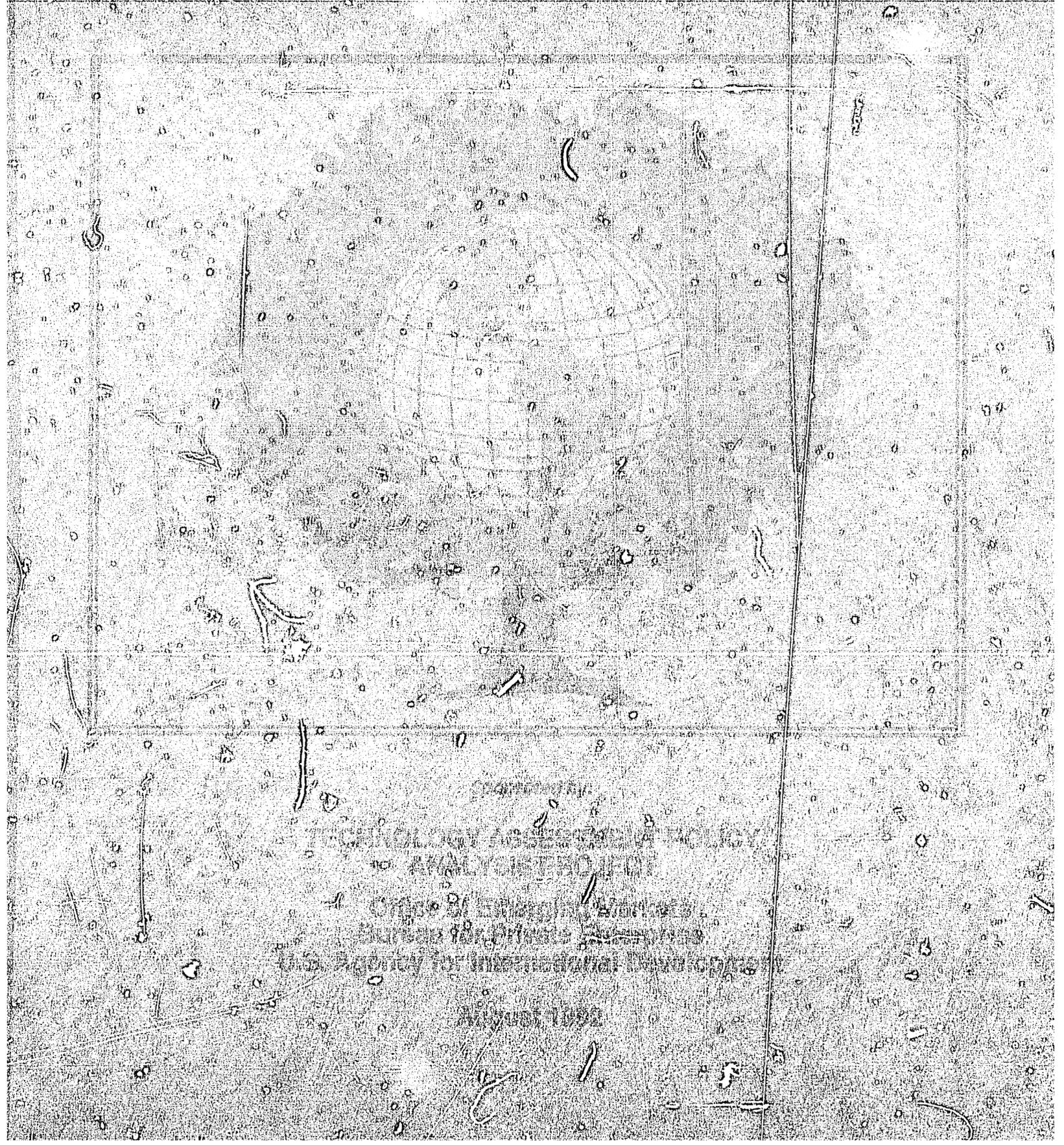


MARKET FOR THE DOMESTIC COUNCIL
AND OTHERS: A REPORT OF
SUPPLY, DEMAND, AND PRICE
COUNCIL REPORT



August 1952

TABLE OF CONTENTS

| | Page |
|---|-------------|
| I. INTRODUCTION | 1 |
| A. Environmental Problems and Opportunities | 2 |
| B. Methodological Approach | 3 |
| II. ASSESSMENT OF DEMAND FOR ENVIRONMENTAL GOODS AND SERVICES..... | 5 |
| A. Classification of Environmental Problems..... | 8 |
| B. Political Pressures Influencing Demand | 13 |
| C. Environmental Policies and Regulations | 18 |
| D. Financial Considerations | 23 |
| III. ASSESSMENT OF SELECTED ENVIRONMENTAL ASSISTANCE PROGRAMS..... | 26 |
| A. Japan's Environmental Assistance Program..... | 26 |
| B. The European Community's (EC) Environmental Assistance Programs..... | 32 |
| C. U.S. Private Sector Capabilities and Environmental Assistance Programs | 38 |
| IV. INDICATIVE ENVIRONMENTAL PRIVATE SECTOR OPPORTUNITIES..... | 62 |
| A. Pollution Detection..... | 62 |
| B. Water Pollution Control..... | 63 |
| C. Air Quality Control..... | 64 |

| | | |
|-----------|---|-----------|
| D. | Solid Waste Management..... | 65 |
| E. | Waste Recycling and Materials Reclamation | 68 |
| F. | Cost of Technology Options..... | 68 |
| G. | Technical and Other Services..... | 70 |
| V. | CONCLUSIONS AND OPTIONS FOR DONOR ASSISTANCE | 71 |
| A. | Findings | 71 |
| B. | Options for Donor Assistance | 72 |

APPENDIX A: U.S. Private and Multi-Sector Industry Association

I. INTRODUCTION

The experience of industrialized and advanced developing countries has shown that economic growth strategies that do not adequately take environmental factors into adequate account are not viable in the long run. Economic activities related to industrialization and urbanization in particular incur various types of pollution which if unchecked will inevitably lead to serious environmental degradation at the local, national, and even global levels.

A number of bilateral and multilateral donor agencies have initiated or are in the process of planning new programs to address environmental concerns. Most of these efforts, however, are being pursued on a government-to-government basis. A major gap identified in these initiatives is the lack of activities that directly engages the private sector, which is capable of supplying a wide range of environmental technologies to developing countries through various commercial arrangements.

The purpose of this study is to provide an analysis of the demand for environmental technologies in developing countries, to assess the bilateral and multilateral programs and initiatives currently undertaken by the United States and other industrialized countries, to determine whether additional environmental technology transfer initiatives are justified, and, if so, to indicate what form of initiatives would best complement currently available programs.

