Marine Park (part of the broader protection system of the Galapagos National Park) with the usual issues of fishing zones, closed seasons, permitted catch, and other issues. One prediction is that with the growth in land-based tourism there will be increased attraction for fishermen to conduct sport fishing trips and to run day trips to areas within the Park. An additional factor is the growth in the local market for fresh fish due to growth in both population and income and the growing demands from visitors for fresh fish. Recently, there has been some friction between the Navy and fishing within Park waters—President Correa referred to this in his recent statements on the Galapagos.

**Research and conservation** is a major economic activity in the Galapagos, and few if any other national parks in the world have such a concentration of international staff. Although the actual expenditures vary from year to year depending on discrete programs and activities, one “guesstimate” of expenditures is about \$10 million per year, a substantial amount given the small population of the Galapagos. Many major bilateral and international agencies have programs in the Galapagos. The Charles Darwin Foundation, for example, had a 2005 budget of over \$4 million (much of it spent at the Research Station in Puerto Ayora). In addition, since most of the money for research and conservation activities is spent on salaries and goods and services in the islands, the economic multiplier impact is substantial. Taylor, Stewart, and Hardner (2006) estimate the economic multiplier for conservation activities at 1.8.

**Government expenditures** are also substantial and Taylor, Stewart, and Hardner (2006) estimate these expenditures at about \$12.8 million for the 2004–05 fiscal year. (Others put the total at considerably more.) Although over half of this money is from the National Park of the Galapagos (\$7.6 million of the total), many Ecuadorian ministries are represented in the Galapagos with both provincial- and municipal-level representation. A major source of income to the National Park and numerous local agencies is the division of the Park admission fees—their total value is about \$8 million or \$9 million per year, and the total is divided between the National Park (both terrestrial—40 percent, and marine areas—5 percent), local *municipios*, and even the Navy! (see Table VII.5) Since international tourists largely pay these admission fees, they may also be reported in gross tourism expenditures (but actually are a financial transfer from the visitors to the different agencies that divide up this steady source of income).

**Table VII.5. Distributions of Revenues from Entrance Fees**

<b>Recipient</b>	<b>Distribution of Total Fees Collected</b>
Galapagos National Park	40%
Galapagos Marine Reserve	5%
Galapagos municipalities ( <i>municipios</i> )	20%
Galapagos provincial government	10%
Ministry of the Environment	5%
Galapagos National Institute (INGALA)	10%
Quarantine and control system (SICGAL)	5%
Ecuador National Navy	5%
<b>TOTAL</b>	<b>100%</b>

Source: TNC, Drumm (2006).

Of great interest is the question of the **size of the economic rents** associated with these different sectors. Without more detailed analysis all that can be presented here are some very rough “guesstimates” based on conversations with individuals there, looking at the statistics, and casual empiricism. The estimates are based on conservative assumptions about economic rents. As seen in Table VII.5 economic rents total as much as \$26 million to \$37 million per year, largely associated with tourism. Part of these rents goes to tourism operators as producers’ surplus; another sizeable portion goes to visitors as consumer surplus. The fishing sector probably produces very few economic rents, and they may even be negative given different subsidies and distortions in the market. Economic rents are not a bad thing—they are part of total welfare. When the rents remain in the Galapagos or Ecuador they increase national well-being. When they leave the country with international visitors, they are “lost” to Ecuador and increase the well-being of the foreign countries that the visitors come from.

Since rents from the environment are produced by nature (and not by direct investment) there is always competition to “capture” these rents for oneself—and thereby gain an extra profit. This is a very active process in the Galapagos.

### *Capturing economic rents—and the two “Gold Cards” in the Galapagos*

Economic rents are generated whenever there is scarcity and some break in the supply-demand relationship. The “break” can be caused by uniqueness of a location—such as the fauna found in the Galapagos—or can be caused by government-created institutional restrictions such as the creation of a class of Galapagos residents that are different than other Ecuadorians. In the Galapagos both nature and institutions have created two very valuable forms of entitlements or rights: the system of *cupos* used to control the total number of sea-based berths for visitors, and the residency system that restricts certain rights to those who have a Galapagos residency card. Both the *cupos* and the residency cards have value and denote special rights. Just as the premium cards from credit card companies or airlines are frequently called their Gold Cards, these two Galapagos “Gold Cards” reflect entitlements that create the possibility of capturing economic rents. Access to these “Gold Cards” is restricted; normal forces of supply and demand are not in effect.

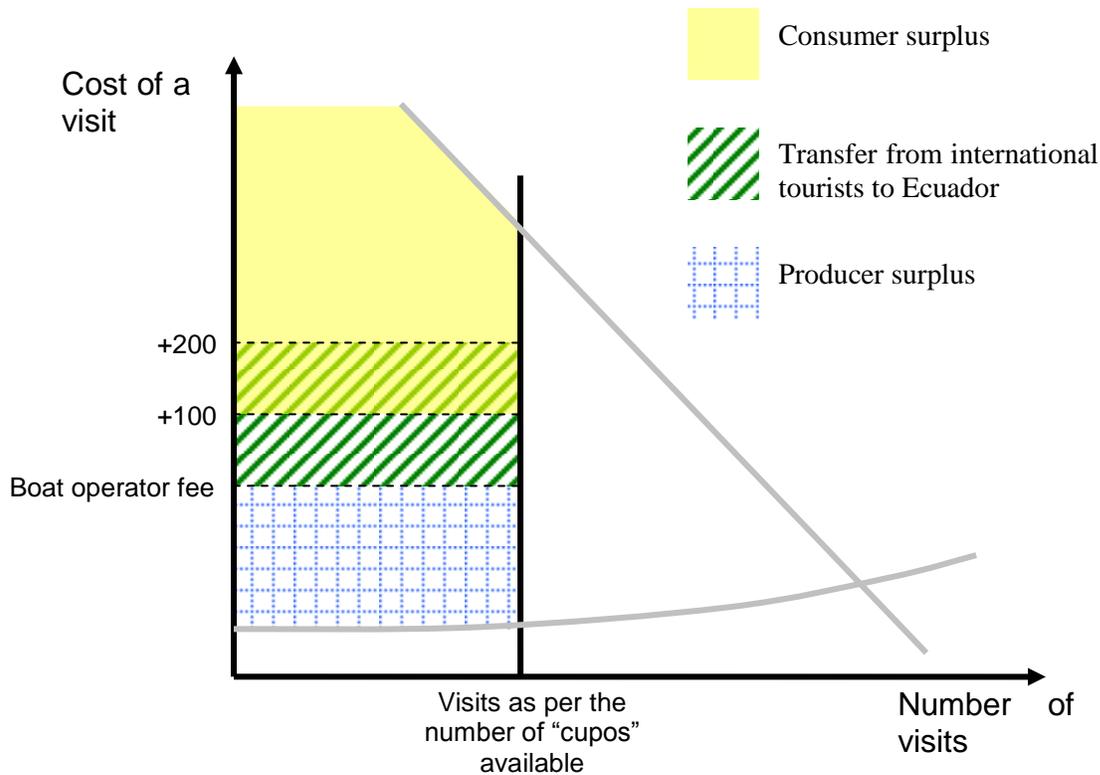
**Cupos and patentes.** All of the live-on-board boats that operate the normal tours in the Galapagos have to have a *cupo*, or permit/quota, for a certain number of berths. There is some debate over whether or not *cupos* are *para siempre*—forever—or if they can be taken back by the issuing authority (and it is not entirely clear yet how the *cupos* were initially allocated). Those who hold the *cupos* believe that they are issued *para siempre* and are an entitlement that can be bought and sold. Some government officials believe that they are not issued forever. Since the holding of a *cupo* is so essential to operating a tourism business in the Park, they are both very valuable and closely guarded. (The number of places/berths authorized by the *cupos* has increased from 1,657 in 1998, to 1,897 in 2005; Taylor, Stewart, and Hardner 2006). The *patente* is merely the annual operating permit (approved by the National Park) and plan of action, but is entirely dependent on holding the *cupo*. The issuing and “status” of *cupos* need to be clarified.

The total number of *cupos* issued at present is over 1,800, so this effectively limits the total number of boat-based visitor nights available each year in the Galapagos. Some “back of the envelope” math confirms this. If the average boat operated for 11 months (with a month off for maintenance and repairs), this would mean that 1,800 *cupos* results in about 594,000 potential berth-nights (1,800 *cupos* x 11 months x 30 days in a month). If the average boat tour lasts from 3 to 7 days, this is equivalent to 198,000 visitors per year if all visitors went on 3-day trips, or 84,857 visitors per year if all went on 7-day trips. Since actual visitor numbers at present (and these include land-based visitors) are in the 105,000 to 115,000 range, the boats would appear to be operating at reasonably high occupancy rates, with most visitors on longer trips.

New entrants into the sea-based tourism market are restricted to those who can secure *cupos*. Usually this means buying *cupos* from an existing *cupo* holder. For operators who want to operate a larger vessel (and the largest vessels in use at present have about 96 berths) it is necessary to buy several smaller *cupos* and aggregate them into the total needed for the larger-capacity vessel. It is reported that there has been a process of consolidation in the sea-based tourism industry—both with respect to ownership and capacity. An increasing share of the multi-day trips are on larger-capacity vessels. The yearly *patente*, issued by the National Park is important and a small fee is paid per berth per year based on the number of *cupos*/berths for each boat. Table VII.3 lists the current annual fee structure for *patentes*, which are \$250 or less per year, or less than 1 dollar per berth per night.

The real “Gold Card” in the tourism industry is the *cupo*. No *cupos*, no *patente*, no visitors. Although it is difficult to estimate the value of a *cupo* (since no transparent market or auction has been used to allocate them), their value is large and can only grow since demand for visitation will increase in the future and the number of *cupos* is fixed at present. Figure VII.1 presents a stylized version of the supply of and demand for sea-based tourism in the Galapagos with the *cupo* system in place.

