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CHEMONICS INTERNATIONAL INC.

TRADE AND ENVIRONMENTAL TECHNOLOGY IN LATIN AMERICAN COUNTRIES

Chemonics International Inc.

July 1996

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ABOUT THIS PUBLICATION

A rapid shift toward trade liberalization and free markets in Latin America and elsewhere in the world has given USAID missions the opportunity to address both trade and environmental issues within activities. Legislation passed by the United States Congress authorizes federal agencies to place greater emphasis on the export of environmental technology, goods, and services. The Export Enhancement Act of 1992, for example, directs the President to set up an "environmental trade working group" under the interagency Trade Promotion Coordinating Committee (TPCC), which includes USAID, to develop a government strategy for expanding exports of environmental technologies, goods, and services. The TPCC provides an effective mechanism by which USAID and its missions worldwide can support and encourage the transfer of U.S. environmental technologies to developing countries in need of assistance in this critical area.

To support such attempts to integrate approaches to hemispheric trade and environmental issues, the author of this publication has compiled trade and environmental technology information that is usually dispersed in many different locations. The purpose of this document is to identify, compile, and summarize current data in the areas of Latin American trade agreements, environmental services, and environmental laws and regulations. This publication is meant to serve as a useful reference for USAID missions and in-country decision makers in the fields of trade and environmental technology.

This report has been divided into five sections. Section I describes significant trade agreements, trade levels, economic policies, political agendas, and environmental initiatives in Latin America. Section II features a discussion of needed environmental technologies and services and identifies the various environmental markets that exist in Latin American countries for improved environmental infrastructures. Section III presents international, regional, and national legislation regarding environmental standards and regulations. In Section IV, the six largest economies and greatest polluters in Latin America are profiled, including their present environmental problems, current economic situation, and size of their environmental technology market. A roadmap for exporting environmental goods and services is included in Section V, which also identifies information sources for further research in the areas of trade in the Western Hemisphere, trade agreements, environmental goods and services, environmental technology markets, research institutions, and related topics.

ACKNOWLEDGEMENT

This document was conceived, prepared, and supervised by Milagros Nanita-Kenett, urban environmental specialist for the Project in Development and the Environment (PRIDE). Other individuals participated in providing information for the preparation of this document. In particular, we wish to thank the American University for providing two students from its Washington Summer Internship Program, Kimberly Drennan and Stephanie D. Mordwin, to assist in preparation of this document. We also wish to thank Toben Galvin, who reviewed this manual.

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SECTION I
GENERAL OVERVIEW TO TRADE AND TRADE TREATIES

A. General Overview

The approval of the North American Free Trade Agreement (NAFTA) has increased the participation of Latin American countries in a world economy increasingly based on free trade and market liberalization. At present, state-controlled protectionist policies based on import substitution are shifting to liberalized foreign trade, deregulated domestic markets, and privatization programs. This trend has been accompanied by the creation of a wide range of intraregional trading arrangements, as well as by a series of initiatives directed at creating preferential trade relations with the United States. The emerging trade agreements are intended to establish free trade zones to reduce tariffs, quotas, registration requirements, and other barriers to trade. Many agreements are in fact customs unions, in which member countries impose a common external tariff on goods from non-member countries. In addition, many trade agreements foresee the eventual establishment of a unified currency.

B. Steps Toward Trade Liberalization

Organization for Economic Cooperation and Development (OECD). An important early step toward a cooperative approach to trade and environmental issues took place in September, 1961, when the OECD was formally formed. The member countries are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, the United States, Japan, Finland, Australia, New Zealand, and Mexico. The OECD has sponsored a large number of initiatives on environmental and trade-related programs. The following principles were adopted by the OECD:

- The polluter pays principle
- The harmonization principle
- The national treatment and non-discrimination principle
- The compensating import levies and export rebates principle

The aim of the OECD in adopting these principles was to promote efficiency in the implementation of national environmental policies and to mitigate potential trade-distorting effects at the international level.

Summit of the Americas. Participants from 34 countries in the Western Hemisphere met in December, 1994, at the Summit of the Americas. In light of widespread economic reforms in Latin American countries and the proliferation of subregional trade agreements, summit participants agreed to negotiate a future Free Trade Area of the Americas (FTAA) by 2005. Under this agreement, the region's 23 trade pacts will be harmonized into an umbrella free trade agreement within 18 months after the summit. The summit resulted in five major commitments:

- Free trade in the hemisphere, with implementation likely by 2015
- The addition of Chile to NAFTA
- A renewed regional emphasis on labor and the environment

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- Financial cooperation, where countries agree to create and enforce hemispheric anti-corruption laws
- Extended investigative privileges and greater enforcement of money laundering laws

United States support to intraregional trade. The United States has played a key role in the move toward trade liberalization in the hemisphere. The Caribbean Basin Initiative (CBI), the Andean Trade Preference Act (ATPA), and the Enterprise for the Americas are all U.S. programs that grant preferential treatment to selected countries in the Latin American region. The CBI, for example, was designed to aid Central America and the Caribbean by allowing a CBI-eligible product to enter the United States duty free. One of the aims of the ATPA was to encourage farmers to find profitable alternatives to the cultivation of coca leaves by giving them greater access to the large U.S. market. The Enterprise for the Americas is an initiative to bolster economic reform in Latin America through a reduction in government debt, the creation of free trade areas, and support for market-oriented reforms.

C. Promoting Environmental Goals in Development

Rio Declaration. An important sign of international interest in linking environmental and development issues was the staging of the United Nations Conference on Environment and Development, held in Rio de Janeiro in June, 1992. This conference built on and reaffirmed many of the goals expressed during the United Nations Conference on the Human Environment held in 1972. The goal of the 1992 conference was to establish new global partnerships to improve the environment through enhanced cooperation among attending countries. Such cooperation promoted the creation of new international agreements that protect the integrity of the global environmental system and supports important developmental goals.

CONCAUSA. The Central American governments signed the Alliance for Sustainable Development in October, 1994. The alliance promotes personal and social attitudes supporting politically, economically, culturally, and environmentally sustainable models for development. Central American leaders have invited the international community—and the United States in particular—to seek sustainable economic development through conserving the diversity of the earth for present and future generations. CONCAUSA (Conjunto Centroámerica-USA) was formed with the following basic goals:

- Promotion of clean, efficient energy
- Identification, conservation, and sustainable use of the region's biodiversity
- Strengthening institutional and legal frameworks and compliance mechanisms
- Improvement and harmonization of environmental protection standards

The attainment of these goals will greatly depend on the cooperation of the American government, both politically and financially. The United States has agreed to provide technical, administrative, and coordinating support in four broad areas: the conservation of biodiversity, energy, environmental legislation, and sustainable economic development. Within this framework, the United States will assist Central America by emphasizing environmental protection through economic incentives and clean technologies that allow for sustainable regional economic growth and promote hemispheric free trade. Central American governments have agreed to support and facilitate the necessary changes, partnerships, and programs designed in collaboration with the United States. The CONCAUSA agreement expresses the determination of

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Central American countries to strengthen regional environmental legislation and harmonize legal frameworks, as well as to focus attention on specific environmental issues.

USAID's role in environmental issues and trade. In 1976, the United States Agency for International Development (USAID) adopted federal regulation number 16 to incorporate environmental quality considerations in the USAID decision-making process. The regulation was revised in 1980 and incorporated in the Foreign Assistance Act in 1981. As a result of this act, each bureau is required to have an environmental officer to oversee implementation of these procedures. There are environmental officers in each of USAID's regional offices and country missions, as well as an agency environmental coordinator. With the recent reorganization of USAID, the Center for Environment was created as part of the Global Bureau. The center's primary goal is to provide technical and programmatic leadership and support in environmental issues to USAID headquarters, field missions, and domestic and international partners. At present, USAID is increasing its involvement in "brown" environmental issues by expanding the scope of its programs to address issues regarding free trade, pollution, urbanization, industrialization, and sustainable energy use. To lay the groundwork for these initiatives, the Center for Environment and the Latin American Bureau launched the Environmental Initiative for the Americas (EIA), which will assist USAID missions in these areas.

D. Other Intraregional Environmental Support

Governments in Latin America are continuing to work together toward common environmental goals in support of sustainable development. In Central America, for example, a group of countries established the presidential-level Central American Commission for Environment and Development (CCAD) as part of the alliance for sustainable development. The Latin American and Caribbean Commission on Development and the Environment developed "Our Own Agenda," in which the region's priorities for environmental management are laid out. Latin American countries, in collaboration with the Pan American Health Organization (PAHO), have also initiated a Regional Plan for Investment in the Environment and Health.

E. Trade Treaties in the Western Hemisphere

Chronology of Significant Multilateral Free-Trade Agreements

1960 - Central American Free Trade Zone (CACM)
1969 - Andean Common Market (Andean Pact)
1973 - Caribbean Common Market (Caricom)
1991 - Southern Common Market (Mercosur)
1992 - North American Free Trade Agreement (NAFTA)
1993 - Group of Three (G-3)

Descriptions of the above trade treaties, the most significant in the Western Hemisphere, appear on the following pages. The criteria for the selection of economic indicators for these treaties are the following:

Aggregate GDP (the sum of countries' GDP) demonstrates the relative potential economic influence of the treaty.

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Population (the combined population of member countries) indicates the market size, labor force and growth potential.

Intraregional trade as a percentage of GDP indicates the role of trade in increasing economic growth.

Percentage increase in U.S. exports to members and imports from members indicates U.S. gains from trade liberalization in Latin America during the past decade.

Percentage increase in total exports and imports demonstrates Latin America's improved international competitiveness.

Calculations (see exhibit No. 1). Calculations are based on data gathered from Latin America and the Caribbean: Selected Economic and Social Data May 1994, published by USAID, Washington D.C., 1994.

CENTRAL AMERICAN FREE TRADE ZONE (formerly CACM)

Type: Customs Union, with Goal of Eventual Common Market
Created in 1960

Members

Costa Rica, Guatemala, Honduras, El Salvador, and Nicaragua.
(Panama has observer status)

Objective

Established in 1963 under the General Treaty for Central American Integration, the Central American Common Market was designed to create a common market by 1965; however, as a result of political volatility, the establishment of a free trade area has been delayed.

General Information

CACM is one of the poorest trading blocs in the region. Several members have implemented common external tariffs ranging from 5 to 20 percent on most non-CACM origin goods. For most members, agricultural products have no intraregional tariffs. In addition, there are no intellectual property rights (IPR), enforcement agreements, nor provisions for standards.

Current Status

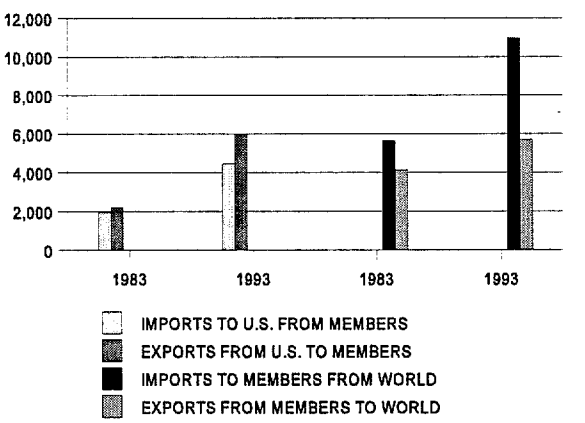
Members are seeking free trade with Mexico, Colombia, and Venezuela, but have encountered delays due to political problems. Investment barriers are currently being lowered by El Salvador, Guatemala, Honduras, and Nicaragua.

Economic Indicators

- 1993 Aggregate GDP: $31.2 billion
- 1993 Population: 28.5 million
- 1993 Total exports: $4.97 billion
- 1993 Total imports: $9.17 billion
- Percentage increase in U.S. exports to the CACM 1983-93: 171 percent
- Percentage increase in U.S. imports from CACM countries 1983-93: 130 percent
- Percentage increase in total exports 1983-93: 38 percent
- Percentage increase in total imports 1983-93: 94 percent

TRADE LEVELS 1983-1993

In millions of U.S. dollars



*See sources for this section

ANDEAN PACT

Type: Customs Union
Created in 1969

Members

Bolivia, Colombia, Ecuador, Peru, and Venezuela

Objective

To promote harmonious development of member countries and the gradual formation of a Latin American common market.

General Information

Andean Pact countries share common external tariffs of 5, 10, 15, and 20 percent. Free trade area exists among pact members.

Current Status

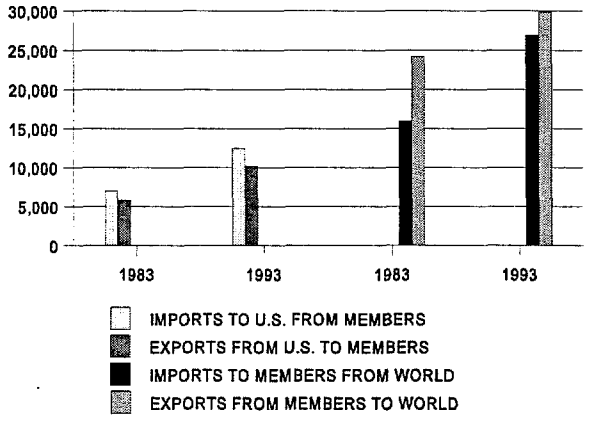
Trade among member states has almost tripled from 1990 to 1993. Peru has not been an active member, however. Negotiations for Peru to rejoin were scheduled to be completed by June, 1995.

Economic Indicators

- 1993 Aggregate GDP: $180.1 billion
- 1993 Population: 96.9 million
- 1993 Total exports: $28.1 billion
- 1993 Total imports: $29.25 billion
- Percentage increase in U.S. exports to the Andean Group 1983-93: 76 percent
- Percentage increase in U.S. imports from the Andean Group 1983-93: 78 percent
- Percentage increase in total exports 1983-93: 22 percent
- Percentage increase in total imports 1983-93: 68 percent

TRADE LEVELS 1983-1993

In millions of U.S. dollars



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CARIBBEAN COMMON MARKET (Caricom)

Type: Customs Union
Created in 1973

Members

Jamaica, St. Cristobal, Dominica, St. Vincent and Grenadines, Antigua and Barbuda, Barbados, Guyana, Belize, Grenada, St. Lucia, Trinidad and Tobago, Montserrat, St. Kitts and Nevis, and the Bahamas.

Objective

To create a common market regime in order to strengthen, coordinate and regulate trade and economic relations among members.

General Information

Caricom membership is comprised of a number of islands with limited economies. Participants have expressed concern over the region's slow progress and many analysts doubt that Caricom will achieve a common market.