**Figure VII.1. Supply and Demand for Park Admission and Impact of Increasing the Entrance Fee**



**Residency cards (and the *Ley Especial para la Provincia de Galapagos, 1998*).** The second Gold Card that exists in the Galapagos is the Residency Cards that were issued to all residents when the *Ley de Galapagos* of 1998 went into affect (for details on the special law see Box VII.1). This law required a special amendment to the National Constitution to allow the restrictions on residency, property rights, and business rights included in the Special Law. Since the Galapagos is a province of Ecuador and has two *diputados* (congressmen) in the National Congress, the residency card allows one to vote in the Galapagos, work there, buy cheap air tickets to Guayaquil or Quito,<sup>34</sup> and invest in the Galapagos. Others, such as individuals from the mainland of Ecuador (referred to as the *continente*), do not have these rights. They can obtain short-term work permits (usually valid for three to six months), but cannot legally stay in the Galapagos forever to work or invest. Hence the identity cards, especially when joint investments are concerned (residents plus nonresidents), are a very valuable entitlement and an excellent way to capture some extra economic rents.

<sup>34</sup> Residents of the Galapagos enjoy some of the cheapest airfares in the world: a roundtrip ticket to Quito costs about \$110 for a resident, about \$220 for other Ecuadorians, and close the \$400 for a foreigner.

At present the only way to become a resident of the Galapagos is through birth (to a resident) or marriage. There may be some other ways to obtain a residency card but I was not able to find out how this could be done (or if it was even legal). As with any artificial restriction (including the *cupos*) the residency card creates a failure in the market and the possibility of capturing extra economic rents by those who hold the entitlement.

#### **Box VII.1. Special Law for Galapagos and other Institutional Milestones**

In 1998, Ecuador passed the Special Law for Galapagos (SLG) (*Ley Especial para la Conservación y Desarrollo Sustentable de la Provincia de Galapagos*), based on the recognition that ecological isolation must be kept, that evolutionary processes should be protected, and that the precautionary principle should be applied. Prior to this landmark legislation, an amendment to the national Constitution was passed by the National Assembly to allow for the placement of restrictions on residency, property, and business rights that would otherwise apply to all Ecuadorians.<sup>a</sup>

Among other things, the SLG establishes the legal and institutional framework that regulates activities in the Galapagos on the following: (a) residency and migration, (b) fisheries management, (c) regional planning, (d) tourism development, (e) waste management, (f) agriculture, (g) environmental impact assessment, and (h) invasive species. The SLG also addresses population growth and established the legal basis for implementing educational reforms. The law also declared the archipelago's marine zone as a protected area and gave it the status of a marine reserve. As a result, fishing became restricted to just certain zones within the Galapagos Marine Reserve (RMG) and was limited exclusively to in-shore fishermen.

In spite of the visionary aspects of the SLG, which provides a legal and institutional framework for key actors, there are shortcomings in its formulation and scope that limit its potential as a planning tool. For instance, the SLG relies to some extent on regulations at the sector level in order to guide how the law ought to be applied. In the absence of regulations for some key sectors, and given the plethora of institutions in the archipelago, governance in Galapagos has been chaotic and has led to friction and clashes among key stakeholders and interest groups. Furthermore, the decisionmaking process among key stakeholders is weak and is exacerbated by a power vacuum among central government agencies.

a. Other key milestones include: (a) creation of the Charles Darwin Foundation and the establishment of the Galapagos National Park (1959); (b) inclusion as a World Heritage Site by UNESCO (1978); (c) initiation of the Galapagos Inspection and Quarantine Program (1999); (d) IUCN includes the entire endemic flora of Galapagos on the red list of endangered and threatened species (2001); (e) the Government of Ecuador passes the Law for Total Control of Introduced Species in Galapagos (2003); and (f) the Galapagos Marine Reserve is recognized as a particularly sensitive area by the International Maritime Organization.

### **5. Sharing the Gold: A Better Division of the Economic Benefits?**

A set of recurring themes during my brief visit to Ecuador and the Galapagos in March 2007 was the need to maintain the ecological stability of the Galapagos, to prevent the introduction of invasive species, and to increase the generation of economic benefits from the Galapagos and to retain more of those benefits within Ecuador and especially within the Islands themselves. One person even referred to the potential conflict between conservation and economic development as *tortuga o gente*—people versus land tortoises!

Although a few people have suggested a “no-growth” policy for the Galapagos, and a decrease in either visitor numbers or the resident population living there, neither of these options is probably feasible or desirable. There are, however, very real questions about the nature of growth, the direction it will take, and how growth can be both economically equitable and ecologically sensible, and therefore more sustainable. Although this goal is a difficult one, the unique

characteristics of the Galapagos and the large economic rents associated with demand by tourism and research, means that it may just be possible to achieve such a goal.

**Increasing Visitor Number and Increasing Local Benefits.** There are three dimensions that need to be taken into account in considering management options for the Galapagos: increasing visitor numbers, increasing economic rent capture, and increasing the share of benefits going to residents of the Islands.

Several main options exist concerning visitor numbers: no increase in overall numbers, increase in visitor numbers with shorter average trips (and no increase in the *cupos*), increase in visitor numbers with an increase in *cupos* and live-on-board spaces, or increase in numbers with increased land-based tourism. Each has different implications with respect to revenues (entrance fees, trip costs, other expenditures) and the distribution of those revenues.

If the goal is to increase the amount of benefits (and employment) created in the Galapagos, then there is a strong preference for increased land-based visitation and/or linked boat plus land packages. At present the land-based visitors spend much less per person per day (perhaps in the range of \$50 to \$75 on average compared to some \$250 to \$400 for boat-based visitors), but potentially much more of the money is spent in the Galapagos and stays behind.

**Increasing Revenues/Rents Captured.** The present admission fee of \$100 for foreigners and \$6 for Ecuadorians (with reduced fees for children) is an important source of dependable income to the Galapagos. Among the highest admission fees to a national park anywhere in the world, the present fee seems to have no measurable impact on demand. Unique resources can command unique fees. The present collection (along with *patente* fees) is about \$8 million to \$9 million per year and is divided among a number of parties (see Table VII.4 for more details).

Given the pattern of demand the fees could probably be doubled (to \$200 per person for foreigners) with no measurable impact on demand. Since Galapagos tourism is already a quite high-end product, and constrained more by capacity than demand, normal supply and demand curves do not apply. The present situation is illustrated in Figure VII.1 where an increase in admission fees has basically no impact on demand—it is merely extracting some of the consumers' surplus that would normally go home with the visitor (or be extracted by the tour operators). Figure VII.1 also has a notional supply curve, but with the capacity restrictions in place now we really do not know what a market-clearing equilibrium of price and demand/visitation would be.

**Increasing local benefits.** There are three main options for increasing local benefits: improved training, increasing local hires, and expanded land-based tourism. All three of these are linked, but the need for improved training is probably the core need. Time and again I was told that it was necessary to import labor since local residents did not have the needed training. This argument, of course, is somewhat circular and self-serving. If proper training is not available in the Galapagos, it is always easier (and cheaper) to bring in nonresidents to perform needed jobs. In addition, both the local income level and salary expectations are higher in the Galapagos than on mainland Ecuador. The result is the large number of both legal and illegal workers, even though their residency in the Galapagos is temporary.

A related, and more difficult, issue is the extent to which land-based tourism should be promoted (*tourismo con base local*). Land-based tourism, much of it lower cost than the ship-based variety, has expanded rapidly. It does create local jobs and income from both construction and services, and caters to a different clientele. One important impact on the Park, however, is that day trips (the predominant form of Park use by land-based tourism) tend to be concentrated in certain areas because of the time available. If this sector grows quickly there may well be congestion issues at certain locations within the Park. The economic tradeoff between sea-based and land-based tourism is interesting. There is no question that boat-based tourists spend MUCH more per person per day, but the impact on the local economy is much less per dollar spent. Land-based visitors, on the other hand, tend to be more budget-constrained but, they do purchase goods and services from the local economy and this is seen as very desirable.

**Invasive species and links to increasing numbers of people and inputs.** A major concern of the conservation community is the introduction of invasive species that will threaten the fauna and flora of the Galapagos. This is a legitimate concern and even with the quarantine measures now in place it is increasingly likely that increased visitor numbers, and increased imports of almost everything consumed by both residents and visitors, will result in more introduced, invasive species. After having evolved in complete isolation for hundreds of thousands of years, the fauna and flora of the Galapagos is sensitive to new species and there have already been a number of major ecological disasters as a result of invasive species—feral goats and cats being only two notable examples. There is no question that increased economic activity will mean increased imports of goods and more visitors. This issue is being addressed by a number of projects and is a topic that requires constant investment and vigilance.

## **6. Summary of Key Policy Issues—Conservation and Development**

There are differing views on how well the Galapagos ecosystem is being protected, and various international agencies and nongovernmental organizations (NGOs) have raised important cautionary flags. Nevertheless, the functioning of the Galapagos as an ecological and economic system could be improved. Any improvement, however, is part of a complicated set of social and economic decisions that are closely interlinked. As mentioned, there is also the clear need for a “champion” who will bring the political will and public support together to affect changes.

The uniqueness of the Galapagos generates the economic surplus or rents that are a focus of this section, but at the same time, that very uniqueness is threatened by unwise development. However, the existence of the strong tourism and scientific demand for the Galapagos makes it possible to consider future scenarios where both economic and ecological objectives can be met. People from around the world will continue to come to the Galapagos to see this very unique ecosystem.

Among the points to consider are the following:

1. **Carrying capacity of the Galapagos.** Although localized overuse may happen, the National Park as a whole is probably still below its maximum carrying capacity, especially at many more-distant landing sites. A major management issue, however, is the impact of trends to increased land-based tourism and shorter boat-based visits. Both trends may put increased pressure on the more accessible sites, thereby leading to localized carrying-capacity issues. This is an important management issue that

- needs to be explicitly considered when examining the total number of annual visitors, the average length of boat-based trips, and the division between boat-based and land-based visitation. Although the actual carrying capacity depends on many variables (including length of stay and locations visited), it is probable that a sustainable level is less than 200,000 visitors per year, and not the millions of visitors received by some island destinations
2. **Growth versus no-growth.** If there is a maximum carrying capacity then one needs to plan how to maximize economic benefits without counting on continuing rapid growth in visitor numbers. It is unrealistic to call for no growth in either visitor numbers or economic activity. The issue is what increase in land-based tourism should be allowed, and, even with no increase in *cupos*, what should be the trend in average length of trip. More land-based tourism and shorter average boat trips will both lead to more visitors per year. The strong pressures for increased land-based tourism (and consequently more economic benefits for the resident population) are a major policy and management issue. And given present visitor numbers, there is still some room for increased numbers—but preferably with each visitor leaving more economic benefits behind.
  3. **Increasing use fees.** Two main opportunities exist for directly capturing more of the economic rents (both consumers' and producers' surplus) from tourism in the Galapagos. The first is increasing the admission fee (especially for foreigners) perhaps to as much as \$200 per person. The proposed increase would be labeled as a special “conservation fee” and would go to a special fund. (A graduated fee could also be introduced with a basic flat fee, and additional charges per day for longer stays, so that length of visit, and use of the natural resources, is reflected in the fees paid.) A \$100 per person increase would capture part of the consumers' surplus of visitors and would generate about \$10 million per year. A second opportunity is to capture part of the producers' surplus of tour operators by increasing the annual *patente* per berth fee. Since there is a strong sense that the *cupos* are entitlements, a fee increase would capture part of the economic rents that clearly go along with holding a *cupo*. If the present very low fees were increased 5 to 10 times, this would generate another \$2 million or more per year. These monies would also go to the new conservation fund. (Note that this increased “rent capture” would still leave considerable economic rents for both visitors and tour operators.) Using any new monies wisely is another matter, and a suggested mechanism (a Galapagos Conservation Fund) is discussed later.
  4. **Increasing local benefits.** In addition to increased rent capture from tourism, a major thrust in recent discussions has been how to increase the share of economic benefits that go to the residents of the Galapagos. This means increasing local “content” in the various services offered, and increasing the skill mix of the local population so that more of the higher-paying jobs go to residents. Training is a key component and training opportunities will need to be re-thought and strengthened. Perhaps a Galapagos Academy could be established to train residents in needed skills (ranging from guiding and interpretation services, to cooks and health care workers).

A second component is a stronger institutional commitment to requiring a larger local content' in staffing of all commercial activities. This cannot happen instantly but can be put in place over a period of a few years (and in step with increased training opportunities). Increasing local benefits does not have to favor either land-based or

sea-based tourism. Both can evolve in a way that provides more local economic benefits—but this will not happen without active government and private sector involvement and commitment.

A related and very delicate issue is that of residency, work permits, and in-migration. As mentioned, the Special Law of the Galapagos creates important rents for those who have resident cards. Although one can use this “gold card” to capture economic rents by being a “silent partner” in business or investments, it is preferable if residents had meaningful and well-paid productive jobs within the Galapagos economy. Training and specialized skill development will be an important part of this process.

5. **The location of future development.** Although the main focal point of tourism is on Santa Cruz (and the airport on Baltra), there are competing centers in San Cristobal and, to a lesser extent, Isabela. Similar development versus conservation issues occur in all locations, and planning needs to consider the benefits and costs of dispersing tourist arrivals and boat departures among different sites. A change in the present pattern would also have an impact on congestion and carrying-capacity issues in certain locations.
6. **A new conservation fund.** If increased rents are extracted from both visitors and the tourism industry, it is proposed that these monies go to a newly created **Galapagos Conservation Fund**. This Fund would be separate from the present fund receiving admission fees and would be managed in an open and transparent manner by a Board with representatives of the public and private sector. The monies in the Fund would be used to support various activities that promote the long-term economic and sustainability of the Galapagos as an ecosystem. Uses can include such activities as quarantine and invasive species control, training and education for residents and visitors, or habitat conservation and management. (The present institutional structure in the islands and the strong positions of various vested interests will make implementing this suggestion very challenging.)
7. **Invasive species.** Perhaps the biggest threat from increased tourism and increased economic activity is that of invasive species. The present system of quarantine is not perfect and invasive species have become a major issue. Goats, dogs, pigs, cats, rats, blackberry, and guava are just a few of the aggressive invasive species that have been introduced to the islands. Although not considered here, the style and size of tourism and economic development will have a major impact on the threat of invasive species and must be planned accordingly.
8. **Ecological sustainability.** A fundamental underlying issue that is not addressed here is the ecological sustainability (and both local and overall carrying capacity) of the Galapagos and how future development will affect the very thing that attracts so much interest and visitation. The Galapagos National Park, the Charles Darwin Research Station, and various government agencies and NGOs are all concerned with the sustainability of the island ecosystem and need to be part of the discussion of future options, since they are such important stakeholders in the Galapagos. There is also substantial international financial support from multilateral and bilateral agencies for these programs.
9. **Subsidy reduction.** A final important economic issue, although one not addressed here, is subsidies. Economic subsidies distort markets and they should be reduced or eliminated. This is especially true for commercial users of the Galapagos, who should pay the full costs of resource use. If energy (fuel) subsidies are reduced this will lead

to some price increases, but there is enough money flowing through the system (and willingness to pay on the part of visitors) that subsidy removal should not affect longer-term demand and profitability. It is realized that price adjustments (whether for admission fees, *patente* fees, or energy costs) are never easy or popular to implement, but these changes will help capture more of the rents generated by the unique resource that is the Galapagos. There is no justification for mainland Ecuadorian taxpayers to subsidize visitors to the Galapagos.

### **Box VII.1. Extracting Economic Rents from Tourism**

Other countries with unique resources have been successful in limiting access and extracting extra “economic rents” from visitors (often by increased entrance fees). The Galapagos are definitely unique and therefore could be more aggressive in collecting some of the extra value associated with its uniqueness. Although the “cupo” system and the limits on the number of berths available are not really found elsewhere in the world, there are some interesting land-based parallels:

1. Bhutan strictly limits the number of annual visitors and “charges” a fixed daily fee that covers modest accommodations, meals, and tours, but also includes a substantial element of “rent extraction.” In contrast, Nepal welcomes very large numbers of visitors per year and extracts very little or no rent per average visitor. However, Nepal also has Mt. Everest, a unique resource, and the Government allows only a fixed number of expeditions per year and each one has to pay a healthy fee to the Government for this right.

Although we cannot say what a “cupo” is worth on the open market, since it is a form of access control or quota, it definitely has value. In New York City, for example, the equivalent of a “cupo” is a taxi medallion—a permit that allows the owner to operate one taxi within New York city. The price of a taxi medallion is very high (no medallion, no taxi!)—more than half a million dollars.

The Galapagos has already introduced the idea of two-tiered entrance pricing: nationals and foreigners. This is increasingly common in many countries (for example, Costa Rica, Jordan, Kenya, and Russia, among others) and the uniqueness of the Galapagos suggests that this difference can be increased even further in the Galapagos without reducing demand.

2. There are precedents for the proposed Special Fund for the Galapagos. In Costa Rica, for example, a *Fundación de Parques Nacionales* was established to serve a similar function—a place where conservation-related fees and donations could be collected and then managed for a distinct purpose—the conservation of Costa Rica’s national parks (and separate from the normal governmental park service). These special funds can often be more focused and efficient in their use, and serve as a “neutral” place where external groups can make donations for conservation. The same approach is also commonly used to support other cultural resources like museums, zoos, and the opera or theater.



## VIII. Addressing Climate Change at the National Level

National planning in Ecuador does not sufficiently anticipate the potential economic, environmental, and human risks of climate change nor incorporate adequate measures to adapt to them. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), released in April 2007, notes that “even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades, which makes adaptation essential.” While Ecuador is only a minor contributor of global greenhouse gases, it is highly vulnerable to the impacts of climate change because of its geography, diversity of microclimates, dependence on glaciers for water supply and hydropower, and vulnerability to periodic El Niño and La Niña climatic effects.

To minimize the impacts of climate change Ecuador urgently needs to develop a national climate change strategy, better data collection and monitoring, improved risk management coordination, and sources of financing to fund these efforts. At the same time, Ecuador should strengthen its efforts to mitigate the problem, particularly through better land use management, conservation of biocarbon sinks, capture of natural gas associated with oil exploitation, and reform of fuel pricing policies to foster more rational energy use and lower carbon emissions.

### 1. Climate Change Evidence, Risks, and Threats in Ecuador

Because it spans the Amazon Basin, the high Andes, and the Pacific coast, Ecuador has an unusual diversity of ecosystems and microclimates for a relatively small country. Its equatorial seasons are defined by wet and dry periods in the precipitation cycle, which are critical to the economy and highly sensitive to El Niño variations, which in turn are influenced by global warming. These features, combined with its overall socioeconomic and environmental vulnerability, make Ecuador one of the more vulnerable countries when it comes to climate variation. Increasing temperatures, changes in precipitation, receding glaciers, and greater frequency of extreme events such as floods, droughts, and heat waves are projected to impose significant costs on the country and will particularly effect the poorest populations and areas. The 1997–98 El Niño event, which caused economic losses equivalent to about 14 percent of GDP, gives an idea of the scale of potential climate change impacts for Ecuador.