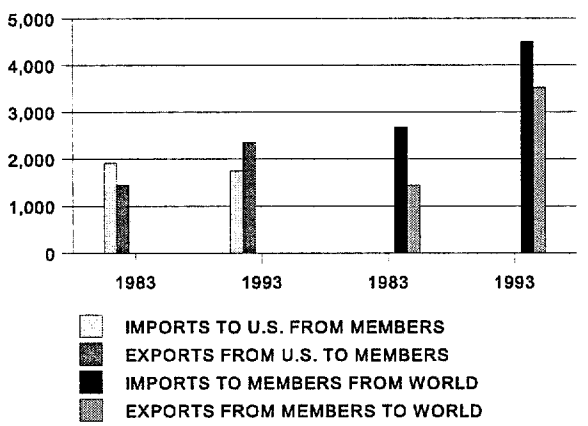
Current Status

Members have established the goal of lowering the common external tariff from its current maximum level of 45 percent to 20 percent by January 1, 1998. Cuba has expressed interest in joining, and has recently increased economic ties with the group through a joint commission established in 1993.

Economic Indicators

- 1993 Aggregate GDP: $15.7 billion
- 1993 Population: 5.6 million
- 1993 Total exports: $5.41 billion
- 1993 Total imports: $8.34 billion
- Percentage increase in U.S. exports to Caricom countries 1983-93: 63 percent
- Percentage increase in U.S. imports from Caricom countries 1983-93: -8 percent
- Percentage increase in total exports 1983-93: 144 percent
- Percentage increase in total imports 1983-93: 68 percent

TRADE LEVELS 1983-1993
In millions of U.S. dollars



SOUTHERN COMMON MARKET (Mercosur)
Type: Partial Customs Union, with Goal of Eventual Common Market
Created in 1991

Members
Argentina, Brazil, Uruguay, and Paraguay (Bolivia has observer status).

Objective
Establishment of free trade among its members, subject to country-specific lists of exceptions.

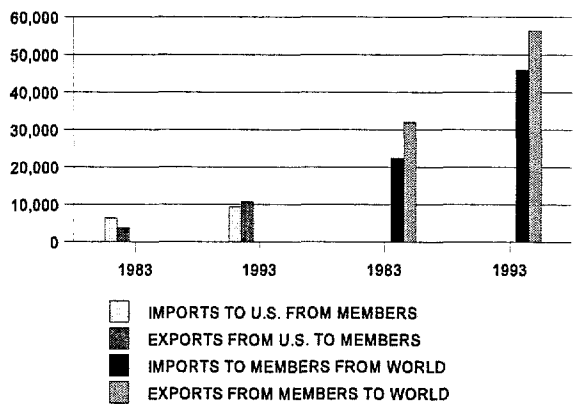
General Information
Mercosur is the second largest trading bloc in the hemisphere, surpassed only by NAFTA. The full customs union calls for gradual elimination of non-tariff barriers, coordination of macroeconomic policies, adaptation of general rules of origin and the installation of a formal dispute settlement mechanism. Full members are not allowed to enter trade agreements with other countries unless the provisions are extended to all Mercosur members.

Current Status
On August 4-5, 1994, Mercosur presidents moved into a partial customs union when they ratified a Common External Tariff (CET), effective January 1, 1995, for 85 percent of goods traded in the bloc. All four members have applied ad valorem tariffs to imports from non-member countries that range from zero to 20 percent.

Economic Indicators

- 1993 Aggregate GDP: $700 billion
- 1993 Population: 197.9 million
- 1993 Total exports: $51.22 billion
- 1993 Total imports: $48.5 billion
- Percentage increase in U.S. exports to Mercosur countries 1983-93: 190 percent
- Percentage increase in U.S. imports from Mercosur 1983-93: 48 percent
- Percentage increase in total exports 1983-93: 76 percent
- Percentage increase in total imports 1983-93: 105 percent

TRADE LEVELS 1983-1993
In millions of U.S. dollars



NORTH AMERICAN FREE TRADE AGREEMENT (NAFTA)

Type: Free Trade Area
Created in 1992

Members

United States of America, Mexico, Canada

Objective

To create a free-trade area by 2009 with the gradual elimination of tariffs in 5, 10, and 15 year intervals. Exceptions are Canadian agricultural and Mexican petroleum products.

General Information

Of all Latin American trade accords, NAFTA is the most comprehensive, involving the hemisphere's largest trading block. NAFTA contains legislation regarding government procurement, product and environmental standards, investment, services, and intellectual property rights. Members do not apply a common external tariff, nor do they coordinate monetary and fiscal policy. In 1994, trade among partners increased 17 percent (over $50 billion).

Current Status

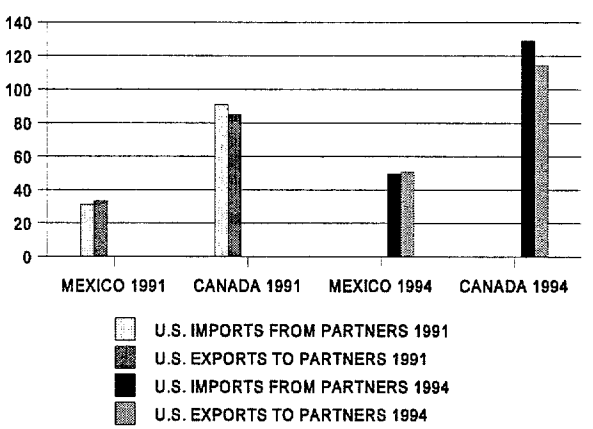
Progress on Chile's accession to NAFTA was scheduled to take place by June 1995. A series of negotiations are scheduled to be completed by mid-1996.

Economic Indicators

- 1993 Aggregate GDP: $7.09 trillion
- 1993 Population: 376.4 million
- 1993 Total exports: $640.15 billion
- 1993 Total imports: $792.62 billion
- Percentage increase in U.S. exports to Mexico 1991-94: 52.6 percent
- Percentage increase in U.S. imports from Mexico 1991-94: 58.7 percent
- Percentage increase in exports to Canada 1991-94: 34.4 percent
- Percentage increase in imports from Canada 1991-94: 41.5 percent

TRADE LEVELS 1983-1993

In millions of U.S. dollars



GROUP OF 3: COLOMBIA-VENEZUELA-MEXICO FREE TRADE AGREEMENT

Type: Free Trade Area
Created in 1993

Members

Colombia, Venezuela, Mexico

Objective

To create intraregional economic cooperation through the establishment of a free-trade zone by 1994.

General Information

The G-3 agreement is similar to other regional accords, calling for the removal of tariff and non-tariff barriers, unification of nomenclature, technical norms, customs procedures, and cooperation agreements on other non-trade related areas. Surpassed in size and importance only by NAFTA and the Southern Common Market, the G-3 agreement is likely to have a powerful economic impact.

Current Status

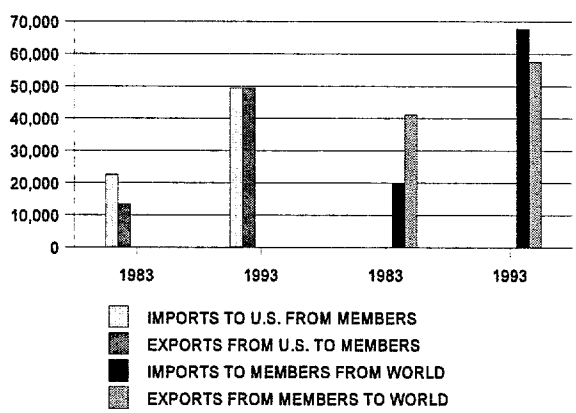
Tariff elimination between Mexico, Colombia and Venezuela is being accomplished in 10 steps over a 10-year period. Members of the Andean Group are beginning negotiations to eventually join G-3.

Economic Indicators

- 1993 Aggregate GDP: $483.7 billion
- 1993 Population: 144.6 million
- 1993 Total exports: $59.58 billion
- 1993 Total imports: $69.05 billion
- Percentage increase in U.S. exports to G-3 countries 1983-93: 272 percent
- Percentage increase in U.S. imports from G-3 countries 1983-93: 120 percent
- Percentage increase in total exports 1983-93: 40 percent
- Percentage increase in total imports 1983-93: 242 percent

TRADE LEVELS 1983-1993

In millions of U.S. dollars



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F. Other Trade Treaties in Region

Latin American Integration Association (LAIA): 1980

Members: All Spanish-speaking South American countries, Mexico, and Brazil
Objective: Established as a response to the failure to achieve objectives set by the Latin American Free Trade Association (LAFTA) in 1960. The goal is to gradually achieve a common market.
Current Status: All member countries have signed bilateral agreements exchanging preferences for predetermined lists of products. A number of member countries have signed economic complementary agreements. The non-extension of preferences granted by Mexico to imports from Canada and the United States under NAFTA to other LAIA members will require a waiver under treaty terms, or will be met by sanctions.
Indicators: (1992)
Aggregate GDP: $863.5 billion
Population: 380 million
Total foreign trade: $202.4 billion
Intra-regional trade as percentage of total foreign trade: 10.3 percent

Chile-Mexico Free Trade Agreement (1991)

Members: Chile, Mexico
Objective: To establish a free-trade area by January 1, 1996
Current Status: Present maximum reciprocal tariff: 7.5 percent
Indicators: (1992)
Aggregate GDP: $240.2 billion
Population: 99.4 million
Total foreign trade: $78.8 billion
Intra-regional trade as percentage of total foreign trade: 0.1 percent

Colombia-Venezuela Free Trade Agreement (1992)

Members: Columbia, Venezuela
Objective: To establish a free-trade area by 1992.
Current Status: A common tariff was established in 1992. Negotiations were initiated with Mexico (Group of Three) to establish a free-trade area.
Indicators: (1992)
Aggregate GDP: $91.3 billion
Population: 52 million
Total foreign trade: $34.7 billion
Intra-regional trade as percentage of total foreign trade: 1.4 percent

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Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua Free Trade Agreement (1992)

Members: Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
Objective: To establish a free-trade area by December 31, 1996.
Current Status: Technical rules and dispute resolution agreements under negotiation.
Indicators: (1992)
Aggregate GDP: $240.3 billion
Population: 112.4 million
Total foreign trade: $74.2 billion

Nueva Ocotepeque Agreement (1992)

Members: El Salvador, Honduras, and Guatemala
Objective: To establish a free-trade area by 1993 and eventually establish a customs union. Recent economic complementary agreements have been signed among these countries.
Current Status: Under implementation. In 1992 a partial free-trade agreement with Venezuela was signed that gradually eliminates Venezuelan tariffs.
Indicators: (1992)
Aggregate GDP: $17.1 billion
Population: 19.5 million
Total foreign trade: $7.3 billion

Chile-Venezuela Free Trade Agreement (1993)

Members: Chile, Venezuela
Objective: To establish a free-trade area by 1999.
Current Status: Maximum tariff for imports from Chile scheduled at 20 percent in 1994. Chile's tariff rate remains at 11 percent. Tariffs scheduled to drop to zero in 1999.
Indicators: (1992)
Aggregate GDP: $240.2 billion
Population: 32.9 million
Total foreign trade: $78.8 billion
Intra-regional trade as percentage of total foreign trade: 0.1 percent

G. Trade Levels Ranked by Trading Groups

Exhibit 1 on page I-13 depicts trade levels, ranked by trading groups, in the U.S. between 1983 and 1993.

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Exhibit 1
Trade Levels (1983-1993)
(in US$ millions)

Trading Groups	US - LAC Trade		World - LAC Trade	
	1983	1993	1983	1993
Andean Pact				
Exports:	5,809	10,212	24,196	29,438
Imports:	6,995	12,475	15,961	26,890
CACM				
Exports:	2,199	5,965	4,136	5,702
Imports:	1,947	4,474	5,640	10,958
G - 3				
Exports:	13,302	49,464	41,196	57,490
Imports:	22,519	49,459	19,792	67,763
Mercosur				
Exports:	3,730	10,807	32,049	56,388
Imports:	6,392	9,452	22,373	45,952
Caricom				
Exports:	1,446	2,353	1,444	3,529
Imports:	1,915	1,755	2,680	4,506

NAFTA	1991	1994
U.S. exports to Canada	85.1	114.4
U.S. imports from Canada	91.1	128.9
U.S. exports to Mexico	33.3	50.8* FAS value
U.S. imports from Mexico	31.2	49/5* customs value

Source: Latin America and the Caribbean: Selected Economic and Social Data. USAID: Washington D.C., 1994.
Source: "NAFTA Facts" Department of Commerce, Document #7101, #8101.

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SECTION II
ENVIRONMENTAL TECHNOLOGY AND SERVICES[1]

A. Overview

An important result of the current trend toward increased trade liberalization in the Western Hemisphere will be the facilitation of the spread of environmental products and services to regional trade partners. In many developing countries, information on the nature, source, levels, and concentrations of pollution is not readily available and institutional capabilities to generate such data are weak. These countries will increasingly require environmental technologies from countries such as the United States, which should be adapted to meet local conditions and preferences. There is a limited pool of trained public and private sector personnel in many fields of environmental engineering, environmental technology, industry and environmental services. Opportunities for environmental technology transfer includes:

- Technologies and infrastructure developed for environmental purposes, including pollution detection, wastewater treatment, air quality control, and solid waste management

- Environmental services provided in technical assistance programs, including the provision of technical assistance in the area of command-and control interventions, municipal development, service finance, and environmental training programs.)

Potential impact. New technologies hold great promise for solving many pressing environmental problems in the Western Hemisphere. At the same time, increasing interest in environmental technologies paired with hemispheric free trade can provide U.S. environmental firms with a decided competitive edge in the region. Recent growth in the field of environmental technology has demonstrated the inaccuracy of the notion that job growth must inevitably be traded off against sound environmental policy. Rather, the growing demand for environmental services in developing countries can serve as an engine for economic growth, particularly in the case of the United States. Developing international markets for American environmental technology can:

- Create high-paying jobs, now and in the future
- Strengthen a key civilian technology base
- Protect and improve the global environment

Facts concerning the U.S. environmental industry. The Organization for Economic Cooperation and Development (OECD) estimates that the United States was one of the world's largest exporters of environmental goods and services in 1990. In relative terms, however, the United States exported only 10 percent of its environmental service production, far less than the estimated export level from Germany and Japan. Due to the diversity of markets and technologies, most U.S. environmental firms are small- to medium-sized. Many of these

[1]Note: We are indebted to Janis D. Bernstein's "Alternate Approaches to Pollution Control and Waste Management," Urban Management Programme, The World Bank, Washington, D.C., 1993, for its comprehensive discussion of environmental services, which we have followed closely in this section.

companies are either new exporters or have not yet entered the export market place. Estimates of the U.S. environmental industry trade surplus in 1990-91 range from $1.1 billion in goods (according to the EPA) to $4 billion in goods and services (according to the OECD). The U.S. environmental industry faces significant competition from Germany and Japan. While the United States maintains international leadership in air pollution control technology and waste management technologies, Germany leads in pollution abatement equipment, particularly in the area of water treatment. Due to the size of the U.S. domestic market, most firms have not been forced to seek export markets for their technologies or services.