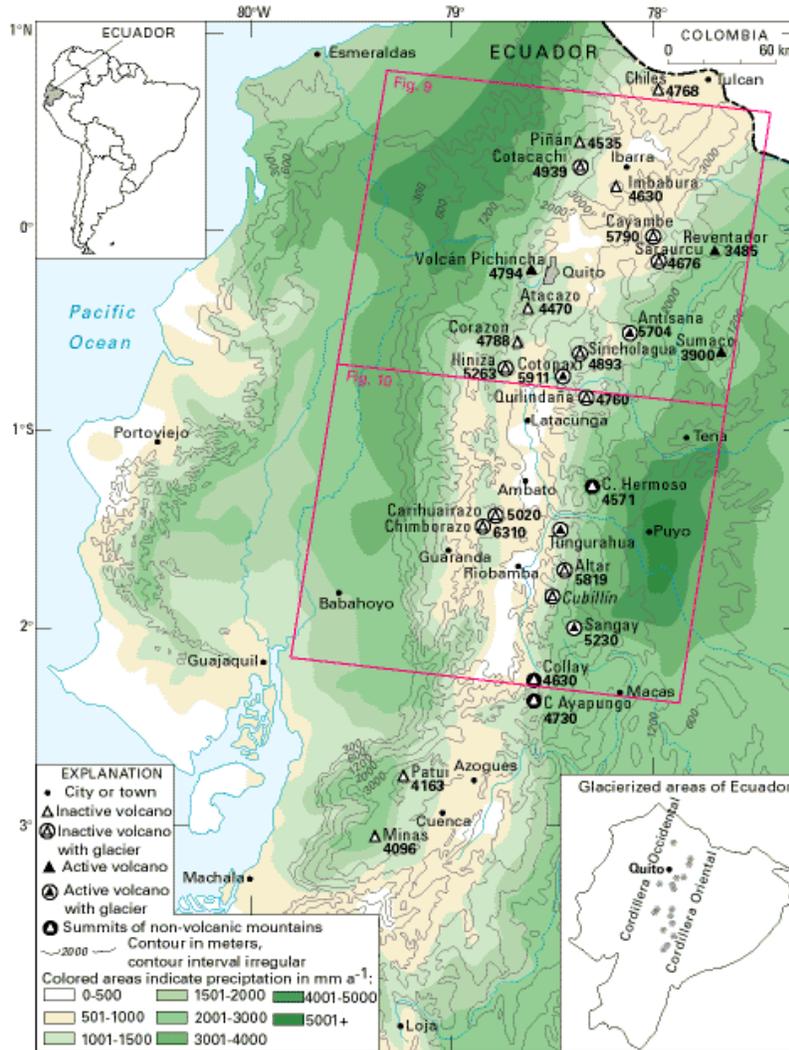
***Changes in Temperature and Precipitation:*** Monitoring data compiled by Ecuador’s National Institute of Meteorology and Hydrology (INAMHI) reveal a sustained increase in temperature that in some areas exceeds the average worldwide increase. Several cities have also begun recording unusual heat waves in recent years. Changes are occurring in the distribution, timing, and intensity of precipitation, leading to unexpected flooding and droughts that have required declarations of emergency by the national government. For example, for the past seven years in the city of Guayaquil, the rainy season has started later and ended earlier than normal. In four of the past seven years there have been precipitation events in January in which 50 to 80 percent of the month’s expected rainfall fell in a single 24-hour period.

***Increase in Extreme Events and Greater Vulnerability to El Niño and La Niña:*** The harshest effects of climate change on people are often from extreme weather such as heat waves, droughts, floods, and hurricanes. According to the DesInventar database of the Social Studies Network for Disaster Prevention in Latin America (*La Red*), Ecuador recorded 3,589 disasters between 1970 and 2003, with their frequency increasing dramatically during that period. Fifty-nine percent of these disasters were associated with hydrometeorological events, mainly

involving heavy rains, flooding, and landslides. Flooding particularly affected coastal areas, whereas landslides occurred more frequently in the Andes and the Amazon. These events and their severity are influenced by El Niño and La Niña cycles. Besides causing several hundred deaths and leaving tens of thousands homeless, according to the Economic Commission for Latin America (CEPAL) and the Andean Development Corporation (CAF), the 1997–98 El Niño phenomenon caused direct damages and economic losses equivalent to about 14 percent of gross domestic product.

**Glacier Retreat and Impacts:** Glaciers, considered one of the most sensitive indicators of climate change, are receding rapidly in the tropical Andes (IPCC 2007; Enever 2002). Glaciers are the source for one-third of Quito’s drinking water and feed many of the rivers that Ecuador relies on for hydropower generation, which accounts for 50 percent of the country’s electricity requirements. Studies done by INAMHI and the French Institute for Investigation and Development found that over the past 20 to 30 years there has been a 30 percent loss in the mass of the Cotopaxi glacier and considerable receding of the Antisana and Chimborazo glaciers. The

**Figure VIII.1. Ecuadoran Andes: Glaciers, Volcanos, and Precipitation Patterns**



Source: USGS (1998).

Cotacachi glacier has disappeared entirely, causing decreased water availability in surrounding areas that have contributed to a decline in agriculture and tourism, loss of biodiversity, and emergence of conflicts over water that are expected to worsen over time (Map VIII.1).

**Vulnerable Sectors:** The sectors most vulnerable to climate change in Ecuador include forestry, agriculture, water resources, and hydropower, as well as marine and coastal zones, low-lying areas susceptible to flooding, and areas vulnerable to erosion, glaciers, and páramos.<sup>35</sup> The energy, transport, infrastructure, and health sectors are also vulnerable to changes associated with climate change. In meetings with the Bank in April 2006, the Ecuadoran Environment Ministry identified agriculture, forestry, and energy as its priority sectors for mitigation. The 2007 IPCC report identifies projected climate change impacts and vulnerabilities for Latin America generally, many of which pertain to Ecuador (Box VIII.1). Despite its vulnerability to climate change, Ecuador has not taken important actions such as incorporating adaptation issues into national planning, strengthening the quality and coverage of meteorological and hydrological monitoring stations (which have declined substantially), expanding its limited network of early warning systems, improving communication between scientific researchers and decisionmakers, and addressing climate issues separately from natural hazards.

#### **Box VIII.1. IPCC Summary of Projected Climate Change Impacts in Latin America**

- By mid-century, increases in temperature and associated decreases in soil water are projected to lead to gradual replacement of tropical forest by savanna in eastern Amazonia. Semi-arid vegetation will tend to be replaced by arid-land vegetation. There is a risk of significant biodiversity loss through species extinction in many areas of tropical Latin America.
- In dryer areas, climate change is expected to lead to salinization and desertification of agricultural land. Productivity of some important crops are projected to decrease and livestock productivity to decline, with adverse consequences for food security. In temperate zones soybean yields are projected to increase.
- Sea-level rise is projected to cause increased risk of flooding in low-lying areas. Increases in sea surface temperature due to climate change are projected to have adverse effects on Mesoamerican coral reefs, and cause shifts in the location of south-east Pacific fish stocks.
- Changes in precipitation patterns and the disappearance of glaciers are projected to significantly affect water availability for human consumption, agriculture, and energy generation.
- Some countries have made efforts to adapt, particularly through conservation of key ecosystems; early warning systems; risk management in agriculture; strategies for flood, drought, and coastal management; and disease surveillance systems. However, the effectiveness of these efforts is outweighed by lack of basic information, observation, and monitoring systems; lack of capacity building and appropriate political, institutional, and technological frameworks; low income; and settlements in vulnerable areas, among others.

*Source: IPCC WGII Fourth Assessment Report, April 6, 2007.*

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<sup>35</sup> See the 1998 “Study of Climate Change in Ecuador” and the First National Communication of Ecuador for the United Nations Framework Convention on Climate Change (UNFCCC) in 2001. The Second National Communication Project Document includes results of a consultation process carried out in 2005 and identifies four priority sectors for evaluation: geographic propagation and frequency of tropical diseases, vulnerability of hydroelectric generation with respect to changes in the future availability of water, impacts of climate change in the forestry sector, and food security vulnerability with priority attention on staples. The Andean Regional Program on Adaptation focuses on glaciers and includes the Antisana glacier as a pilot for analysis of impacts on potable water, hydropower, and páramos.

## 2. Institutional Responses and Gaps

Ecuador participates in global efforts to address the causes of climate change, reduce its impacts, and adapt to its effects, and has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. Participation in international climate change negotiations is coordinated by the Ministry of Environment, but due to lack of financing only two Ecuadorian delegates participate in most cases, one funded by the UNFCCC Secretariat and another by international cooperation agencies interested in carbon markets.

Ecuador is also part of the Iberoamerican Community and participates in the Iberoamerican Network of Climate Change Offices (RIOCC), which meets independently and in subsidiary sessions of the UNFCCC Conference of the Parties. The RIOCC's work plan prioritizes vulnerability and adaptation, but it needs greater political momentum and economic resources for implementation. An initiative it supported in 2006 in Guayaquil is notable for bringing together risk management, climate change, and meteorological experts to identify synergies and undertake joint work.

The Andean Community (CAN), which includes Ecuador, has also initiated several efforts on climate change, including drafting a proposal for an Andean Strategy on Climate Change and approving an Andean Environmental Agenda for 2006–2010 that included a climate change component. Climate change was one of the three areas of consensus (along with biodiversity and water resources) agreed by the Andean Committee of Environmental Authorities in 2002 as a follow-up to the Johannesburg World Summit on Sustainable Development. However, after an initial push, the Community's activities on climate change have waned. Currently, CAN is still planning to issue a final Andean Climate Change Strategy and Action Plan that will include prioritized activities, alliances, and established resources; develop projects on renewable energy and on climate change vulnerability and adaptation; and create a strategy for coordination with the "Support for Disaster Prevention in the Andean Community" project.

There are about a dozen agencies in the national government with mandates relevant to climate change (see Table VIII.1). The National Climate Committee (CNC), created by executive decree in 1999, is responsible for climate policies and strategies in Ecuador and includes representatives from several ministries and institutes. The CNC also established the institutional mechanisms to implement the Clean Development Mechanism under the Kyoto Protocol.

***National Climate Committee (CNC):*** The CNC's mandate is to propose, define, and establish policies and strategies for implementing the UNFCCC. The regulation establishing the CNC identifies 11 working groups, 4 of which have been established on a preliminary basis. In practice, the work of the CNC has basically consisted of the actions and proposals of the Ministry of the Environment. The working groups that have been formed have made some advances, but do not have an institutionalized structure and operation. The working groups were seen as a vehicle by which to institutionalize the issue of climate change under the leadership of agencies in the relevant sectors, but that objective still has not been fully achieved. The lack of budget for the CNC has been a very significant limitation.

**Table VIII.1. Principal Agencies Involved in Climate Change Issues in Ecuador**

Entity	Description/Mandate
National Climate Committee (CNC)	Created by executive decree in 1999 to propose, define, and establish policies and strategies for implementing the UNFCCC. Composed of the Ministry of Environment, Ministry of Energy and Mines, National Council for Higher Education (CONESUP), Ecuadorian Committee for Environmental Defense (CEDENMA), INAMHI, the Coastal Chamber of Commerce, and the Sierra Chamber of Commerce.
Ministry of Environment	Functions as national environmental authority, Global Environment Facility Operational Focal Point, and President of CNC, AN-MDL, and CORDELIM. Currently, working on project to develop Second National Communication to UNFCCC, National Climate Change Strategy, and GEF-funded National and Regional Adaptation projects.
AN-MDL	National Authority for the Clean Development Mechanism, government entity for national institutionalization of the carbon market.
CORDELIM	Corporation for Promotion of the CDM, private entity for promotion, information dissemination, and support of carbon project proponents.
INAMHI	National Institute of Meteorology and Hydrology, generates critical information on hydroelectric facilities and freeze warnings, responsible for the network of climate and surface water monitoring stations.
National Network of Meteorological Stations	Established in the mid-1980s with 1,000 meteorological and hydrological stations, of which only about one-third are still in operation; information is no longer considered adequate.
SENPLADES	National Secretariat for Planning and Development, recently strengthened and preparing a National Plan for Social and Productive Development 2007–15
INOCAR, INP	Navy Oceanographic Institute and National Fisheries Institute. Provide oceanographic and fisheries information that helps monitor events such as El Niño.
National Civil Defense Agency	Responsible for natural disaster preparedness and response. Functions with limited budget that often forces a focus on response rather than prevention.
ERFEN	National Committee for the Regional Study of the El Niño Phenomenon. Responsible for monitoring and follow-up on El Niño events.
CORPEFEN and CORPECUADOR	Implementation entities formed by the government of Ecuador after the 1997–98 El Niño event, with the mandate to address impacts caused by El Niño.

**Clean Development Mechanism (CDM):** The Ecuadorian model for the carbon market gives the National Authority for the CDM (AN-MDL) responsibility for its regulation, and the Corporation for Promotion of the CDM (CORDELIM) responsibility for its promotion. In practice the actions of CORDELIM have primarily been sustained by international cooperation secured by the Ministry of Environment, and its efforts have been important for the promotion of the CDM at the national level. However, this dependence on international financing without using the option of marketing its services appears to be weakening CORDELIM’s sustainability and institutional effectiveness. In addition, more proactive development of national carbon market legislation is needed, including formalized procedures, a legal definition of certified emissions reductions, and other details described in the consultant study for the CEA.

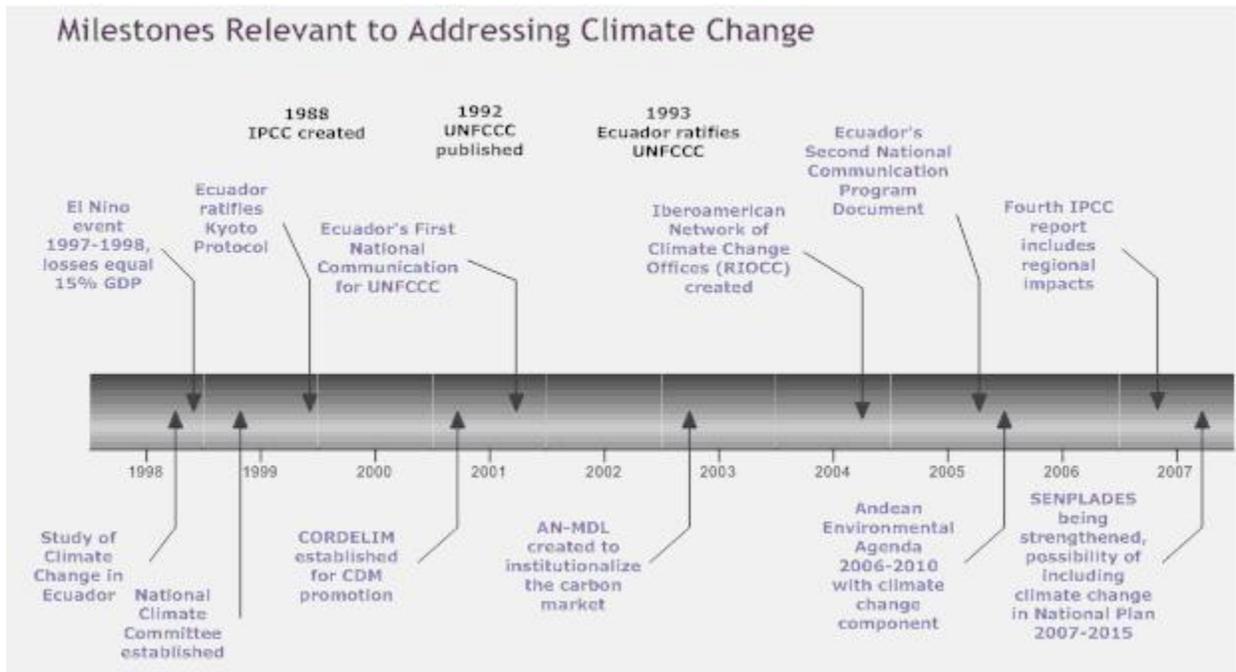
***Ministry of Environment:*** The Ministry of Environment is the national environmental authority and serves as Operational Focal Point for the GEF and president of the CNC, AN-MDL, and CORDELIM. The Ministry's stated climate change priorities are to create a National Adaptation Strategy, promote diffusion and awareness, provide training for human resources, build capacity for conducting analytical studies, include climate change in national and sectoral policies and strategies, and institutionalize the handling of climate change (Ministry of Environment 2006). These priorities were based on the degree of current vulnerability, importance to social, economic, and environmental well-being and basic services, and feasibility (political, economic, institutional). To fulfill its current responsibilities and achieve its planned objectives, the Ministry needs to strengthen its institutional capacity on climate change, incorporate climate change issues more fully into its programs and procedures, elevate the status of its two climate units or "subprocesses," expand its climate change staff, and provide specialized training for its professional staff.

***SENPLADES:*** The National Secretariat for Planning and Development (SENPLADES) has been strengthened recently and is currently preparing the National Plan for Social and Productive Development for 2007–15. This provides a unique opportunity to include, for the first time, adequate consideration of climate change in the Plan, based on the clear ideas and proposals of the CNC and Ministry of Environment regarding national climate strategy.

***INAMHI and the National Network of Meteorological Stations:*** The National Institute of Meteorology and Hydrology (INAMHI) is a national resource that should be strongly supported in its efforts to monitor and communicate climate information through its website and other channels. INAMHI manages the National Network of Meteorological Stations, which since the mid-1980s has been reduced to one-third of its original size. The network needs urgent support from the government and international donors to modernize its instruments, restore its coverage to previous levels (and preferably expand it), and allow it to be operated and maintained in an efficient and systematic way. It is also important to identify specific options for generating the resources needed to sustain these information systems and services, which help sectors such as water, agriculture, and health to reduce their climate change vulnerability.

***Natural Hazard Risk Reduction and Management:*** Early warning systems, which are also limited, should be considered a national priority, especially since the frequency and intensity of extreme hydrometeorological events is expected to increase. Coordination among the members of the ERFEN National Committee, including INAMHI, INOCAR, INP, the National Defense Agency, and the El Niño/La Niña entities, should be expanded to include the CNC. It is also critical that vulnerable sectors be identified and included in early warning systems so they can be more proactive on risk reduction and management.

**Figure VIII.2. Timeline of Milestones Related to Climate Change in Ecuador**



### 3. Recommendations for Addressing Climate Change

The IPCC recommends a mixed portfolio of strategies that includes mitigation, adaptation, technological development (to enhance adaptation and mitigation), and research (on climate science, impacts, adaptation and mitigation). The following recommendations focus on the national institutions responsible for climate change adaptation and mitigation strategies, research and monitoring, and risk reduction and management (Table VIII.2). They are based on the results of an institutional analysis, projected climate trends, current events, and interviews and meetings with researchers and policymakers stakeholders in Ecuador. They also conform to the most recent guidance from the IPCC, such as incorporating adaptation measures into land-use planning, infrastructure design, water resources management, and sustainability programs, and including climate change issues in disaster risk reduction strategies. Climate monitoring systems and program funding were identified as key weaknesses in Latin American and Caribbean countries (see Box III.1) and should be strengthened. Finally, the retreat of glaciers must be closely monitored and an action plan developed to anticipate and address impacts on water storage, hydropower generation, agriculture, and other sectors and groups.

#### *Create a National Climate Change Strategy and Incorporate it into National Planning*

The IPCC recommends that plans for promoting sustainability include explicit measures to either adapt to climate change or improve capacity for adaptation. The recent institutional strengthening of SENPLADES presents a unique opportunity to include, for the first time, adequate consideration of climate change in the National Plan for Social and Productive Development for 2007–15, which is currently under preparation. Immediate action should be taken on this issue and others summarized in the recommendations matrix.

#### *Strengthen Data Collection and Monitoring*

The IPCC report noted that the effectiveness of adaptation efforts can be outweighed by, among other things, “lack of basic information, observation and monitoring systems.” Data collection and monitoring (using meteorological, hydrological, biological, glacial, and other types of data) underpin the climate change planning process by identifying important trends and helping to determine appropriate adaptation strategies. Inadequate instrumentation and data quality weaken Ecuador’s capacity in this area.

#### *Improve Coordination of Risk Management and Early Warning Systems*

There are many entities involved in risk monitoring and reduction, and they require greater coordination and strengthening to design and implement a National Climate Risk Management System.