International markets for U.S. environmental goods and services. The market for environmental equipment and services, which include products for water and effluent treatment, waste management, air quality control, land remediation, and noise abatement, is now estimated at $200 billion worldwide and is growing at a rate of 5.5 percent a year. Estimates show that developing countries will need to invest amounts exceeding 1 percent of their gross domestic product to factor environmental objectives into development programs. As countries become more prosperous and democratic, and people demand cleaner air, water, and soil, the need for environmental technology will increase. The demand for U.S. urban environmental services, which should grow sharply, will include the following requirements:

- Eliminating waste discharges will require new pipelines and sewage treatment plants.
- Increasing supplies of potable water will require new aqueduct systems, distribution systems, pumping stations, and reservoirs.
- Extending central sewage collection and treatment systems to those not currently served will require sewer collection pipelines and appurtenant facilities.
- Improving solid waste management facilities will necessitate new waste disposal alternatives, recycling technologies, and landfill management services.
- Building new industrial and chemical plants will require automatic monitoring stations, and specialized equipment to treat solid waste from industrial processes and monitor sludge produced under biological degradation processes.
- Lowering industrial emissions will create the demand for specific industrial pollution control equipment, such as monitoring devices, liners, filters, chemical feeders, pH control equipment, portable laboratories, flexible membranes, centrifuge units, specialized transportation equipment, sludge processing equipment, efficient incinerators, information systems, and environmental services.
- Research, laboratory, laboratory supplies, chemicals and chemical test kits, and architecture, engineering, consultant and financial services will also be required.

The demand for environmental services in Latin American countries. Urban service deficits exist throughout the region, largely because capital investment projects were neglected during the 1980s due to the debt crises that affected most Latin American countries during this period. In 1992, the market for environmental services in Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela was estimated at $2.4 billion. In Latin America, the growth in demand for environmental services is a result of increases in the demand for such services as potable

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water, sewers, water treatment and recycling, solid waste management, and pollution control and monitoring. The pressing need for improved environmental services in the region can be illustrated by the following observations:

- In Latin America's urban centers, approximately 90 percent of untreated sewage is emptied into surface streams. Many countries in the region pollute freshwater resources 11 times more than Europe on a per capita basis.

- Only 49 percent of households have sewer connections and only 32 percent have septic tanks and latrines.

- Poor neighborhoods have no regular refuse collection services and in affluent areas service is sporadic and insufficient.

- Unserviced urban settlements are experiencing rapid growth. Nearly half of city dwellers live in slums and squatter settlements and are subject to severe health problems. Small children, the elderly, and persons with heart conditions or respiratory disease are among the groups at particularly high risk.

- The rapid expansion of the informal sector is adding to solid waste and wastewater management problems. In many countries, the informal sector employs over 60 percent of the labor force and is growing at an extraordinary pace.

- Air quality problems exist in nearly all the major Latin America cities. Studies suggest that 60 to 80 percent of the people living in urban areas are exposed to unacceptably polluted air.

- Urban pollution and the lack of urban infrastructure are contributing factors to a loss of diversity in animal and plant species in terrestrial and aquatic ecosystems and the destruction of scenic areas.

Opportunities for technology transfer in Latin American countries. Although Latin America has embraced trade liberalization, the present optimism toward sustainable economic development is clouded by growing social, health and environmental concerns related to poor urban service delivery in the region. Greater trade liberalization should help facilitate the spread of environmental goods and services from more developed countries, such as the United States, which will improve urban conditions in the region. Opportunities for urban improvements and environmental services will continue to grow in the future, due to the following factors:

- The approval of the North American Free Trade Agreement (NAFTA) has increased the participation of Latin American countries in a world economy based on trade and market liberalization, facilitating the transfer of U.S. environmental products.

- Municipal development and decentralization programs implemented throughout the region, in combination with rapid urbanization and industrialization, have enlarged the demand for urban services.

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- Increased regulations, the search for reduced compliance costs, and the need to incorporate environmental technologies into integrated production systems will require new environmental technologies.

- Latin American countries have recently undergone a wave of privatization which will increase the existing demand for U.S. environmental technology and goods.

- Following the U.S. and Chilean models, Latin American countries will shift from technologies that control and clean up pollution, to those that prevent pollution from occurring. This shift in emphasis will also contribute to the need for new environmental technology.

B. Environmental Technology: Selected Examples

Pollution detection. Sensors are widely used for pollution detection, and represent a growing market in the environmental sector. Sensor units range from hand held units to systems installed as fixed components in a process plant. Sensing techniques include:

- **Remote sensing.** Through satellite or aircraft-borne detection/observation, remote sensing can give an indication of changes over large areas due to pollution. Although remote sensing is highly effective in detecting pollution, especially in areas with difficult access, the use of this technology can be costly and complex as satellites or aircraft are needed to transport the sensors and cover large and remote areas.

- **Biological sensors.** Biological sensors can determine whether a certain pollutant is present at a particular site. The advantages of biological sensors are effectiveness, relative low cost, and low level of technical complexity. However, it is difficult to attain proper conditions for effective biological sensor use at in most pollution sites.

- **Other sensors.** Locating gases and liquid pollutants with open-path and guided-wave optical sensing techniques, biosensors and thin-film sensing technologies in external locations, laboratories, or within process plants can establish the presence and concentration of specific chemicals, allowing for suitable action if a predetermined safety threshold is exceeded.

Wastewater treatment. Wastewater treatment includes primary treatment to remove solid particles (filtering and clarifying), secondary treatment to remove bacteria (biological treatment and chlorination) and tertiary treatment to remove chemical or metal compounds (reverse osmosis and chemical recovery systems). Equipment for water and effluent treatment involves instruments designed to remove pollutants from water or convert pollutants to a less polluting form prior to use or discharge. Extensive private sector opportunities exist in the water pollution control equipment sector in developing countries.

- **Chemical, physical, biological, and newer types of treatments.** These types of treatment are combined in many treatment plants. Chemical conversion is usually applied through oxidation, reduction, and chelation, which require relatively low-technical complexity and low capital requirements, but are only moderately effective. Physical conversion involves the use of activated carbon. It is highly effective but more costly and more technically complex than chemical conversion. Biological conversion

involves such processes as digestion and oxidation of the pollutant. It is highly effective if appropriately applied and represents a relatively low-cost means that should be ex plored by developing countries. Newer types of treatment of wastewater include aerobic methods, ion exchange, and membrane technologies. Costs vary with the choice of the technique selected in the chemical, physical, or biological conversion categories, but in general, physical treatment entails higher operation costs, due to the high material and maintenance costs of specialized features in the treatment plants.

- **Water pollution control equipment**. The market includes, among others, ranking, screening, and flotation equipment, gravity separators, sand traps, settling basins, and chemicals. Auxiliary products include pumps, pipes, tanks and handling equipment. Water treatment goes beyond simple pollution control and firms that supply equipment for water and effluent treatment tend to be large system suppliers.

Air quality control. Gases that usually require emission control include carbon dioxide, sulfur dioxide, and nitrogen oxide. High concentrations of sulfur dioxide and nitrogen oxide cause acid rain, while carbon dioxide, chlorofluorocarbons, methane, and nitrous oxide are believed to be major contributors to the depletion of the ozone layer and the greenhouse effect. Equipment for air quality control is generally designed to remove pollutants from the air or convert pollutants to a less polluting form prior to discharge into the atmosphere. New, more rigorous enforcement of environmental regulations in developing countries will increase private sector opportunities in the market place for air quality control devices.

- **Air pollution control equipment**. Equipment for air pollution includes devices for treating: (1) particulates, which include fabric filters, electrostatic precipitators, and mechanical collectors; (2) acid emissions from power stations and other large-scale combustion plants, such as scrubbers, catalytic reduction, and electron beam methods; and (3) the emissions of gases and vapors, including equipment for desulphurization and oxidation, and carbon absorption.

- **Physical separation or filtration**. This method can remove some of the pollutants from the waste gases, causing chemical and physical absorption and conversion through catalyzers to remove noxious gases from emissions. Though very effective, such treatment requires a relatively large capital expenditure and involves a high degree of technical complexity.

- **Particulate emissions collectors and equipment for the control of acid emissions.** These types of equipment are estimated to account for about 60 percent of the value of air pollution control equipment sold worldwide. This equipment include flue gas desulphurization, scrubbers, fluidized bed combustion, and selective catalytic reduction equipment.

Solid waste management. Effective waste management requires equipment to collect, transport, treat, and dispose solid, liquid, and toxic wastes. There is a large and growing market for waste management equipment, especially for hazardous wastes. The market for hazardous waste management includes toxic waste handling equipment, treatment chemicals, biological degradation methods, and incineration equipment. Auxiliary waste management products include shredders, screening devises, containers, and handling equipment. The following solid waste

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management methods present opportunities for marketing U.S. environmental technology products overseas.

- **Landfill.** Landfills will continue to be an important disposal method in the short to medium term, providing good market opportunities in monitoring equipment, impermeable liner construction, leachate collection systems, and management services. A properly managed landfill site accepting known, treated wastes with plastic linings to prevent leaching of toxic chemicals to ground water is still a viable means of waste disposal. In addition, methane, a common gas produced at landfill sites as decomposition of waste occurs, can be utilized as an energy resource, thereby providing an opportunity for return on investment. The convenience, low cost, and low-technology requirements of landfills make it an attractive option for waste disposal in those developing countries where land is not at a premium.

- **Incineration.** This method has emerged as an alternative to disposing of hazardous wastes and domestic waste by landfill. Incineration involves considerable capital investment and comprises a variety of incineration technologies that convert solid, liquid, and gas wastes to a safer end product through high temperatures, which often exceed 1200°C. In spite of the costs involved in building and running the plants, many experts believe that incineration is one of the most environmentally effective and flexible means currently available to dispose of wastes.

- **Bioremediation or bacterial digestion.** This method is receiving increasing attention as a means of waste treatment. Bioremediation is less expensive than chemical treatment, or cleaning up contaminated sites, or removing soil for dumping or incineration. Bioremediation has considerable potential in developing countries because of its moderate cost compared to other means of waste disposal. Furthermore, its relatively low-technology application does not require a large number of technically skilled personnel.

- **Deep well injection.** This method is specifically targeted at hazardous liquids. It involves pumping the liquid into a permeable earth stratum below water levels to eliminate ground water contamination, between impervious shale, clay, or granite layers. This method of storing waste is not very technically complex, but involves large capital expenditures.

- **Storage tanks.** Storage tanks can be used to contain hazardous materials until they are transferred for final disposal or treatment. Storage tanks are only moderately costly and technically very simple. However, storage tanks are not a long-term solution for hazardous waste disposal, and other disposal means must eventually be sought.

- **Solidification.** This method comprises a variety of treatment techniques designed to contain wastes. These techniques minimize the risk of leaching during long-term storage, but appropriate safeguards are required in burial sites for waste storage. Typical wastes handled in this way are pesticides, heavy metals, and cyanide. The cost of solidification varies with the substance being treated, but in general is lower than deep well injection and higher than using storage tanks.

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- **Encapsulation**. This method isolates wastes without the need for secondary consent, such as in drums. The process is expensive, due to high material costs, energy requirements, and the need for skilled labor.

- **Waste recycling**. Waste recycling is an effective means of reducing the amount of wastes that need to be treated or stored. It reduces the cumulative effects of pollution from poorly disposed wastes, and the cost of effective disposal. It also lowers the demands on resource materials. The major technical hurdle in recycling is to collect and isolate material to be reintroduced into the production cycle. Collection and sorting mixed materials in municipal wastes, for example, requires either highly developed technology or intensive labor levels. Recycling of some materials is more appropriate in developing countries than in industrially developed countries due to high costs for materials and energy and low labor costs. Good market opportunities in the developing countries exist for U.S. recycling products.

C. Environmental Policy Instruments: Selected Examples

Command-and-control strategies. These strategies rely primarily on regulatory instruments and involve direct regulation through monitoring and enforcement systems. This approach usually involves setting health- or ecology-based ambient environmental standards regulating the amount of pollutants that can be discharged, or specifying the technology used to meet specific objectives. Such strategies can also require schedules for meeting standards, permitting and enforcement procedures for facilities, liability assignment, and penalties for non-compliance. The command-and-control approach gives the regulator maximum authority to control where and how resources will be spent to achieve environmental objectives. The responsibility for defining and enforcing standards and other requirements is shared in legislatively specified ways among national, state, and local governments. Monitoring programs are necessary to evaluate the progress and results of command-and-control policies. The command-and-control approach provides limited incentives for innovation in pollution control technology once standards are achieved. The major regulatory instruments include the following:

- **Regulatory standards**. Standards are a principal means by which many countries control pollution and manage wastes. They operate by defining environmental targets and establishing the permissible amount or concentration of polluting substances in air, water, land, or consumer products. Generally, standards are established by central governments; in some instances, however, central governments set out framework regulations to be carried out by local, state, or regional authorities. Types of standards include:

  - Ambient environmental quality standards, used principally for protecting water and air quality and assessing the risk to a given victim caused by a known dose of exposure to a pollutant

  - Effluent or emission standards, which establish the legal ceiling on the total quantity or concentration of a pollutant discharged from a pollution source

  - Technology-based or prescriptive standards, used to specify a particular technology a firm must use to comply with environmental laws and regulations

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- Performance standards, used to define a performance measure and allows dischargers the flexibility to select the best means to meet this standard

- Product standards, employed to establish a legal ceiling on the total quantity or concentration of pollutants that can be discharged into the environment per unit of product output or prohibit the addition of certain substances to products

- Process standards, which limit the emission of pollutants associated with specific manufacturing processes

- **Permits and licenses**. The granting or withholding of permits, licenses, or other authorizations is an important tool for controlling pollution. Permits or licenses are generally tied to an air or water quality standard and may be subject to the fulfillment of specific conditions, such as compliance with a code of practice, selection of a location that minimizes environmental and economic impacts, installation of a treatment plant or pollution-control equipment within a certain time period, or adoption of other environmentally protective measures.

- **Land and water use controls**. Land use controls, including zoning and subdivision regulations, are principally local government tools that can be applied for environmental protection. For instance, the location of industries, relocation of existing facilities, and installation of pollution control equipment can be established and enforced through land use controls. On the other hand, these types of controls can be vulnerable to economic and political pressures that may override environmental objectives. Controls on water use can be used to limit or ban activities such as energy development, exploitation of natural resources, recreational activities, and other potentially polluting uses in designated waters. In many cases, these regulations form part of regional or master plan to manage coastal zones, national parks, seashores and recreational areas, or marine sanctuaries.

Economic strategies. To varying degrees, economic strategies incorporate the polluter-pays, and user-pays principles, which associate a financial cost to the polluter and a cost for resource users. These strategies are directed at having the polluter pay the full social cost of polluting and the user the full cost of supplying the resource. Sometimes, direct costs are applied (e.g., charges based on the volume and toxicity of discharges, pay-per-bag systems for solid waste disposal, permit fees for air emissions where the fee varies with the volume emitted, refundable deposits on containers). At other times, indirect costs are involved, such as pollution taxes on inputs (e.g., fuel taxes). Advantages in the adoption of these strategies are:

- Promoting cost-effective means for achieving acceptable levels of pollution

- Stimulating development of pollution control technology and expertise in the private sector

- Providing government with a source of revenue to support pollution control programs.

- Allowing flexibility in pollution control technologies

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- Eliminating the need for large amounts of detailed information to determine the appropriate level of control in each instances

- **Pollution charges.** This approach aims at establishing the expenditure to control incremental units of pollution. Their application is appropriate when the damage from incremental units of pollution can be estimated reliably and least appropriate when regulators cannot determine the level of achieved environmental quality. Types of charges include:

  - *Effluent or emission charges* (fees levied by a government authority for pollutants discharged into the environment by an industrial facility, the costs for financing a pollution abatement scheme, or effluent standards)

  - *User charges* (used in the collection and treatment of municipal solid wastes and or for wastewater discharge by municipal authorities)

  - *Product charges* (fees added to the price of products that cause pollution in either the manufacturing or consumption phase or for which a special disposal system has been established)

  - *Administrative charges* (fees paid to authorities for environmental regulation enforcement, regulations, which finance the activities of pollution authorities)

  - *Tax differentiation* (used to promote consumption of products or services that are environmentally safe, for example, less polluting fuels or vehicles)

- **Market approaches.** Under this approach, markets can be created in which polluters can buy "rights" for actual or potential pollution and can sell these "rights" to other actors. Types of market creation include:

  - Marketable or tradeable permit system (an allowable level of emissions or an ambient environmental quality standard converted into permits and distributed to local firms)

  - Marketable discharge permits (transferable permits that allow the transfer of permitted emissions for monetary compensation across jurisdictional boundaries)

  - Liability insurance (risks for damage penalties transferred from individual companies or public agencies to insurance companies)

- **Subsidies.** Subsidies are incentives provided by government agencies directed at reducing industrial discharges. Types of subsidies include:

  - Grants (funds provided by government agencies for pollution abatement mandates and programs, purchase of pollution abatement-related equipment, and personnel training)

  - Low interest loans or loan guarantee programs (government monies loaned for a specific pollution program

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- Equipment tax incentives (tax credit or relief for controlling pollution for firms that adopt management practices and production technologies that minimize the release of environmental pollutants)

- **Deposit-refund systems.** Under this approach, consumers must pay a surcharge when purchasing potentially polluting products. This instrument is applied to products that are either reusable or that are not consumed during use, such as beverage containers, automobile batteries, and pesticide containers. These changes can also be applied to substances that have significant potential for damaging the environment. To establish most deposit-refund systems, new organizational arrangements are needed for handling collection and recycling and for managing administration. Statutory authority is required for establishing the system. The advantages of deposit-refund systems are that management remains primarily with the private sector and incentives exist for third parties to establish return services when users do not participate.

- **Enforcement incentives.** These types of incentives, which establish penalties for failure to meet environmental standards, are commonly used as municipal government instruments to encourage dischargers to comply with environmental standards and regulations. Penalties can double for a second offense and continued failure to meet effluent standards can lead to closure. Combined with public pressure, these measures have been effective in controlling surface water pollution.

- **Mixed systems.** In general, economic instruments are typically used in combination with regulatory instruments to achieve pollution control objectives. Studies suggest that such mixed systems appear to be more effective than a system composed of only one instrument. Mixed systems may combine the following elements:

  - Pretreatment standards (limits on pollution discharges)
  - Effluent charges (charges on pollution discharges)
  - Tax credits (supporting capital investment for pollution control)
  - Rapid depreciation allowances (for investments in pollution control facility)

D. Program Interventions for Pollution Control Management: Selected Examples[2]

Environmental impact assessments. These types of studies are informational tools for analyzing the potential environmental impact of proposed projects prior to implementation. In theory, assessments provide decision makers with a full discussion of significant environmental effects of a proposed action. Alternatives proposed in the assessment should provide information on how to minimize potential adverse effects of projects. The value of project objectives can be weighed against any environmental impact or irretrievable resource commitment. Environmental impact assessments should cover the following areas:

- Baseline environmental conditions

[2]A variety of environmental services can be provided as part of technical assistance components of environmental/development projects. Supported by federal programs and major donor agencies, such services are supplied by a range of U.S. consulting companies and organizations. USAID has successfully used many of these environmental services within its technical assistance programs in host countries in the past.

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- Comparison of environmental impact of investments, sites, technologies, and designs
- Preventive, mitigatory and compensatory measures
- Environmental management and training requirements
- Provisions for incorporating input from the general public and monitoring impacts

Comparative risk assessments. These studies identify, evaluate, and rank in priority order the environmental problems confronted by a particular city or region. They analyze cost-effective policy measures for mitigation, prioritize environmental problems, and compile information on adverse impacts on human health. In addition, such studies provide information on the "anatomy" of environmental problems (that is, which components of a problem—pollutants, sources, or routes of exposure—are most important, or where, is a problem most severe). Comparative risk assessment studies help focus a trade related policy agenda and harmonize environmental laws and enforcement mechanisms across regions and can help establish environmental priorities for "brown" issues. They serve as important tools for identifying appropriate environmental programs and allocating economic resources on a regional or country-to-country basis.

Reviews of environmental laws and standards. Assistance can be provided for preparing reviews and assessments of environmental laws at national levels and comparative reviews at regional levels. These reviews evaluate legislation, regulations, and enforcement mechanisms affecting such areas as air and water quality management, hazardous waste disposal, the use and disposition of fertilizers, pesticides, and other agricultural and industrial chemicals, and waste reduction and minimization practices. Recommendations for standardizing national and local regulatory structures can be based on internationally recognized environmental standards and protocols.

Environmental strategies. Environmental strategies that focus on regional cooperation is another potential area for assistance. Proposed strategies can be directed at improving environmental resource management through the strengthening of democratic institutions and private sector programs. Strategies should identify priority problems, appropriate environmental policies and project interventions, and local and international funding for implementation of pilot activities. They should be designed with a frequent update and feedback program that allows for periodic adjustment to countries' changing circumstances.

Regional profiles. Assistance is sometimes required by municipal governments, the private sector, and CBOs/NGOs for the preparation of regional profiles that describe critical environmental problems in selected countries and technology needed to address such problems. Regional profiles should highlight technologies that are low cost and appropriate for a particular region or country. Profiles listing American environmental products as well as those projects requiring environmental technologies are preferable.

Environmental financing programs. Policy-based lending can be used to support environmental programs. These programs should rely on individual initiative, market forces, and the private sector to provide urban services and produce affordable shelter-related environmental infrastructure in partnership with national and local governments within this framework. USAID Housing Guarantee Programs and other donor programs can be used to finance urban environmental infrastructure and clean industrial technologies to reduce urban pollution. Environmental financing programs can be directed at promoting private sector lending; establishing appropriate credit institutions or consolidating exiting ones; establishing privatization programs for urban services; initiating private sector loans for low-cost water and sanitation

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facilities; promoting the mobilization of economic resources at the community level, and establishing policies, tariffs (based on market interest rates), cost-recovery strategies, and cross-subsidies, when appropriate.

Data and software programs. Assistance can help establish database systems for a range of environmental programs, such as water quality, command-and-control strategies, and solid waste minimization monitoring plans. Activities can include the analysis, interpretation, and operation of data; retrieving quality data; methods for filling the gaps of incomplete data; data-base/information clearinghouse; generation of periodical reports; and preparation of profiles for environmental management. Custom-made software programs can be prepared for specific in-country needs to determine required levels of pollution emissions reduction, calculation of benefits generated by implementation of a particular environmental program, and preparation of environmental studies, such as comparative risk assessment studies.

In-plant audits or assessments. These studies focus on the collection of detailed data on waste or pollutant sources, amounts, and chemical types, as well as information on raw materials, such as energy, water, and chemicals. The main purpose is to identify cost-effective pollution prevention opportunities. These studies typically involve heavy polluting manufacturing facilities. Environmental audits can undercover the need for clean technologies, and for environmental products and services.

Industrial surveys. Industrial surveys determine, prioritize, and rank major polluting large and medium sized industries that affect a particular area. Such surveys can also identify dangerous wastewater discharges that affect regional or host-country primary water resources. These surveys may be used to identify the need for pollution prevention and control programs, environmental technology and clean technology interventions; urban environmental problems that, in conjunction with industrial problems, affect water resources; and institutional efforts required to monitor and control industrial wastewater discharges. Specific measures to reduce pollution and environmental impacts can be proposed as well as methods for filling data gaps. Industrial surveys can provide guidance for the preparation of industrial audits and industrial and urban pilot-scale evaluations.

Comparative assessments for local communities. Comprehensive methodologies and user friendly guidelines can be designed to conduct local environmental risk and management assessments at county and/or grassroots levels. Methodologies can include the descriptions of the proposed steps in the process; mechanisms for public participation; guides to environmental problems found in the area; descriptions of potential health, ecological or social/economic damage; criteria for determining the severity of an environmental problem; potential measures to be taken at the community level to address potential environmental problems; suggested local community activities that could be initiated to increase community environmental awareness and involvement in the preparation of action plans; and drafts of ranking matrices, posters, and charts that could be used in the process.

Local government interventions. Assistance can be provided to strengthen local government participation in environmental policy management. These institutions are largely responsible for enacting overarching legislation and policies governing natural resource/management, legal tenure, environmental protection, privatization, and trade; for creating and implementing policy instruments affecting solid waste management, wastewater collection, treatment, disposal, air pollution, and groundwater contamination; for promoting

public participation; for establishing, monitoring, and enforcing environmental quality standards; and for creating pollution prevention and control programs involving incentives and enforcement mechanisms, pricing policies, user fees and other cost recovery systems.

CBO/NGO interventions. Another avenue of assistance is to strengthen the role of CBOs/NGOs in environmental management. Through public education and advocacy efforts, CBOs/NGOs can play a significant role in establishing and monitoring compliance with legislative, regulatory, and economic instruments for environmental protection. They can work to establish national guidelines and policies on community participation and to mobilize community actions for natural resource conservation. These organizations can build public awareness on the value of environmental protection and how to achieve it, and create fora for participatory, multi sectoral debates on micro-policies affecting the environment.

Private sector interventions. Assistance can be furnished to the private sector to strengthen its involvement in environmental management; to identify, create, and serve markets for environmentally friendly products; to promote the development and adoption of innovative environmental policies; and to support instances where business interests in expanded intra- and inter-regional trade will have environmental benefits. Private firms may also establish joint ventures with foreign firms for the transfer of environmentally sound technologies, and provide credit for organizations in various sectors that are willing to adopt environmentally conscious management practices. Programs should identify opportunities where pollution prevention and resource recovery can be profitable for the private sector.

Training activities. Training can be provided to strengthen democratic and private sector-related institutions in the areas of natural resource conservation, applicable laws, and application of market-based incentives. Training provided to local governments can improve administrative and operational capacities in the provision, management, and maintenance of urban services; introduce appropriate pricing and revenue collection procedures; promote an environment conducive to both large and small-scale privatization; expand access to private sector loans; and promote greater interaction between municipalities and CBOs/NGOs. Special support can be provided to CBOs/NGOs for the development of projects and proposals; strengthening abilities to negotiate with local authorities; expanding knowledge of low-cost and self-help technologies; collecting community information; preparing environmental and related studies, such as environmental and health risk assessments; and promoting community resource mobilization. Training activities can include public awareness, preparation and distribution of guidance materials, and preparation of workshops, seminars, education programs, and conferences for key public officials, the private sector, and CBO/NGO members.

E. Comparison of Selected Environmental Technologies

Exhibit 2 on page II-14 shows a range of environmental technologies that are compared by effectiveness, costs, and technical complexity.

Exhibit 2
Comparison of Selected Environmental Technologies

Technologies	Environmental Effectiveness	Relative Costs and Capital Requirements	Technical Complexity
Sensors			
Remote	Good	High	High
Biological	Good	Low	Low
High-Tech	Good	Medium	High
Wastewater Treatment			
Physical	High	Medium	Medium
Chemical	Medium	Low	Low
Biological	High	Low	Medium
Gas Treatment			
Physical	High	High	High
Chemical	High	High	High
Waste Disposal			
Burial/Landfill	Limited	Medium to High	Medium
Incineration	High	High to Very High	High
Bioremediation	High	Medium	Low
Waste Storage			
Deep Well	Limited	High	Medium
Storage tanks	Low	Medium	Low
Solidification	Medium	Medium to High	Medium
Encapsulation	Medium	High	Medium
Waste Recycling/ Reclamation	High	Medium to High	Low to Medium

Source: SRI International

Sources

Environmental Technology: selected examples from:

SRI International for the Bureau for Global Programs/Center for Economic Growth/ Office of Economic and Institutional Reform. Handbook of U.S. Environmental Technology Transfer Resources. USAID: Washington, D.C., 1994.

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Bernstein, Janis D., Alternative Approaches to Pollution Control and Waste Management, Urban Management Programme, The World Bank, Washington, D.C., 1993.

SECTION III
ENVIRONMENTAL LAWS

A. General Overview

There is a debate between those who believe that free trade will undercut existing environmental protection laws and lead to greater environmental problems, and those who maintain that free trade will create opportunities for the use of environmentally sound technologies and spur greater environmental protection. The former argument is based on fears that free trade will inexorably lead to over-exploitation of the natural resource base and irreversible ecological damage. The latter argument is based on the premise that trade can have positive effects on incomes, resulting in greater public interest in environmental issues and increased spending on resource protection.

International laws and regulations. Free trade agreements have become a common theme within development programs, with a decided impact on economic growth and environmental agendas. As a condition for approval of NAFTA, an environmental side agreement was approved. The main objectives of this side agreement were the following: improve environmental conditions to avoid future trade barriers; strengthen cooperation for preparing and improving environmental laws, regulations, and enforcement mechanisms; and promote sound policies that will mitigate future deterioration of the environment resulting from increased trade activities. In addition, the International Standardization Organization (ISO) has created and is presently developing new systems to help standardize environmental and procedural management practices among member firms. Finally, the Organization for Economic Cooperation and Development (OECD) has prepared a document providing procedural guidelines for governments that seek to establish environmental policies that correspond with possible trade agreements.

Harmonization of environmental laws. To remove barriers to free trade, creating environmental regulations that conform to international standards is a key issue. Standardizing environmental laws involves balancing the demands of national and international law, national sovereignty, market economics, and sustainable development. Pro and con arguments concerning standardizing regulations include the following:

- If all countries have the same environmental regulations, companies from different countries can compete on an equal footing.
- Widely divergent systems of environmental laws, rules, and regulations around the globe create obstacles for free trade.
- If environmental standards are set too high, developing companies may be unable to afford appropriate technology and could be permanently excluded from markets.

Enforcement. In many Latin America countries, environmental legislation and regulatory institutions are either nonexistent, weak, or buried within legal codes for health and sanitation. In other instances, environmental legislation exists but enforcement is weak, hindered by powerful groups and political agendas in countries. However, governments and legislators can help create the political climate needed for effective enforcement of laws and environmental regulations. International organizations can promote programs to improve the legal and institutional capacities

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of governments to better cope with national problems of governance, effective law-making, and enforcement of laws affecting the environment and sustainable development. In addition, the general public or interest groups can exert pressures for reform.