#### *Develop Permanent Sources of Funding*

Lack of funding for implementation is a key reason that few of the goals defined in Ecuador’s climate change prevention, mitigation, and adaptation strategies have been realized. National planning should include stable budget allocations to enable responsible institutions to carry out their plans and responsibilities regarding climate change. Efforts should also be made to leverage funds from international donors and organizations to supplement these permanent income streams.

#### *Define and Implement Strategies to Respond to Glacial Retreat*

A GEF project is currently under preparation for Design and Implementation of Pilot Climate Change Adaptation Measures in the Andean highlands of Bolivia, Ecuador, and Peru. This project, the studies it is conducting, and action plans it is developing, will be key tools in helping Ecuador respond to the impacts of glacial retreat. The government should also follow up on the lines of action proposed on glaciers in the Andean Environmental Agenda 2006–2010 and work with relevant partners to find synergies between the Agenda’s actions and the planned GEF project. These projects present key opportunities to develop strategies for glacier retreat monitoring and adaptation that draw on experience and information from three countries with similar dependency on glacier-fed waterflows.

**Table VIII.2. Recommendations for Addressing Climate Change**

Entity	Description/Mandate	Requirements	Recommended Measures and Supporting Institutions
<b>1: Incorporation of climate variability and change into national planning, as a strategic element for sustainable development</b>			
National Climate Committee (CNC)	Responsible for developing a viable climate change program.	Expand its national presence with greater political power and resources that will allow it to develop viable processes related to vulnerability reduction, adaptation to the evolving climate situation, reduction of greenhouse gas emissions, and raising public awareness.	Based on lessons learned in the past 8 years of operation: <ul style="list-style-type: none"> <li>Promote development of a national climate policy and its inclusion in the National Plan for Social and Productive Development 2007–15 being prepared by SENPLADES.</li> <li>Develop and propose national government policies and a National Climate Change Strategy.</li> <li>Update structure and functions (including 11 working groups, formalizing membership of the Ministry of Foreign Relations) and obtain national and international resources/funding.</li> </ul>
SENPLADES	Responsible for planning and development; recently strengthened and currently developing a new National Plan for Social and Productive Development.	Consider climate change and variations adequately in the National Plan for Social and Productive Development 2007–15 currently under preparation.	Take the decision to include climate change in the National Plan and incorporate the issue into the different Working Groups. To be most effective the National Climate Committee, led by the Ministry of Environment, will participate directly in the Working Groups.
Ministry of Environment	The national environmental authority, Operational Focal Point for the GEF, and President of the CNC, CORDELIM, AN-MDL.	Strengthening institutional capacity to address its national and international responsibilities.	Give higher status to relevant staff and increase trained staff from the current level of four (two full-time and two part-time), which will require having the National Secretariat for Human Resource Development and Compensation in the Public Sector (SENRES) create a Climate Change Office as a cross-sectoral agency of the Ministry of Environment. Coordinate with SENPLADES to have the CNC participate in crafting the National Plan for Social and Productive Development 2007–15.  Introduce the issue of climate change in Ministry regulations and environmental strategies.
Ministry of Environment and Ministry of Education	Jointly created the National Environmental Education Plan for Basic and College Education.	Resources are needed to implement the Plan (with a strong climate change component).	Actively seek funding to carry forward and implement the National Environmental Education Plan for Basic and College Education.

<b>2: Strengthen systems for climate change observation and monitoring</b>			
National Institute of Meteorology and Hydrology (INAMHI)	Responsible for meteorology and hydrology in Ecuador. Operates and maintains a Network of Meteorological and Hydrological Stations.	Operate and maintain a reliable, nationwide Network of Meteorological and Hydrological Stations (the number of stations has decreased by-one third since the mid-1980s and the accuracy of its information is inadequate).	Design and implement a strategy for: <ul style="list-style-type: none"> <li>• Modernization of instruments through international financing and/or support from private and government sectors (Ministry of Economy and Finance).</li> <li>• Generation of resources for the operation and maintenance of the Network through: <ul style="list-style-type: none"> <li>○ Charging fees for use of information in large projects.</li> <li>○ Agreements with sectoral and local governments and private enterprises for stations located in their jurisdictions.</li> </ul> </li> <li>• Implement a Hydrometeorological Information System focused on facilitating, under established mechanisms, online access for national and international users, with participation from other institutions that provide information.</li> </ul>
Oceanographic Institute of the Navy (INOCAR)	Responsible for study and monitoring of oceanographic conditions. Operates a network of oceanographic and meteorological stations.	Participate in the design and operation of the National System of Hydrometeorological Information.	Establish permanent formal agreements with INAMHI for implementation of the National System of Hydrometeorological Information.
Dirección de Aviación Civil (DAC)	Responsible for generating meteorological services for Civil Aviation. Operates and maintains a network of aeronautical stations.	Participate in the design and operation of the National System of Hydrometeorological Information.	Establish permanent formal agreements with INAMHI for the implementation of the National System of Hydrometeorological Information.
<b>3: Implementation of the National Climate Risk Management System and Early Warning Systems for key sectors</b>			
Civil Defense	Responsible for response to natural disasters. Its scarce resources have limited its actions to reactive responses rather than prevention.	Design and implementation of National Climate Risk Management System (some advances have already been made, but clearer institutional responsibility, agreements, and interinstitutional cooperation are needed), including early warning	Lead a joint effort to design and implement the National Climate Risk Management System, with the participation of directly related institutions.
SENPLADES	Responsible for national planning. In recent years has generated risk management plans in four national		

	sectors.	systems for different users.	
ERFEN National Committee	Responsible for monitoring and evaluation of El Niño events.		Support and participate in the design and implementation of the National Climate Risk Management System. Strengthen the existing early warning systems for El Niño events and establish direct coordination with its primary users.
INAMHI	Generates information and operates certain early warning systems for El Niño events and hydroelectricity generators. Forms part of the ERFEN National Committee.		Support and participate in the design and implementation of the National Climate Risk Management System. Lead the design and implementation of Early Warning Systems with and for users in key sectors such as health, hydropower generation, and agriculture.
INOCAR	Leads the ERFEN National Committee, generates oceanographic information.		Support and participate in the design and implementation of the National Climate Risk Management System. Lead the design and implementation of Early Warning Systems with and for users in key sectors such as fishing, coastal tourism, and maritime security.
National Fisheries Institute	Generates information in fisheries sector and forms part of the ERFEN Committee.		Support and participate in the design and implementation of the National Climate Risk Management System. Lead the design and implementation of Early Warning Systems with/for users in sector.
CIIFEN	International Center for Study of the El Niño Phenomenon.		Support, within the framework of its responsibilities, methodologies related to El Niño events.

**Table VIII.2. Potential Funding Options for Recommended Lines of Action**

<b>Recommendation</b>	<b>Possible Sources of Financial and Technical Resources</b>	<b>Support Entities/Organizations</b>
<p>Inclusion of climate change and variability in national planning as a strategic element of sustainable development</p>	<p><i>National:</i></p> <ul style="list-style-type: none"> <li>• Ministry of Economy and Finance</li> <li>• Institutions responsible for implementation</li> </ul> <p><i>International:</i></p> <ul style="list-style-type: none"> <li>• Global Environment Facility (GEF)</li> <li>• Regional cooperation and integration organizations</li> <li>• International cooperation organizations</li> <li>• Cooperating governments</li> </ul>	<p>Ecuadorian Institute of International Cooperation (INECI)</p> <p>SENPLADES</p> <p>National Climate Committee</p> <p>Board of Directors of INAMHI</p> <p>Ministry of Environment</p> <p>Ministry of Foreign Relations</p>
<p>Strengthening of climate change monitoring systems</p>	<p><i>National:</i></p> <ul style="list-style-type: none"> <li>• Ministry of Economy and Finance</li> <li>• Institutions responsible for implementation</li> <li>• Regional and local governments</li> <li>• Private enterprise</li> </ul> <p><i>International:</i></p> <ul style="list-style-type: none"> <li>• World Meteorological Organization</li> <li>• Global Environment Facility (GEF)</li> <li>• Regional cooperation and integration organizations</li> <li>• International cooperation organizations</li> <li>• Cooperating governments</li> </ul>	<p>Ecuadorian Institute of International Cooperation (INECI)</p> <p>SENPLADES</p> <p>National Climate Committee</p> <p>Board of Directors of INAMHI</p> <p>Ministry of Environment</p> <p>Association of Ecuadorian Municipalities (AME)</p> <p>Consortium of Provincial Councils of Ecuador (CONCOPE)</p>
<p>Implementation of a National System of Climate Risk Management and Early Warning Systems</p>	<p><i>National:</i></p> <ul style="list-style-type: none"> <li>• Ministry of Economy and Finance</li> <li>• Institutions responsible for implementation</li> <li>• Regional and local governments</li> <li>• Users of early warning systems</li> </ul> <p><i>International:</i></p> <ul style="list-style-type: none"> <li>• International Strategy for Disaster Reduction (UN ISDR)</li> <li>• International Red Cross</li> <li>• World Meteorological Organization</li> <li>• Global Environment Facility (GEF)</li> <li>• Regional cooperation and integration organizations</li> <li>• International cooperation organizations</li> <li>• Cooperating governments</li> </ul>	<p>Ecuadorian Institute of International Cooperation (INECI)</p> <p>SENPLADES</p> <p>National Climate Committee</p> <p>Board of Directors of INAMHI</p> <p>Ministry of Environment</p> <p>Ministry of External Relations</p> <p>National Red Cross</p>

## IX. Conclusions and Policy Options

Ecuador has undertaken major efforts to establish institutional and organizational frameworks for environmental management. Although important challenges exist, the country has established a healthy foundation. If the country stays on its path to strengthen institutions, this foundation will support Ecuador in improving environmental quality and natural resource management while at the same time enhancing long-term economic growth and reducing the significant socioeconomic costs associated to environmental degradation. The following aspects stand out as the most salient strengths:

- Ecuador has in place an Environmental Management Law (EML) that provides a sound basis for regulating environmental pollution and resource conservation. The existing legal framework is comprehensive and ambitious in its principles. The EML also opens opportunities for developing an effective set of environmental policy instruments to tackle other environmental concerns.
- The country has established institutions for developing and implementing environmental policies. Key ministries have environmental units and the National Decentralized System of Environmental Management (*Sistema Descentralizado de Gestión Ambiental*, SDGA) provides a strategic foundation to mainstream environmental considerations into sectoral policies.
- Valuable contributions to environmental protection in Ecuador may also be expected from a series of nongovernmental organizations that are engaged with environmental issues at different levels.
- Several mechanisms encourage public participation, which can provide useful inputs to policy development and foster higher levels of compliance with regulations.
- There is an increasing awareness at many levels within the Ministry of Environment (MAE) of the environmental framework's weaknesses, and the desire to address them. Other key government agencies (including the Ministry of Energy and Mining [MEM], the Ministry of Coordination of Social Development [MCSD], the National Secretariat for Planning and Development [SENPLADES], the Ministry of Economy and Finance [MEF], the Ministry of Tourism [MT], and the Ministry of Foreign Affairs [MRE]) also appear to be interested in improving the environmental framework. There is an across-the-board recognition of the need to strengthen environmental protection while at the same time eliminating unnecessary hurdles for economic activity.
- Valuable contributions to environmental protection in Ecuador may also be expected from a number of municipalities that are engaged with environmental issues at different levels (Cuenca, Guayaquil, Loja, and Quito particularly stand out).

Specific ongoing efforts will continue to make the system more resilient, adaptable, and active. Among these initiatives, the following merit attention:

- The recently published regulations on public participation and consultation (October 2006) provide an operational framework to channel the increasing public interest in environmental quality.

- A set of new environmental regulations for hydro and thermoelectric projects was issued in March 2007.
- In April 2007, SENPLADES began coordinating the National Water Resources Council, which will allow for a more integrated approach toward water resources management.
- A framework to further decentralize forest and environmental management responsibilities was issued in October 2006.
- A national strategy on climate change will be issued in July 2007.
- Updated guidelines to conduct and evaluate environmental impact assessments will be published in 2007.

These efforts have carried Ecuador far in effectively managing the environment. However, the overall environmental framework still faces significant challenges that could not only affect the health of Ecuadorians but also hinder the country from achieving sustainable development in the long term. The CEA identified the following key challenges:

- After eight years in operation, MAE needs to be revitalized and reinforced through improved priority setting, planning, coordination, information processing, and funding.
- A renewed effort to establish priorities and coordinate their implementation is needed to tackle Ecuador's environmental degradation problems and to address potentially increasing pressures related to greater natural resource use.
- Ecuador needs to improve its environmental information systems as a means to better support decisionmaking and monitoring.
- Despite important progress, public participation and consultation processes still face a number of weaknesses, particularly with regard to oil operations in indigenous communities' lands.
- Compliance and enforcement are perhaps the weakest aspects within the country's institutional framework for environmental and natural resource management. Without effective compliance and credible enforcement, the deterrent, corrective, and guiding effects of an environmental management framework, and its credibility, are jeopardized.
- The key flaws of the current decentralized licensing system are certification and enforcement. These two weaknesses compromise the effectiveness of the system.
- Apart from the transfer of responsibilities and resources, a successful decentralization strategy requires institutions to increase transparency and accountability, as well as coordination among the different agencies and government levels.
- Regulations and technical standards are also lacking in several areas, in particular regulations for pollution control, zoning, and water resources management, and standards for air, water, and soil quality.

These weaknesses can be tackled effectively in the short term. The new administration's interest in environmental issues creates opportunities for advances in addressing these

challenges and matters that have been delayed or are at a stalemate. Ecuador needs to further strengthen its environmental and natural resource management institutions. Strengthening does not necessarily mean scaling-up or increasing budgets and staff of current organizations. This report concludes that strengthening MAE’s capacity to conduct its core functions; improving policy coordination mechanisms; better supporting environmental decisionmaking through improved information systems and public participation; and stepping up compliance with environmental regulations through enhancement of inspection and enforcement capacities are key pillars of a successful strategy. The following tables show the report’s main recommendations by chapter. The policy options that are expected to have a greater impact and that can be implemented in the short/medium term are in bold.

### 1. Institutional and Organizational Analysis

Objective	Policy Option
Strengthen MAE’s ability to carry out core functions	<ul style="list-style-type: none"> <li>• <b>Strengthen MAE’s planning unit in developing policy that sets out environmental priorities its and compliance units in monitoring the license action plans.</b></li> </ul>
Improve cross-sectoral coordination	<ul style="list-style-type: none"> <li>• <b>Issue regulations to support the operation of the <i>Comisión Nacional de Coordinación (CNC)</i> and that call for the participation of key ministries in the commission.</b></li> <li>• <b>Establish sectoral agendas, through instruments such as strategic environmental assessments, and identify both technical and financial resources required for monitoring agreements.</b></li> </ul>
<p>Decentralization</p> <p>Move focus from transfer of competences to expenditure and functional coordination</p> <p>Capacity building at the subnational level</p>	<ul style="list-style-type: none"> <li>• Strengthen the environmental unit at the <i>Contraloría General del Estado (CGE)</i>.</li> <li>• Create citizen complaint mechanisms within <i>Autoridades Ambientales de Aplicación (AAAs)</i>.</li> <li>• Establish programs to address environmental waterborne diseases and solid waste disposal problems (with the participation of the national, provincial, and municipal governments).</li> <li>• Provide sufficient resources (training, equipment, and budget) to municipal environmental units.</li> </ul>
Improve environmental information	<ul style="list-style-type: none"> <li>• <b>Revitalize the national environmental information network (the RNIA) to provide relevant information on environmental management that supports decisionmaking, policy implementation, and performance monitoring.</b></li> <li>• Adapt the successful experience of the Social Front Technical Secretariat to the environment sector.</li> <li>• <b>Develop results indicators to steer policy</b></li> </ul>

	<b>priorities and accountability.</b>
Promote public participation	<ul style="list-style-type: none"> <li>• Create and support social audit mechanisms for extractive projects (oil, mining, and so forth).</li> <li>• <b>Create an Environment and Natural Resource Observatory.</b></li> <li>• <b>Issue a biennial report on the state of the environment (MAE).</b></li> </ul>
Improve effectiveness and efficiency of the <i>Sistema Unico de Manejo Ambiental</i> (SUMA)	<ul style="list-style-type: none"> <li>• <b>Evaluate the role of licensing and complement it with additional instruments (economic incentives, emission standards, and strategic environmental assessments).</b></li> <li>• <b>Improve the accreditation process (update prerequisites and introduce random audits).</b></li> <li>• <b>Strengthen the environmental unit of the CGE.</b></li> <li>• <b>Strengthen the AAAs follow-up and compliance process.</b></li> <li>• Strengthen public participation in the licensing process.</li> </ul>
Improve compliance with environmental regulations	<ul style="list-style-type: none"> <li>• Consider creating an autonomous enforcement agency.</li> <li>• Establish a compliance promotion program monitored by the CNC.</li> <li>• Establish information-sharing protocols between MAE and the enforcement units of the AAAs.</li> <li>• Improve the monitoring units of MAE and the AAAs by staffing, training, and equipping them adequately.</li> <li>• Promote the creation of independent environmental certification and auditing entities in support of voluntary compliance.</li> </ul>
Make budgetary and special funds allocations more efficient and equitable  Institute for the Eco-development of the Ecuador Amazon Region (ECORAE)	<ul style="list-style-type: none"> <li>• <b>Develop priority-setting mechanisms based on: the costs of environmental degradation, its impacts on vulnerable groups, and the efficiency and effectiveness of interventions.</b></li> <li>• <b>Base distribution of earnings on revenues generated by operations in the region, priority investment needs, and verification of administrative capacity of executing agencies.</b></li> </ul>

## 2. Environmental Health

Objective	Recommended Action
Reduce morbidity and mortality	<ul style="list-style-type: none"> <li>• <b>Improve water disinfection in urban areas.</b></li> </ul>

resulting from waterborne diseases	<ul style="list-style-type: none"> <li>• <b>Strengthen hygiene programs for children under 5.</b></li> </ul>
Reduce environmental health risks associated with ambient air pollution	<ul style="list-style-type: none"> <li>• <b>Develop air quality standards.</b></li> <li>• <b>Monitor PM<sub>2.5</sub> and PM<sub>10</sub> in priority urban areas.</b></li> <li>• Implement air pollution control interventions, including: (a) reduction of sulfur content in diesel, (b) implement inspection and maintenance programs, and (c) improve fuel quality used by industry.</li> <li>• <b>Conduct emissions inventories in major urban centers.</b></li> </ul>

### 3. Oil Sector

<b>Objective</b>	<b>Recommended Action</b>
Strengthening the Ministry of Environment's (MAE's) capacity as sector leader and the Ministry of Energy and Mining (MEM's) capacity to include environmental issues in its operations	<ul style="list-style-type: none"> <li>• Strengthen planning and policy design capacities.</li> <li>• Introduce new planning tools, such as a strategic environmental assessment.</li> <li>• Develop policies in the following areas: land use planning, remediation, recovery of degraded sites, benefit sharing, and energy (including renewable energy).</li> <li>• <b>Improve information systems.</b></li> <li>• <b>Establish indicators to monitor performance and outcomes.</b></li> <li>• Improve environmental impact assessments (EIAs).</li> <li>• Improve monitoring of actions required by licenses.</li> <li>• Establish auditing system.</li> </ul>
Improving the quality of regulations	<ul style="list-style-type: none"> <li>• Update the Substitute Environmental Regulations for Hydrocarbon Operations (especially with regard to enforcement and rights of indigenous peoples and nationalities).</li> <li>• <b>Call for strategic assessments before project approval (at present, EIAs are required after projects have been approved).</b></li> <li>• <b>Establish regulations on prior consultation and public participation in the petroleum sector.</b></li> </ul>
Improving the technical and environmental operations of Petroecuador	<ul style="list-style-type: none"> <li>• <b>Prepare an environmental action plan (quantitative goals, budgets, and schedules) that addresses:</b> <ol style="list-style-type: none"> <li>1. <b>Infrastructure improvement (primary and secondary pipelines, pumping systems, production platforms, systems for crude oil separation, automatic systems to control flows and close valves).</b></li> </ol> </li> </ul>