Factors that limit countries' progress in achieving environmental compliance include the following:

- A clear regulatory authority has not been established.
- Key industries have been state-owned and not forced to comply with environmental regulations.
- Economic dependence on exports has further minimized the likelihood that plants, especially state-owned, would be shut down because of non-compliance.
- Countries lack monetary resources and technical skills for environmental enforcement.

B. International Regulatory Frameworks

The North American Free Trade Agreement (NAFTA). NAFTA was the first international trade agreement that comprehensively addressed major environmental issues. In the agreement, Mexico, Canada, and the United States recognized that economic development and expanded trade should take place in an environmentally responsible manner. One of NAFTA's objectives was is to "contribute to the harmonious development and expansion of world trade...in a manner consistent with environmental protection and conservation...promote sustainable development and enforcement of environmental laws and regulations." NAFTA was accompanied by two important side agreements: the NAFTA Supplemental Agreement on Environmental Cooperation, and the Integrated Plan for the U.S. Mexican Border Area. The supplemental environmental agreement outlined the obligations of each signatory with regards to the development and enforcement of environmental policy. Furthermore, it established the trilateral Commission of Environmental Cooperation (CEC) as a forum for technical information exchange. Headquartered in Montreal, the CEC is responsible for enforcing trilateral environmental dispute settlement procedures and trade sanctions in the event that a signatory violates its environmental obligations. The Integrated Environmental Plan for the Mexican-U.S. Border Area is a program designed by the Secretarial for Social Development (SEDESOL) and the U.S. Environmental Protection Agency (EPA) to address bilateral environmental problems throughout the implementation of NAFTA.

Key NAFTA environmental issues can be summarized as follows:

- NAFTA explicitly addressed environmental protection issues and contained more environmental provisions than any prior trade agreement.

- NAFTA specifically protects the rights of local, state, and federal governments to set and enforce their own environmental, health, and safety standards.

- The dispute settlement process under NAFTA protects environmental, health, and safety standards.

- Studies by the World Bank, the National Bureau of Economic Research and Los Alamos National Laboratory indicate that NAFTA and increased free trade will have a direct and positive impact on environmental quality and pollution reduction.

ISO 9000. The International Organization for Standardization (ISO) is a consortium of virtually all the world's industrialized nations. The United States is represented by the American National Standards Institute (ANSI). One of the ISO's missions is to develop industrial standards that facilitate international trade. Thus far, ISO has promulgated more than 8000 internationally accepted standards. The ISO 9000 standards focus on the process by which products and services are created and are intended to apply to products made anywhere in the world. Through certification, the ISO 9000 quality system provides customers and corporate management with the assurance that the product meets customer expectations and requirements. ISO 9000 is an accepted and in some cases mandated quality system, which is standard in Europe. Future trade relationships with Europe will largely depend on products receiving a ISO 9000 certification.

Key ISO 9000 environmental issues can be summarized as follows:

- Product quality must be *planned* to ensure that specified goals, authority, and responsibility are defined and understood.

- Product quality must be *controlled* to ensure that specified requirements at all levels are met, problems are anticipated and averted, and corrective actions planned and carried out.

- Product quality must be *documented* to ensure compliance with specified quality objectives, methods, and processes.

ISO 14000. ISO 14000 is a series of international voluntary environmental management standards whose purpose it is to create basic, uniform standards that can assist an organization in achieving environmental objectives through the use of effective management tools and systems that safeguard against potential negative impacts on trade and commerce. ISO 14000 is expected to have a similar impact on trade as the ISO 9000 series. Direct customers of the standards are businesses and industry, governments, non-profit organizations, and other users around the world. The success of ISO 14000 will be measured by the extent to which the standards remove barriers to international trade and improve environmental performance.

Key ISO 1400 environmental issues can be summarized as follows:

- Promote the facilitation of trade and removal of trade barriers

- Promote management standards that are cost effective, non-prescriptive, flexible, and scientifically based

- Enhance organizations' ability to attain and measure environmental performance

- Promote uniformity of national and regional environmental management standards

- Prevent the use of environmental management standards for granting unfair privileges or rights to any class of stakeholder

Voluntary standards. In the U.S., federal government activities involve the use of products or services that must meet reliable design and/or performance standards. Many of these standards are developed by the private sector through organizations referred to as voluntary standards bodies. Voluntary standards are developed by groups such as industry, nonprofit organizations, and trade associations. The federal government's participation in these standards bodies can provide incentives and opportunities to develop standards that serve national needs in environmental, health, safety, and other areas. Government adoption of voluntary standards can help reduce costs to government agencies and further enhance effective public-private partnerships. For example, the EPA uses voluntary standards to support rule making compliance activities and partnership programs with industry. Voluntary standards can be made mandatory by being incorporated into law by governmental bodies. For instance, private sector standards that come under international trade rules, or are referenced in specifications and contracts, are not voluntary in application.

C. Environmental Regulations for Selected Countries[1]

Argentina

Basic rules. Law 24.051, effective April 17, 1992, controls generation, transport, and disposal of hazardous waste (firms have 180 days to comply, extendable for another 180 days). Provincial and municipal laws cover air and water pollution.

Enforcement. Regulations enforced by the recently created Secretariat of the Environment, which reports to the president. Enforcement was considerably strengthened in 1993. At present, fines amount to millions of dollars; chemical plants and meat packers targeted for enforcement measures.

Water pollution. The national water utility has supervised disposal of liquid waste since the 1950s. Law 5965/50 of the province of Buenos Aires seeks to protect the area's water supplies. At present, enforcement is becoming stricter. For example, firms pay fines until treatment plants are built or upgraded.

Air pollution. Buenos Aires municipal code (Law 39025 of 1983) is aimed at controlling air pollution; similar rules exist in other cities. Automobile emissions, previously not regulated, are now being monitored by municipal authorities.

Hazardous substances. Law 24.051 regulates transport, packaging, labeling, and procedures for spills and staff training. Producers of toxic waste must submit forms with detailed information regarding operations. Importation is banned (Decree 181 of 1992).

Licences/permits. New law creates a registry of waste generators. Environmental certificate is needed for transport, treatment, or disposal of hazardous waste. Environmental studies are required for waste treatment plants and hydroelectric dams.

Outlook. Firms are under public pressure to improve environmental programs. A bill sent to the legislature in 1994 was designed to prevent pollution in nascent mining industries.

[1]Information included in this section was prepared and updated in 1994. See sources for this section.

Under the new provisions, firms would have to prepare environmental impact studies and would be responsible for damages caused by their activities.

Brazil

Basic rules. There is no comprehensive national environmental law. States regulate most environmental issues while federal agencies are more active in the prevention of deforestation.[2]

Enforcement. Strictest enforcement exists in São Paulo, Santa Catarina, Paraná and Rio Grande do Sul. In Rio de Janeiro and Bahia, enforcement is becoming stricter. Federal enforcement powers remain limited, except in the case of protection of national forests.

Water pollution. Rules have long been lax but are currently being tightened. Many rivers, aquifers, lakes, reservoirs, and stretches of coast are badly polluted. Strongest clean-up efforts focus on inland rivers and are overseen by state agencies.

Air pollution. Industrial air pollution is regulated by states and municipalities. São Paulo has forced clean-ups in many industries. National program governing automobile emissions was launched in 1990.

Hazardous substances. Producers of toxic waste must be licensed by states; enforcement is generally weak but is becoming stricter. Imports of toxic waste are restricted by federal law.

Licences/permits. Firms must file environmental impact statements for new projects. However, the review process is not stringent and permit requirements vary by state and municipality. Plants in São Paulo must adhere to controls by state environmental agency.

Outlook. At present, laws and enforcement are becoming stricter. The federal government is playing a greater role in terms of enforcement and regulations. Populace strongly in favor of controls and clean-ups. Local corporate opinion focused mostly on public relations.

Chile

Basic rules. Environmental Framework Law (DL 19.300 of March 1994) is based on polluter-pays principles. It streamlines rules and provides guidelines for future regulations and resolution of disputes, but is not yet fully operational.

Enforcement. Enforcement by Ministry of Health is somewhat lax but becoming stricter. Under the new law, CONAMA, the new environmental commission, has temporary enforcement authority. Violations now lead to light monetary fines but may be coupled with plant closures.

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[2]Under a current buy-in, Chemonics is developing a comparative matrix of environmental laws in Central America.

Water pollution. Rule 1333 of the National Institute of Standards restricts disposal of putrid matter, heavy metals, and floating solids. Other regulations limit discharge of liquid effluents and forbid ocean dumping of untreated wastes.

Air pollution. Decree 185 (1992) requires smelters to decontaminate emissions. Under Decree 4, factory discharges in Santiago must be halved by 1996. Decree 211 requires three-way catalytic converters for new cars in Santiago.

Hazardous substances. New law will restrict emissions of arsenic and sulphur dioxide. Environmental impact studies are required. Cradle-to-grave responsibility under study for Santiago only. Toxic-waste disposal is currently not regulated.

Licences/permits. Permits awarded by regional authorities of Ministry of Mining, which requires environmental impact studies. CONAMA has temporary powers to grant licences and permits for three years.

Outlook. Although the Environmental Law has been enacted, accompanying regulations are still lacking. Government is pursuing alternative energy sources, especially natural gas. Tradeable pollution rights are set to go into effect in 1996.

Colombia

Basic rules. Law 99 (1993) created the Environment Ministry, which regulates land use, grants licences, and helps firms comply with environmental rules. Decree 2811 of 1974 and Law 23 of 1973 still regulate other broad sectors.

Enforcement. The Environment Ministry is developing standardized sanctions that will be enforced by regional authorities. These include warnings, fines, plant closures, and demolition of construction at the violator's expense.

Water pollution. Current regulations are being revised. Firms must install systems for treatment of liquid waste. Specific guidelines established for waste disposal, with fines for violators ranging from $600 to $36,000; however, enforcement is weak.

Air pollution. Fines are proportional to volume of emissions and are higher for toxic substances; however, enforcement is weak. Incentives for reducing contamination is available. Car makers will be required to install exhaust filters in 1995.

Hazardous substances. Article 81 of the constitution bans the import of nuclear and toxic waste. A national plan for waste disposal is under revision. Community waste reduction and recycling projects are under way; however, public awareness is low.

Licences/permits. Environmental officials determine which projects with potential for environmental damage require licences and environmental impact studies. Law 99 of 1993 streamlines approval process for oil sector.

Outlook. Constitution passed in 1991 cites protection of environment as priority. New Environment Ministry has unified diverse authorities and reformed regulations.

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Ecuador

Basic rules. New environmental law is under consideration by the legislature; however, current code is weak. As of 1992, special rules apply to oil companies. Ecuador has ratified the biodiversity pact drawn up at the 1992 Earth Summit conference.

Enforcement. Air pollution is monitored by Ministries of Health and Industry; oil sector is regulated by Ministry of Energy and Mines and state oil company. Most rigorous enforcement deals with the petroleum industry, but is generally lax elsewhere.

Water pollution. CIPA, the supervisory agency, has adopted U.S. norms for water pollution; however, enforcement is weak. Law 2910 (1992) controls disposal of liquid industrial waste in Quito and will likely be the model for other locations.

Air pollution. Air pollution law (2910) applies only to Quito. Municipal agency may order relocation of violators or plant closures. Regulations existed that concern lead content in fuel; when necessary, government may limit traffic.

Hazardous substances. Contamination of soil, air, or water with toxic waste is punishable by up to eight years in prison. Import or transport of all toxic waste is banned. Penalties exist for endangering flora or fauna.

Licences/permits. Licences are required for mining, hunting and fishing, roads, power plants, and other projects involving infrastructure. Mining and oil ventures must be approved by the Ministry of Energy and Mines after an environmental impact study.

Outlook. Stronger codes are to be approved in 1994, and implementation of existing laws will be strengthened. New norms for industrial liquid wastes and fuel consumption are expected soon. Public concern is mounting on ecological issues.

Mexico

Basic rules. General Law of Ecological Equilibrium and Environmental Protection dates from 1988. However, many technical norms are still lacking.

Enforcement. The Office of the Federal Attorney-General for Environmental Protection enforces standards. Penalties are more lenient for existing companies than new ones; penalties include plant closures, fines, and jail terms.

Water pollution. Technology-based controls on effluent discharges have not been fully implemented. Standards vary according to industry or body of water. Controls on discharges into municipal sewerage systems are lax.

Air pollution. SEDESOL sets level for common pollutants, but has limited monitoring ability. Permits are required for all industrial sources. Mexico City program includes mandatory "day without a car."

Hazardous substances. Cradle-to-grave approach exists with specific norms for waste storage and disposal. Manifests are required for transport. Inadequate disposal facilities hamper proper toxic-waste treatment. No superfund type law exists on clean-ups.

Licences/permits. Companies need operating license from SEDESOL and water discharge registration. Builders of new facilities must file impact analysis as well as risk assessment if hazardous substances are involved.

Outlook. Accords parallel with NAFTA have created a Commission for Environmental Cooperation to push enforcement. Still, uneven application of the law persists, with toughest action in Mexico City and along the U.S. border.

Peru

Basic rules. Strict 1990 Environment and Natural Resources Code (Decree 611) was modified due to protests from businesses complaining of high costs. Pollution is severe in most urban areas.

Enforcement. Penalties for violations include maximum eight-year prison terms and/or fines. Mining and energy sectors are under strictest scrutiny.

Water pollution. Disposal of any pollutants in water prohibited. Water employed in mining and energy sectors must be treated after use. Prior authorization is needed to discharge industrial waste through public sewerage system. Zoning restrictions can apply to different types of residual waters.

Air pollution. Restrictions on air and noise pollution exist; however, enforcement is weak. Some municipal governments have taken individual action to control automobile emissions. Open-air mines are subject to decontamination requirements.

Hazardous substances. Mining wastes must be kept at least 500 meters from bodies of water and comply with UN standards if deposited at sea. Energy industry is subject to special regulations. Imports of chemical and toxic waste are prohibited.

Licences/permits. Environmental impact studies are required for most projects, especially in construction, oil and gas, mining, fishing, forestry, chemicals, and petrochemicals. Studies must be approved by the respective ministries.

Outlook. Attention to environmental issues will be used to bolster government's international image. Public and corporate opinion is in favor of pollution control. Most oil and mining companies adhere to green requirements.

Uruguay

Basic rules. There is no national anti-pollution law, but various municipal regulations exist. The Ministry of Housing and Environment was created in 1990 to oversee environmental protection.

Enforcement. Supervision by Ministry of Housing and Environment and municipal governments exist; enforcement is generally weak, but improving. Fines are up to $4,500 and/or closure. New industries face stricter enforcement.

Water pollution. Water pollution is regulated by 1978 Water Code and Decree 253 (1979). Industries in Montevideo are governed by Municipal Decree 13.892 (1967) on shedding of industrial fluids. Liquid mining waste is subject to special disposal requirements.

Air pollution. First national air pollution law is awaiting approval in the legislature in 1994. Municipal government of Montevideo can set environmental safety parameters and bar new industries that pollute. Cities control the emission standards for vehicles.

Hazardous substances. Decree 259 (1989) forbids transport, importation, and disposal of dangerous waste and covers all substances. Producers of radioactive materials have cradle-to-grave responsibility.

Licences/permits. Industries must obtain permits to locate in Montevideo. Equipment and sanitary facilities need municipal certification. Law 16466 of January 1994 requires environmental impact statements for approval.

Outlook. Enforcement of rules on water and air pollution have been strengthened. Uruguay signed accord with Brazil in 1992 to monitor cross-border pollution and other with Argentina in 1993 to control accidents involving harmful substance in common waters.

Venezuela

Basic rules. Penal Environmental Law, effective April 27,1992, supplements Organic Environment Law (1976). Seventeen norms cover all aspects of pollution. Environmental crimes are established as well as punishment for violators.

Enforcement. The Environment Ministry supervises enforcement. Enforcement can increase as compliance deadlines expire. Penalties include fines, imprisonment of up to 10 years, and plant closures.

Water pollution. All aspects of water pollution are covered, including offshore territorial waters. Rules comply with international standards; however, extent of enforcement is still unclear.

Air pollution. All industries are targeted. Sources of pollution are classified according to UN norms. Recent stance against state petrochemical plant can point to tougher enforcement in the future.

Hazardous substances. Cradle-to-grave responsibility. Disposal sites must be approved according to strict norms for their use. Transport rules include use of a specially registered vehicle. Importation of toxic waste is strictly prohibited.

Licences/permits. Companies must submit list of contaminating activities to the Environment Ministry to obtain temporary permit. Definitive permit is granted after review. Environmental impact studies are required for new projects.

Outlook. Compliance is increasing with new law; however, many entities have not adhered to deadlines for specific pollution categories. At present, government is determining which firms should be sanctioned or excused.

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Sources

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Other publications used in this section include:

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Mexico's Environmental Markets. USAID: Washington D.C., 1995.

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SECTION IV
SELECTED COUNTRY PROFILES

A. General Overview

New economic policies are guiding Latin American countries toward a recovery from the "lost decade" of the 1980s. The end of the Cold War has created new opportunities for North-South cooperation and the coordination of political, economic, and social agendas. With a redefined political atmosphere and a new economic landscape, the region is laying the groundwork for sustainable economic development through market-oriented policies. The challenge now for Latin America, as it undergoes economic restructuring, is to provide opportunities for the poor to participate in economic growth. Having endorsed trade liberalization, the region's leaders are entering into broad, bilateral trade agreements that will lead to export-led growth and an eventual hemispheric free trade area. Countries are promoting export expansion and trade liberalization in order to alleviate poverty, encourage investment, and increase the flow of foreign capital into Latin America.

Latin American countries are becoming increasingly aware that economic decline and environmental degradation are closely linked. Over-exploitation of resources and pollution are decreasing potential economic growth for current and future generations, undermining human health, and contributing to global climate change and loss of biodiversity. Environmental degradation occurring in Latin America is rooted in such factors as pervasive poverty, rapid urbanization, limited access to appropriate resource management and clean production technologies, governmental policies that distort resource management incentives, and weak public and private environmental management institutions.

Economic trends. Through 1993, Latin America and the Caribbean continued to show strong growth. Real GDP for the region increased from 2.1 percent in 1992 to 3.3 percent in 1993. Per capita GDP, aided by a decrease in population growth, rose 1.6 percent in that year (USAID 1994). Trade flows are a major factor in the regional economy's high growth rate. The region's trade with the world reached $350 billion, with a 9.3 percent increase in exports alone. Intra-regional trade grew to $32 billion, a 15 percent increase from 1992, as regional trade agreements were ratified and negotiated. For the first time, U.S.-Latin American trade surpassed $150 billion in 1993, with an annual export growth of 12 percent since 1989 (USAID 1994).

B. Country Profiles

Criteria for the selection of country profiles. Starting on page IV-3, a series of country profiles appears that include relevant economic and environmental data for six countries: Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. These countries have the largest economies in Latin America, but can be the major sources of environmental degradation in the region. These six countries have a total population of 347 million and a combined GDP of $802 billion. They account for 79 percent of the region's total population and 89 percent of the region's GDP. Economic growth in these countries in recent years has been relatively strong. These countries have benefited from their move toward market liberalization and economic reform, including reduced import barriers and tax reforms, increased foreign access to investment, and lower inflation and foreign debt. These countries are seeking new free trade agreements within the region and with the United States and are in the process of privatizing major industries.

Environmentally, these countries face the conflicting demands of growing and rapidly urbanizing populations, economic expansion, and environmental protection. In many instances, the need to industrialize and improve overall economic welfare has taken precedence over environmental concerns. These countries share similar problems that stem from populations clustered in dense urban areas close to major industrial centers. Rapid urban growth and unregulated industrial development have created severe potable water and sanitation problems. In many cases, people and industry must share the same polluted, rapidly depleting water supply. Air pollution from industry and transportation is often magnified by high population densities and proximity to urban areas.

In terms of pollution, although the regulatory and compliance situation is changing—many Latin American countries are modeling environmental programs after those in the United States—the majority of countries still face serious problems. Furthermore, each country is at a different stage in developing policy and regulatory frameworks and enforcing environmental legislation.

Size of the environmental market. According to USAID, the expected size of the environmental market in the six aforementioned Latin American countries is about $2.45 billion, with an estimated yearly growth rate ranging from 25 to 30 percent. About 70 percent of the environmental market will be spent on water pollution amelioration, including industrial and municipal water and sewage treatment. The air pollution sector will total about 21 percent and solid and hazardous waste markets 9 percent of the total market. Due to increases in regulation and enforcement, the Latin American environmental market should continue to experience significant growth.

International funding. Bilateral and multilateral funding for environmental projects in Latin America is steadily increasing. The Inter-American Development Bank (IDB) currently has 14 environmental projects planned for six of the selected countries; of these, 5 are water pollution control projects for Brazil that are each valued at over $200 million. The World Bank has 11 environmental projects planned for these countries in the areas of water pollution and institutional strengthening. U.S. Government agencies, such as the Agency for International Development, the Environmental Protection Agency, and the Trade and Development Program, are all conducting environmental assistance programs in these countries. Many of these bilateral programs will involve the procurement of environmental equipment and services from U.S. companies.

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ARGENTINA

Economic Data:
1993 GDP: $152.43 billion
1990-93 GDP growth rate: 7.9 percent
1993 GDP per capita: $4,522
1993 Foreign debt as a percentage of GDP: 41.5 percent
1993 Population: 33.497 million
1990-93 Population growth rate: 1.2 percent
1993 Urban population: 87.1 percent

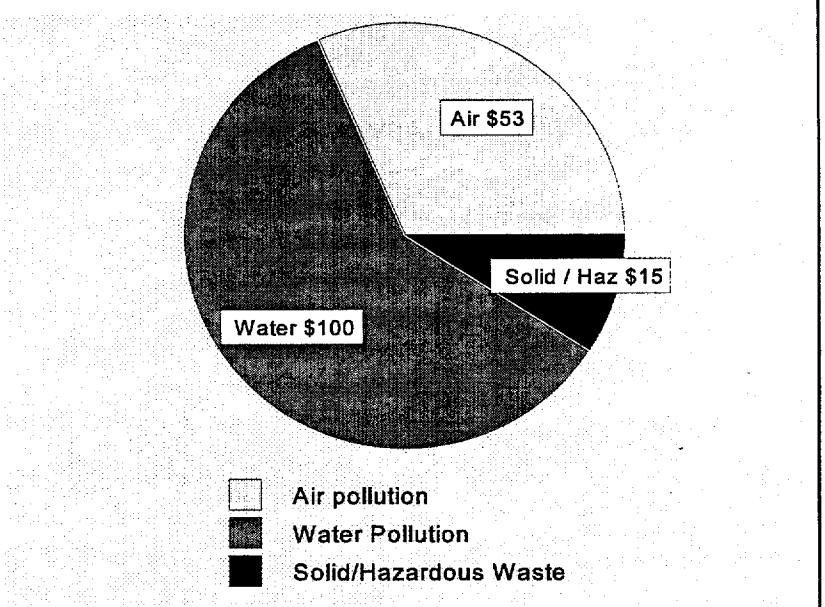
Trade Treaties:
Mercosur, and Latin American Integration Association (LAIA)

Bilateral Agreements with:
Uruguay, Peru, Ecuador, Mexico, Brazil, Venezuela, Colombia, Paraguay, Bolivia, Chile

Environmental Data:
Area: 2,766.89 (thou. sq. km)
Density: 11.8 (pop. per sq. km)
Agricultural land: 61.9 (% of land area)
Forest and woodland: 591 (thou. sq. km)
Energy consumption per capita: 1,351 (kg of oil equiv.)

Environmental Technology Market: (in millions of U.S. dollars, 1992)
Total size: $168
Air pollution: $53
Water pollution: $100
Solid/Hazardous waste:$15
Key Market Trends:
Improving economy through privatization and export promotion; recent formation of environmental ministry; criminal prosecution of willful environmental negligence

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: Argentina has opened its markets to international trade and is in the process of stabilizing its economy. The government of Argentina has moved decisively to solve major economic problems, which include high inflation, an unsustainable fiscal deficit, a bloated public sector, business uncertainty, a high level of public sector indebtedness, low growth, and a commercially uncompetitive private sector. The economy's strong performance in the early 1990s is the result of increased privatization of state-owned industries, deregulation, exchange rate reform, and other economic reforms.

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Current trade and environmental technology-related information: Lower tariffs are encouraging greater volumes of trade. Imports from the United States grew from $1 billion in 1989 to $1.9 billion in 1991. The United States has a $2.6 billion dollar trade surplus with Argentina; Argentina's trade deficit may disappear following the recent 1995 currency devaluation. The return of capital invested elsewhere and increased foreign investment has eased the debt burden. Favorable conditions continued into 1993, with a drop in inflation and a 6 percent rise in real GDP. A major goal in Argentina's economic policy is to improve the relative prices of tradeable goods while maintaining a fixed exchange rate. Demand for pollution control equipment and services is likely to come from four sectors: municipal and cooperative water authorities, electric utilities, industrial plants, and national agencies.

Environmental status: Argentina has begun to devote serious attention to environmental problems at the federal level. The effects of industrialization, modernization of agriculture (in particular, pesticide use), urbanization, and rising urban poverty are evident in the hardest hit areas of Buenos Aires and Santa Fe Provinces. The manufacturing sector generates significant levels of pollution; the power and transportation sectors are heavy polluters. Argentina accounts for about 0.5 percent of net world emissions of greenhouse gases. Because of its proximity to the South Pole, the country is seriously concerned with ozone depletion; it is one of only a handful of Latin American countries to sign the Montreal accords on ozone depletion. No comprehensive national environmental law exists in Argentina. Provinces such as Buenos Aires and Cordoba have adopted strong legislation but a mixture of contradictory, overlapping decrees and by-laws exist at the federal level. Once Argentina develops a coherent federal strategy, the need for environmental technologies will translate into opportunities for U.S. exporters.

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BRAZIL

Economic Data:
1993 GDP:$349.05 billion
1990-93 GDP growth rate: 1.6 percent
1993 GDP per capita: $2,229
1993p Foreign debt as a percentage of GDP: 33.5 percent
1993 Population: 156.57 billion
1990-93 Population growth rate: 1.7 percent
1993 Urban population: 78.2 percent

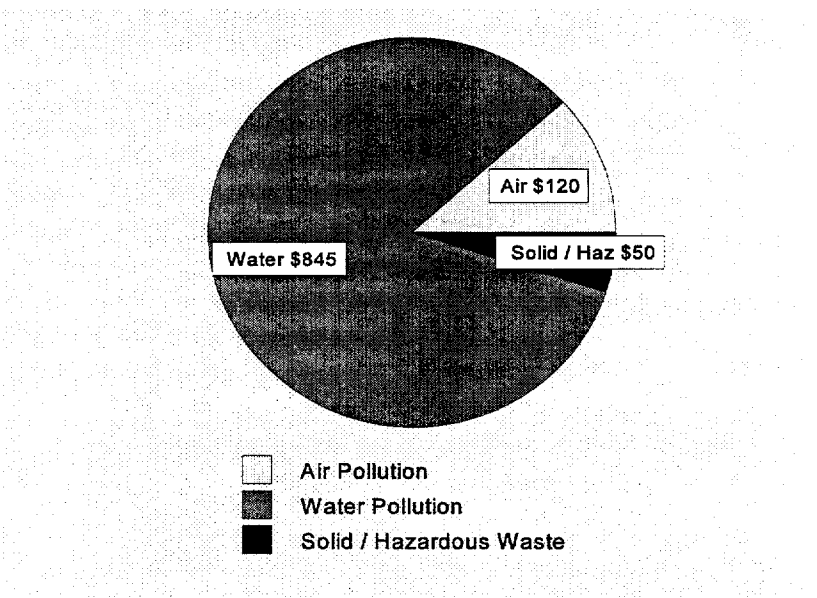
Trade Treaties:
Mercosur, and Latin American Integration Association (LAIA)

Bilateral Agreements with:
Uruguay, Argentina

Environmental Data:
Area: 8,511.97(thou. sq. km)
Density: 17.8 (pop. per sq. km)
Agricultural land: 29.2 (% of land area)
Forest and woodland: 4,905 (thou. sq. km)
Energy consumption per capita: 681 (kg of oil equiv.)

Environmental Technology Market: (in millions of U.S. dollars, 1992)
Total size: $1,015
Air pollution: $120
Water pollution: $845
Solid/Hazardous Waste: $50
Key Market Drivers:
Increasing public pressure to solve pollution problems, movement to a market-oriented economy, more active regulatory enforcement, privatization of state-owned companies

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: The country of Brazil occupies 48 percent of the Latin American continent. Following three consecutive years of recession, the GDP rebounded with a 5 percent growth rate in 1993, largely due to higher real wages in the private sector, lower interest rates, increased investment, and large capital inflows. Economic policy was adversely affected by legal and political factors, including scandals and mounting fears that the government would introduce a shock program to reduce four-digit inflation. GDP growth in 1993 was approximately 5 percent; 1994 GDP is anticipated to fall within the range of 3.5-4 percent. In spite of political difficulties, progress and growth are being achieved. The future challenge will be to reduce inflation to manageable levels and keep prices down over the long term.