	<ul style="list-style-type: none"> <li>2. <b>Produced water re-injection.</b></li> <li>3. <b>Clean-up of unremediated oil waste pits.</b></li> <li>4. <b>Waste pits for drilling mud.</b></li> <li>5. <b>Reforest degraded areas near petroleum operation sites.</b></li> <li>• <b>Invest in:</b> <ul style="list-style-type: none"> <li>1. <b>Capturing associated natural gas that is vented or flared.</b></li> <li>2. <b>Upgrading refineries to improve fuel quality, process wastes, and reduce emissions.</b></li> <li>3. <b>Reopening closed wells (improved technology makes them profitable; some were not closed properly).</b></li> </ul> </li> <li>• <b>Restore financial autonomy to Petroecuador.</b></li> <li>• <b>Give authority to the environmental protection unit to design policies and implement plans.</b></li> <li>• <b>Strengthen the environmental units in Petroecuador’s subsidiaries to effectively implement policies.</b></li> <li>• <b>Update plans for emergencies and closure of facilities.</b></li> </ul>
<p>Improving conflict management and benefit sharing</p>	<ul style="list-style-type: none"> <li>• <b>Create a Social Unit to reassert the Government’s leadership as the arbiter of conflict management and benefit sharing.</b></li> <li>• <b>Conduct a strategic assessment of the oil sector in the Amazon.</b></li> <li>• <b>Coordinate territorial planning in the south-central Amazon, including designation of selected exclusion zones where oil operations will not be allowed.</b></li> <li>• <b>Formulate new laws and regulations to respect the collective rights of indigenous peoples and monitor legal compliance with the Constitution, new and existing laws and regulations, and ILO 169.</b></li> <li>• <b>Agree on a policy for sharing oil benefits with local governments and indigenous peoples and establish a single, transparent, and automatic mechanism to implement it.</b></li> <li>• <b>Assess the use of ECORAE resources, ensure their transparency, and incorporate them along with other resources into the new negotiation strategy.</b></li> <li>• <b>Strengthen the role of CODENPE as an executor of public policies and advocate for indigenous rights in relationship to the petroleum sector.</b></li> <li>• <b>Take a direct role in conflict management and benefit sharing, promote tripartite dialogue</b></li> </ul>

	<p>(government, industry, and communities), and negotiate with public and private companies to channel resources through a single benefit-sharing mechanism.</p> <ul style="list-style-type: none"> <li>• Strengthen the management capacity of indigenous communities to monitor implementation of oil operations, including the creation and support of social audit mechanisms.</li> </ul>
Effectively protecting protected areas	<ul style="list-style-type: none"> <li>• <b>Issue special monitoring and environmental regulations for concessions with active operations</b></li> <li>• <b>Ensure that all the necessary cleanups are carried out and that all operations comply with environmental regulations before making any decision on expanding into new areas.</b></li> </ul>

#### 4. Forest Resources

Objective	Recommended Action
Making natural resource management and conservation policy priorities	<ul style="list-style-type: none"> <li>• Broaden the scope of the Sustainable Forest Strategy of Ecuador (multifunctional role of forests; communities' role).</li> <li>• Develop a comprehensive national land use planning strategy.</li> <li>• <b>Develop land regularization policy and programs.</b></li> </ul>
Ensuring the sustainable use and conservation of forest resources and ecosystem services	<ul style="list-style-type: none"> <li>• <b>Introduce payment for environmental services programs.</b></li> <li>• <b>Introduce incentives to promote sustainable forest management by indigenous communities (improved access to credit and markets, technological support).</b></li> <li>• <b>Eliminate the stumpage tax.</b></li> <li>• <b>Eliminate the prohibition on exporting logs.</b></li> <li>• <b>Introduce mechanisms to regularize tenure of settlers of forestlands located in areas of the Public Forest Estate.</b></li> <li>• <b>Promote international standards and indicators of sustainable forest management.</b></li> <li>• <b>Support third-party certification schemes.</b></li> </ul>
Strengthened forestry agencies	<ul style="list-style-type: none"> <li>• <b>Create a national system of forestry information.</b></li> <li>• Increase public participation in the policymaking process.</li> <li>• Make the Decentralized Forest Control System operational.</li> </ul>

## 5. Conservation

Objective	Recommended Action
Strengthening legal and policy framework	<p><i>Legal</i></p> <ul style="list-style-type: none"> <li>• <b>Complete regulations of the EML (issue a biodiversity act that facilitates the operation of the SNAP and provides a cohesive operational framework to the numerous biodiversity-related conventions and strategies).</b></li> <li>• Facilitate the development of regulations on: the use of genetically modified organisms, the introduction of exotic species, and access to genetic resources.</li> </ul> <p><i>Policy</i></p> <ul style="list-style-type: none"> <li>• <b>Strengthen MAE’s capacity to conduct basic policy functions (planning, coordination, monitoring, and compliance).</b></li> <li>• <b>Strengthen policy coordination mechanisms (CNC, CNDS).</b></li> <li>• Develop programs to achieve the objectives of the <i>Convention on Biological Diversity</i> and the <i>Regional Biodiversity Strategy of Andean Tropical Countries</i>.</li> <li>• Mainstream conservation objectives in key sectors:               <ol style="list-style-type: none"> <li>1. Extractive industries (oil and mining)</li> <li>2. Agriculture</li> <li>3. Tourism</li> <li>4. Forestry.</li> </ol> </li> <li>• <b>Strengthen enforcement capacity (evaluate the creation of an independent enforcement agency).</b></li> </ul>
Effective decentralization	<ul style="list-style-type: none"> <li>• Provide technical assistance to subnational government environmental management units to develop and implement local and regional Biodiversity Action Plans.</li> </ul>
Consolidation of the National System of Protected Areas	<p><i>Bio-diversity Management</i></p> <ul style="list-style-type: none"> <li>• Increase budget allocations to the National System of Protected Areas (SNAP).</li> <li>• <b>Give more administrative and financial autonomy to SNAP.</b></li> <li>• Strengthen coordination between management of protected areas and natural resource management in these areas (water, bio-aquatic resources).</li> <li>• Monitor and evaluate protected area management.</li> <li>• <b>Resolve land tenure conflicts in the PANE.</b></li> <li>• <b>Strengthen participation in the management of</b></li> </ul>

	<p><b>protected areas.</b></p> <ul style="list-style-type: none"> <li>• <b>Expand SNAP to include protected areas established by subnational governments, communities, the private sector, and NGOs.</b></li> <li>• <b>Develop a plan to obtain conservation- friendly revenues (for example, carbon sequestration) in PA with extractive resource potential.</b></li> </ul>
Strengthening management tools	<ul style="list-style-type: none"> <li>• Implement the Territorial Zoning Plan (<i>Plan de Ordenamiento Territorial</i>) in the priority regions identified in the National Biodiversity Strategy.</li> <li>• <b>Strengthen environmental information systems.</b></li> <li>• <b>Incorporate biodiversity indicators into the Integrated System of Social Indicators of Ecuador (<i>Sistema Integral de Indicadores Sociales del Ecuador, SIISE</i>).</b></li> </ul>
Development of economic instruments for conservation	<ul style="list-style-type: none"> <li>• Conduct economic valuation of studies of the goods and services provided by ecosystems.</li> <li>• <b>Develop and implement payment of environmental services programs.</b></li> <li>• <b>Facilitate certification schemes.</b></li> </ul>

## 6. The Galapagos

<b>Objective</b>	<b>Recommended Action</b>
Generate key analyses and consensus for decisionmaking	<ul style="list-style-type: none"> <li>• <b>Estimate the carrying capacity.</b></li> <li>• Determine the location of future development.</li> </ul>
Allocate additional funds for conservation (quarantine and invasive species control, training and education for visitors and residents, habitat conservation)	<ul style="list-style-type: none"> <li>• <b>Create a new conservation fund managed in an open and transparent manner by a Board with representatives of the public and private sector.</b></li> </ul>
Increase revenues that can be allocated for conservation	<ul style="list-style-type: none"> <li>• <b>Increase fees for foreign visitors.</b></li> <li>• <b>Increase the annual <i>patente</i> per berth fee.</b></li> </ul>
Reduce market distortions that affect environmental quality	<ul style="list-style-type: none"> <li>• Reduce subsidies (energy, water).</li> </ul>
Facilitate dialogue and consensus	<ul style="list-style-type: none"> <li>• Senior respected “champion” has to emerge and then be supported in implementing the needed changes.</li> <li>• <b>Take advantage of the constitutional process to discuss and promote new institutional arrangements that facilitate consensus building.</b></li> </ul>

## 7. Climate Change

Objective	Recommended Action
Incorporation of climate change into national planning	<ul style="list-style-type: none"> <li>• <b>Include climate change in the National Plan of Social and Productive Development 2007–2015.</b></li> <li>• <b>Develop a National Strategy of Climate Change.</b></li> <li>• Strengthen Climate Change Unit at MAE.</li> <li>• <b>Incorporate climate change considerations into MEM plans and strategies.</b></li> </ul>
Strengthening climate observation and monitoring	<ul style="list-style-type: none"> <li>• <b>Implement a Hydro-meteorological Information System.</b></li> <li>• <b>Improve maintenance of meteorological and hydrological stations.</b></li> </ul>
Implementing the National Climate Risk Management and Early Warning Systems in key sectors	<ul style="list-style-type: none"> <li>• Define responsibilities by sector and agency.</li> <li>• Allocate adequate resources.</li> </ul>

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