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Current trade and environmental technology-related information: Brazil has industrialized rapidly over the last 30 years and become a leading producer of petroleum, petrochemicals, and steel. The Brazilian market is the largest in Latin America and accounts for about one-half the region's total output. Recently, imports have jumped over 25 percent to $25.7 billion due to economic recovery and the opening of the economy. Opportunities for United States exporters of environmental technology are increasing in Brazil due to growing public pressure for environmental improvement, reductions in import restrictions duties, market-oriented economic reforms, greater enforcement of environmental regulations, and privatization of public industries. In 1992, the overall environmental market in Brazil was estimated at over $1 billion, with tremendous growth potential. Growth in environmental imports will be driven by local companies looking for high-tech components or equipment—especially rèlated to water pollution control—that are not available from domestic companies.

Environmental status: Rapid growth in Brazil's industrial sector has caused the following severe air, water, and solid waste problems: air pollution from dust, sulfur dioxide, odors, and volatile organic compounds; contamination of water resources with toxic wastes and heavy metals; and hazardous metals in the soil. With industrial pollution as the major concern, Brazil's overall environmental situation is worsened by the geographical concentration of its population and industries and widespread poverty. In Sao Paulo, water sources are shared by industry and the general public, only 50 percent of the city's sewage is collected and less than 10 percent is treated. Brazil has developed a comprehensive regulatory system on federal and state levels to deal with environmental problems. Brazil's National Environmental System (SISNAMA) is responsible for environmental standards, zoning, and impact assessments, and for maintaining an environmental database. Levels of enforcement vary widely among Brazil's industrial states due to economic factors; therefore, a federal environmental program, the National Industrial Pollution Control Project, funded by the Brazilian government and the World Bank, has been established to aid companies in financing industrial pollution control measures.

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CHILE

Economic Data:
1993 GDP: $42.22 billion
1990-93 GDP growth rate: 7.0 percent
1993 GDP per capita: $3,056
1993 Foreign debt as a percentage of GDP: 41.6 percent
1993 Population: 13.81 million
1990-93 Population growth rate: 1.6 percent
1993 Urban population: 86.9 percent

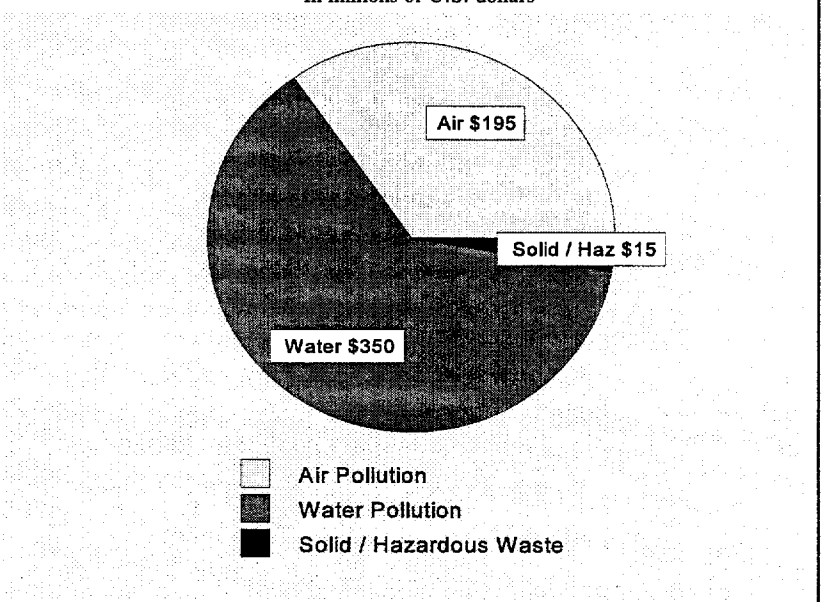
Trade Treaties:
Anticipated next member of North American Free Trade Agreement (NAFTA),and Latin American Integration Association (LAIA)

Bilateral Agreements with:
Venezuela, Mexico, Bolivia, Uruguay, Colombia

Environmental Data:
Area: 756.95(thou. sq. km)
Density: 17.7 (pop. per sq. km)
Agricultural land: 24.0 (% of land area)
Forest and woodland: 88 (thou. sq. km)
Energy consumption per capita: 837 (kg of oil equiv.)

Environmental Technology Market: (in millions of U.S. dollars, 1992)
Total size: $560
Air pollution: $195
Water pollution: $350
Solid/Hazardous waste: $15
Key Market Trends:
New air regulations; the cleanup of Santiago; lack of existing infrastructure; economic changes that improve import opportunities

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: During the past decade, Chile has developed one of the most stable and market-oriented economies in Latin America. Economic growth is the result of open market policies, export diversification, promotion of foreign investment, and foreign debt reduction. Chile has rapidly privatized major industries, GDP growth has averaged 6.1 percent since 1985, and unemployment is currently at a 30-year record low of 4.5 percent. A growth in output and a low unemployment rate in 1993 was consistent with a rise in labor productivity and wages. With rising incomes, this number of people living below the poverty line has declined from 40 to 28 percent in the last four years. A surplus in the fiscal balance has spurred increased spending on infrastructure and the social sectors.

Current trade and environmental technology-related information: Chile appears to be moving toward stability and progress. With relatively low tariffs and duties, Chile's trade structure is favorable to foreign imports, especially those from the United States, due to Chile's desire to join NAFTA. In 1992, Chile experienced an unprecedented amount of foreign investment (about 4 percent of GDP) with the largest portion of direct investment coming from the United States. The United States is Chile's largest trading partner, supplying nearly 23 percent of Chile's total imports and absorbing nearly 17 percent of Chile's exports. The present administration is currently negotiating a Free Trade Agreement (FTA) with Ecuador, similar to agreements already signed with Mexico, Venezuela and Colombia; the primary emphasis, however, will be placed on achieving a FTA with the United States. The market for environmental goods and services is emerging rapidly, with municipal wastewater and industrial air pollution at the forefront. Solid and hazardous waste markets are still in their infancy but significant opportunities exist for services such as auditing and emissions monitoring.

Environmental status: Chile's environmental problems range from air polluted with sulfur dioxide and heavy metals to water polluted by industrial and municipal wastes. These problems are the result of rapid industrialization and deregulation with no consistent environmental policy; another factor is the high concentration of people and industries in a few areas of the country. About 75 percent of the population lives in Chile's central region which includes the capital, Santiago, the second most polluted city in Latin America. Old factories, diesel buses, unpaved roads, and thermal inversions have contributed to the city's severe water, sewage, and air pollution. Chile has more than 2,000 environmental laws, yet problems persist because of sporadic enforcement. In the last two years, however, the government has set environmental policy as a priority and established a National Environmental Commission (CONAMA).

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COLOMBIA

Economic Data:
1993 GDP: $52.22 billion
1990-93 GDP growth rate: 3.5 percent
1993 GDP per capita: $1,537
1993 Foreign debt as a percentage of GDP: 31.8 percent
1993 Population: 33.987 million
1990-93 Population growth rate: 1.7 percent
1993 Urban population: 73.7 percent

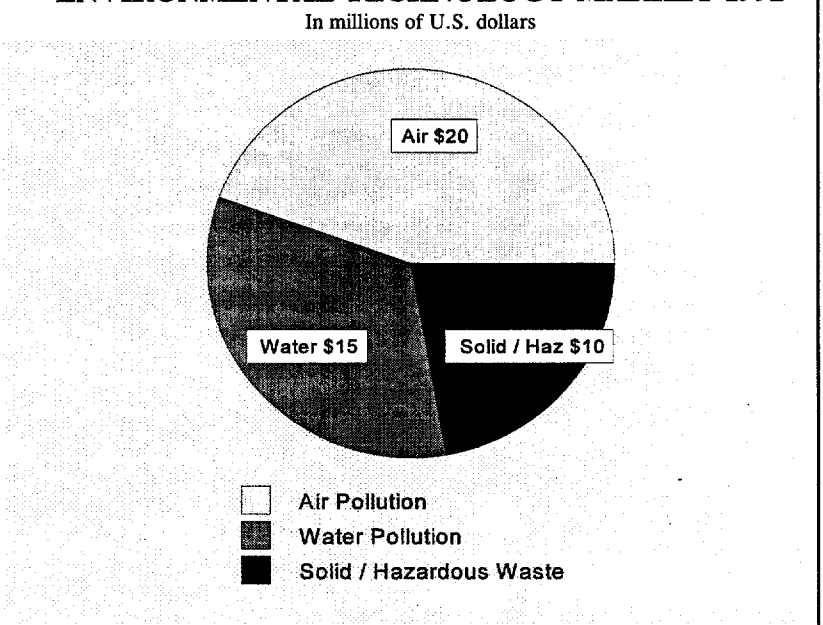
Trade Treaties:
Group of Three (G-3), Andean Common Market (Ancom or Andean Pact), Latin American Integration Association (LAIA), and U.S. Andean Trade Preference Act (ATPA)

Bilateral Agreements with:
Chile, Argentina

Environmental Data:
Area: 1,138.91 (thou. sq. km)
Density: 28.8 (pop. per sq. km)1987-92 est.
Agricultural land: 44.2 (% of land area)
Forest and woodland: 500 (thou. sq. km)
Energy consumption per capita: 670 (kg of oil equiv.)

Environmental Technology Market: (in millions of U.S. dollars, 1992)
Total size: $45
Air pollution: $20
Water pollution: $15
Solid/Hazardous waste: $10
Key Market Trends:
Severe pollution; environmental initiatives; public pressure; opening of Colombian markets

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: Colombia's recent economic policy has focused on maintaining economic growth while maximizing efforts to reduce inflation. Guerrilla violence, fiscal austerity measures to control inflation, and low levels of private investment all contributed to a slight decline in the growth rate in 1991, to 3.0 percent, creating uncertainty in the short-term success of the government's new *apertura* reforms designed to enhance economic growth, modernize local industry, and liberalize Colombia's markets. Government officials were predicting a GDP growth for 1994 in the range of 5.5-6 percent, with a decrease in inflation to 19 percent.

Current trade and environmental technology-related information: Economic liberalization reforms that began in 1991 have fueled the import of capital goods and has led to increased efficiency of Colombia's industrial sector. Petroleum, mining, and other non-traditional exports are helping to compensate for the decline experienced in world coffee prices. The United States is Colombia's main trading partner, with 39.9 percent of the export markets and supplied 32.8 percent of imports in 1993. Due to rapid growth in the U.S. export sector in 1993, the United States posted a $395 million trade surplus; the year before, Colombia held a $467 million trade surplus with the United States. Colombia's newly autonomous central bank and restructured import-export bank, along with two new ministries for foreign trade and the environment, will help Colombia move towards privatization and a market-oriented economy. Imports dominate Colombian pollution control efforts, representing 78 percent of the market in 1992. The United States currently has more than 40 percent of the market; the Department of Commerce anticipates that the U.S. share will grow at a rate of 6 percent over the next three years.

Environmental status: Rapid urbanization and industrialization have created severe municipal and industrial pollution problems that threaten public health and the economic development of Colombia's major production centers. Water pollution in the Bogota River, the most intensively used river in Colombia, affects agricultural output and raises the cost of water treatment. The Rio Bogota supplies the nation's capital, Bogota, which has a population of over six million and the highest concentration of industry in the country. New government initiatives, such as the National Environmental Policy Plan (NEPP) and a new constitution effected in July 1992, provide a new institutional foundation for the implementation of what has been called the most comprehensive set of environmental legislation passed to date in Latin America. The new framework attempts to integrate environmental management with economic and social planning at all levels, specifically targeting agriculture, energy and mining, urban sanitation and waste management, and civil works.

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MEXICO

Economic Data:
1993 GDP: $195.86 billion
1990-93 GDP growth rate: 2.2 percent
1993 GDP per capita: $2,262
1993 Foreign debt as a percentage of GDP: 53 percent
1993 Population: 86.58 million
1990-93 Population growth rate: 2.1 percent
1993 Urban population: 74.1 percent

Trade Treaties:
North American Free Trade Agreement (NAFTA), Group of Three (G-3), Central American Common Market (CACM), Latin American Integration Association (LAIA)

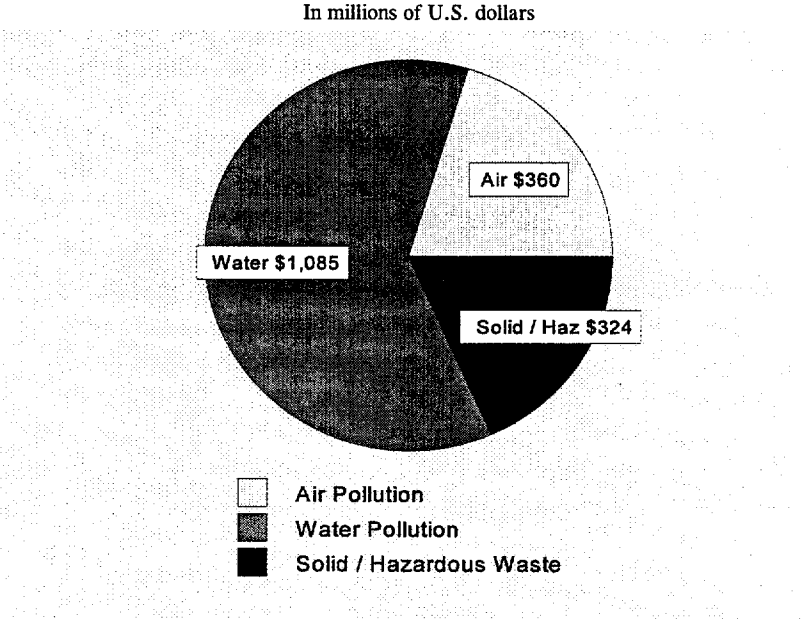
Bilateral Agreements with:
Chile, Uruguay, Argentina

Environmental Data:
Area: 1,958.20 (thou. sq. km)
Density: 42.5 (pop. per sq. km)1987-92 est.
Agricultural land: 52.0 (% of land area)
Forest and woodland: 419 (thou. sq. km)
Energy consumption per capita: 1,525 (kg of oil equiv.)

Environmental Technology Market: (in millions of U.S. dollars, 1994)
Total size: $614
Air pollution: $104
Water pollution: $400
Solid/Hazardous waste: $110

Key Market Trends:
Growing public pressure on the Mexican government to improve living conditions; NAFTA obligations; continued market liberalization; rapid urbanization and industrialization; new stringent environmental standards

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: Trade liberalization, subsidy reduction, an extensive privatization program, the removal of foreign exchange controls, incentives for foreign investment, and debt reduction have set the course for Mexico's recovery from economic stagnation during the 1980s. However, the 1994 peso devaluation and ensuing financial turmoil have had the effect of raising the price of U.S. exports within the Mexican market, reducing federal spending, and raising the cost of domestic borrowing. While the economic situation is expected to lead to a lower growth rate in 1995, the environmental business segment is expected to be one of the leading economic sectors.

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Current trade and environmental technology-related information: The NAFTA tariff reductions have already increased the cross-border trade of environmental goods and services. By 1998, tariffs on nearly all categories of environmental equipment are scheduled to be eliminated. Two binational institutions created in the NAFTA side agreement on the environment, the Border Environmental Cooperation Commission (BECC) and the North American Development Bank (NAD Bank), will provide opportunities for U.S. firms to create and expand their business in Mexico. Mexico has also launched the 100 Cities Program, designed to promote migration away from the largest metropolitan areas; the proposed demographic shift will increase demand for environmentally sound infrastructure development in participating cities. The size of the Mexican market for environmental goods and services is expected to increase nearly four-fold during the 1990s with the public and parastatal sectors being the largest consumers, spending primarily on state and municipal water and solid waste infrastructure projects.

Environmental status: Pressures from a growing urban population and an increase in the number of industrial facilities have strained Mexico's environmental infrastructure to the limit. With population and major industries concentrated in three cities, Mexico City, Guadalajara, and Monterrey, the demand for clean water and solid waste management is constantly an increasing. The border region represents one of most pressing environmental problems in the country. With the rapid growth of the maquiladoras since the late 1960s, an increasing population (now totaling 8 million, with a 3 percent annual growth rate) has overwhelmed drinking water facilities, wastewater treatment plants, and facilities for the disposal of solid and hazardous wastes. New regulatory agencies have been created, modeled after the United States, at the federal, state, and local levels. State and local agencies are beginning to take on greater enforcement responsibilities. The Secretariat of Social Development (SEDESOL) has divided environmental policy formulation and enforcement into two divisions, which are, respectively, the National Institute of Ecology (INE) and the Office of the Attorney General for Protection of the Environment (PROFEPA).

VENEZUELA

Economic and Social Data:
1993 GDP: $76.6 billion
1990-93 GDP growth rate: 5.3 percent
1993 GDP per capita: $3,715
1993 Foreign debt as a percentage of GDP: 63.3 percent
1993 Population: 20.62 million
1990-93 Population growth rate: 2.2 percent
1993 Urban population: 94.3 percent

Trade Treaties:

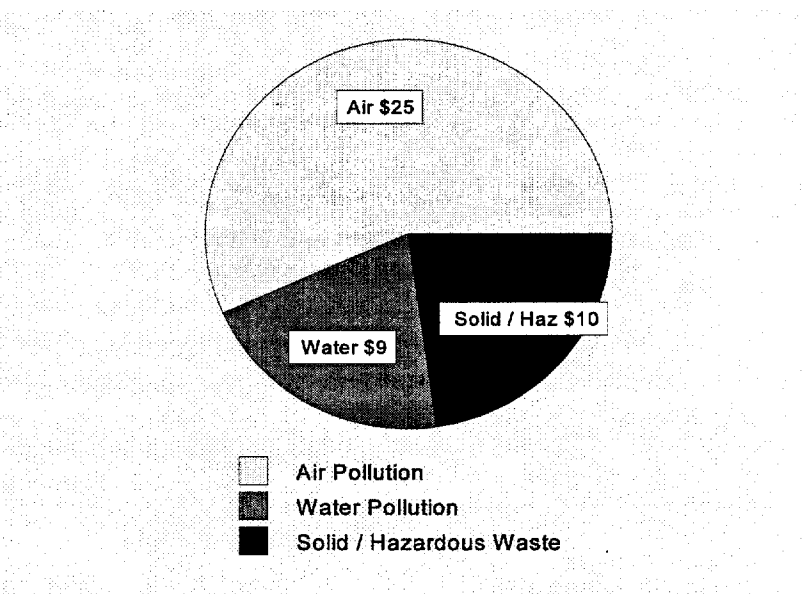
Group of Three (G-3), Andean Common Market (Ancom or Andean Pact), Latin American Integration Association (LAIA)

Bilateral Agreements with:
Chile, Argentina

Environmental Technology Market: (in millions of U.S. dollars, 1992)
Total size: $44
Air pollution: $25
Water pollution: $9
Solid/Hazardous waste: $10

Key Market Trends:
Expansion and moderniza-tion of petroleum sector; increased enforcement of environmental regulations; growing efforts to clean up main sources of pollution

ENVIRONMENTAL TECHNOLOGY MARKET 1992
In millions of U.S. dollars



Current economic situation: Venezuela, the country with the highest growth rate in Latin America from 1990-1992, has suffered the repercussions of political and economic adversity. Contracted domestic demand in 1993 contributed to a 1 percent fall in GDP. Two attempted coups in 1992, the suspension of former President Perez, and the subsequent installment of an interim administration all contributed to a mood of considerable uncertainty in the market, leading to a recession in 1993. Setbacks in privatization efforts, international investor confidence, trade liberalization, and a fall in the price of oil, which contributes nearly 28 percent of the country's GDP, have all slowed growth. The government has more recently introduced several controversial

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economic policies, including new taxes, wage hikes, transportation subsidies, suspension of economic/social liberties, and the imposition of far-reaching price and wage controls.

Current trade and environmental technology-related information: In the short term, exports will remain constrained but a slow recovery will begin if the Caldera administration embraces a sound economic plan. Over the longer terms, trade between the United States and Venezuela is expected to grow substantially despite a current decline in U.S. exports. Economic reforms will eventually channel economic activity away from a static, petroleum-based economy. Venezuela is the fourth largest market in the Western Hemisphere for U.S. exports and the United States is the primary market for Venezuela's exports, absorbing approximately 55 percent of the country's total exports in 1993. The major challenges ahead for Venezuela include: reducing the fiscal deficit, increasing incentives for foreign investment, reducing inflation, and combating poverty through more efficient public spending. At present, the Ministry of Environment and Renewable Natural Resources has begun to urge the oil industry to increase its use of pollution prevention technologies.

Environmental status: Environmental concerns dating back to the 1970's involve the high levels of mercury, lead, and other compounds found in Lake Maraciabo, the continent's largest freshwater lake, and Lake Valencia, near Caracas, where the majority of the urban population resides. The country's air, water, and land endowments have been substantially affected by the mineral extractive industries. Venezuela's regulatory structure is primarily directed towards achieving pollution control via end-of-pipe measures rather than promoting pollution prevention.

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SECTION V
GUIDE FOR EXPORTING EGS

A. Road Map for Exporting Environmental Goods and Services

Overview. Strong domestic sales frequently serves as a good proxy for a product's potential success abroad, assuming the existence of similar demand conditions and product needs. However, U.S. conditions and requirements rarely prevail in foreign markets and products and marketing approaches must often be adapted to meet local preferences and circumstances. In addition, exporters of EGS should be aware that products that may be losing market share in the United States to more advanced technologies may be well positioned to make a second run in overseas markets. Since the United States is an EGS leader, there is often a significant lag between the time that a new, leading-edge service is in demand in the United States and when it makes an impact on markets in other countries. Thus, buyers in developing countries, while hesitant to purchase state-of-the art technologies due to cost or technical complexity, may be eager to purchase older U.S. products that are less sophisticated and more affordable. This factor should be kept in mind when a firm considers whether its product is exportable. While sensitivities may exist regarding "old" or "used" technology and equipment in some countries, markets can often accommodate a wide range of environmental goods and services.

Research the export market. Market research is critical for determining overseas demand for EGS, identifying specific markets by region and type of buyer, and assessing potential competitors, both domestic and international. The Department of Commerce recommends the following methodology for formulating an initial assessment of market possibilities.

- Obtain export statistics that indicate exports of EGS to various countries.
- Identify five to ten large, fast-growing markets for EGS, and compare growth over time.
- Identify smaller, emerging markets that may be good targets for ground-floor start-ups.
- Target three to five promising markets for in-depth follow-up.

Once a company has identified three to five target markets, the firm can initiate a more detailed strategic study for each market. This step might involve contracting an outside firm with specialized marketing expertise.

Conduct feasibility study (optional). Large-scale environmental projects may require on-site feasibility studies. The benefits to exporters of feasibility studies are twofold: (1) They provides critical information on whether and how a project should proceed; and (2) Studies furnish host countries with information on environmental technologies and services required for the project. The advantage for U.S. companies in participating in project designs through feasibility studies is that overseas clients will often purchase the company's environmental goods and services once the project is underway.

Identify local contacts for marketing and distribution. It is an exporter's advantage to pursue U.S. and international contacts who could serve as future partners in the export business. U.S. exporters have several options. They can:

- Hire a broker or sales representative who represents them overseas, usually on a commission basis.
- Contract a distributor who purchases the exporter's merchandise and sells it for a profit.
- Link up with a trading company (i.e., a joint venture among exporters from the same country that will oversee all steps of exporting at a lower price because of higher volume).
- Pursue direct sales to the end-user, either by long-distance contact or by setting up an office overseas.

Private sector industry groups are invaluable for identifying local partners for marketing and distribution. Their memberships can include manufacturers, importers, wholesales, or retailers of environmental goods and services. Those with worldwide memberships can serve as liaisons to connect U.S. exporters with potential overseas business partners. Trade associations also provide useful support services such as annual conferences, trade shows, publications on industry developments and technical assistance to member firms planning to expand into international markets.

Environmental industry trade shows are also an excellent venue for making contact with local partners who can act as marketers, purchasing agents, and distributors. Chapter IV lists some of the major environmental trade shows, both in the U.S. and abroad, that should be investigated by potential exporters.

Arrange export financing and insurance. Regardless of how critical the need may be in a given country, environmental technologies may never find a strong market niche abroad if reasonable financing options are unavailable. U.S. exporters who can arrange financing gain a marked advantage in making their products and services competitive in developing country markets.

The first source of financing is the exporter's own working capital. In circumstances where self-financing restricts total cash availability, exporters can seek outside financing from a commercial bank, preferably one with an experienced international trade department. In addition to providing such services as credit reports and links with foreign branches, commercial banks also access many U.S. government export financing programs, such as those available through the Export-Import Bank and the Small Business Administration.

Export insurance against such risks as currency inconvertibility or political unrest is also available from the Overseas Private Investment Corporation.

Provide after-sales service for overseas customers. The availability of after-sales service for environmental goods and services is often a critical factor in consummating an export transaction. Since EGS often represent imported technology unavailable in the host country, local experts may not be able to service the equipment should a problem arise once the export transaction is completed. The lack of after-sales services can act as a major disincentive to foreign customers that want to import U.S. technologies but fear not being able to service or modify them later. The absence of after-sales servicing may also signal overseas buyers that U.S. firms are not willing to make a long-term commitment to their markets and that they are instead

simply looking for a "quick sell." To overcome these potential obstacles, U.S. firms have several possible options. The ultimate choice will depend on what is financially feasible for the exporter. Some options are:

- Arrange for a local firm to provide services.
- Train the overseas distributor to provide services.
- Establish service personnel abroad.
- Provide the service long distance.
- Link up with other U.S. firms in the host country to provide services.

U.S. trade and environmental technology-related agencies. The environmental awareness of many governments has risen in recent years, leading to the creation of programs aimed at improving environmental performance worldwide. In the past, governments generally limited their activities to the adoption and enforcement of environmental standards. Increasingly, government agencies are taking proactive roles in promoting the use of environmentally sound technologies and practices.

In the United States, the responsibility for facilitating the transfer of environmental technologies is divided among several federal agencies and departments. Agencies with responsibility for promoting U.S. exports and providing assistance to American businesses abroad are the Department of Commerce, the Export-Import Bank, the Overseas Private Investment Corporation, and the Trade and Development Agency.

Other agencies maintain activities in trade promotion. The U.S. Agency for International Development sponsors several environmental technology transfer programs of interest to U.S. exporter with the aim of encouraging U.S. private sector involvement in development assistance. The Department of Energy and the Small Business Administration also sponsors export promotion programs. Additional agencies have created overseas opportunities for U.S. companies, such as the Environmental Protection Agency, often consulted for its special expertise in the environmental sector.

B. Trade and Environmental Institutions

A list of trade and environmental technology-related research institutions appears on page V-7 that should be of use for American companies interested in penetrating export markets for environmental goods and services.

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TRADE AND ENVIRONMENTAL TECHNOLOGY-RELATED RESEARCH INSTITUTIONS

U.S. Agency for International Development
320 21st Street NW
Washington DC 20523
(202) 647-4000
Bureau for Latin America (202) 647-8070
Office of South America and Mexican Affairs
(202) 647-4790

U.S. Department of Commerce
14th & Constitution Avenue NW
Washington DC 20230
(202) 482-2000
Office of Environmental Technologies
Exports (202) 482-5225
Office of NAFTA (202) 482-0300
Amerifax fax information retrieval system
(202)482-1495

U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585
(202) 586-5000
Office of Science and Technology Policy
(202) 586-7180
Office of Environmental Management
(301) 903-7640

Environmental Protection Agency
401 M Street SW
Washington, DC 20460
(202) 260-2090
Office of Policy Planning and Evaluation
(202) 260-4332
International Technology Transfer Activities
(202) 260-2087

Export-Import Bank of the U.S.
811 Vermont Avenue NW
Washington, DC 20571
(202) 566-4490 or (800) 424-5201
Office of International Business Development
(202) 565-3900
Engineering and Environment Division
(202) 566-8802

International Trade Commission
500 E Street SW
Washington DC 20436
(202)205-2000

Overseas Private Investment Corporation
1100 NY Avenue NW
Washington DC 20527
(202)336-8400
Office of Investment Business Development
(202) 336-8614

Office of the U.S. Trade Representative
600 17th Street NW
Washington DC 20506
(202)395-3000
Office of Financial and Investment Policy
(202) 395-3541

Small Business Administration
409 3rd Street SW
Washington DC 20416
(202) 205-7272

Trade Information Center
1-(800)USA-TRADE / (800-872-8723)
For those deaf or hearing impaired:
1(800) 833-8723

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U.S. Department of State 2201 C Street NW Washington DC 20520 (202)647-4000 Bureau of Economic and Business Affairs (202) 647-1682 **U.S. Department of the Treasury** 1500 Pennsylvania Avenue NW Washington DC 20220 (202)622-2000 Office of International Affairs (202) 622-1536 **U.S. Trade and Development Agency** Room 309, SA-16 Washington, DC 20523 (703) 875-4357 **U.S. Department of Agriculture** Global Change Program Office (703) 235-9018 **U.S. Department of the Interior** Office of Policy Analysis (202) 208-3862	**U.S. Department of Labor** Bureau of International Labor Affairs (202) 219-7610 **White House Office of Science and Technology Policy** (202) 456-6202 **White House Office of Environmental Policy** (202) 456-6224 **U.S. Export Assistance Centers** Long Beach, Cal. (310) 980-4550 Miami, Fla. (305) 526-7425 Chicago, Illinois (312) 353-8040 Baltimore, Maryland (410) 962-4539 **World Bank** 1818 H Street NW Washington DC 20433 (202) 477-1234 U.S. Department of Commerce representative at the World Bank: Janice Mazur (202) 458-0118

Sources: Prepared by SRI International for the Bureau for Global Programs/Center for Economic Growth/ Office of Economic and Institutional Reform. Handbook of U.S. Environmental Technology Transfer Resources. USAID: Washington, 1994.

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ANNEX A
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Latin America and the Caribbean: Selected Economic and Social Data, USAID: Washington D.C., 1994.

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