Section I presents an overview of environmental problems and opportunities, and describes the methodological approach used in this study. Section II provides a needs assessment of the potential demand for environmental goods and services in a sample of transforming and developing country markets. Countries are examined according to the extent of their environmental problems, the nature of their regulatory environments, political pressures for stricter control of environmental standards, and the availability of financing.

Section III focuses on the various environmental development assistance programs currently undertaken by both public and private organizations in Japan, the European community and the United States. Special emphasis has been placed on those initiatives which involve the private sector. In this section, the activities of U.S. industry associations which represent private firms capable of providing environmental expertise are illustrated in a set of matrices. This section also surveys the different activities currently funded by various government organizations, including AID, the Environmental Protection Agency, U.S. Department of Commerce, Overseas Private Investment Corporation, and the Trade and Development Program.

Section IV assesses the costs and effectiveness of various existing environmental technologies for developing countries, and identifies the private sector opportunities in the developing country market for environment goods and services.

Finally, Section V presents general conclusions drawn from this study and explores possible options for donor assistance in light of existing activities and initiatives.

This report was prepared by SRI International under the auspices of the Technology Assessment Project, sponsored by the Office of Emerging Markets of the Bureau for Private Enterprise (PRE/EM). The overall purpose of the project is to examine technology issues from an economics perspective, and to identify innovative private sector solutions to technology transfer and technology development problems.

A. Environmental Problems and Opportunities

Many of the more advanced developing countries (primarily those in Asia and in Latin America) as well as transforming nations in Central and Eastern Europe are currently striving to achieve rapid economic growth through industrial expansion. While growth strategies are increasing employment, foreign exchange and income, in most cases accelerated industrial development has led to greater pollution and environmental degradation.

The need for "environmental goods and services" (defined as goods and services that eliminate, reduce or at least control pollution and environmental degradation) in transforming and developing countries is increasing. Industrial and urban expansion carried out with no or only limited regard to environmental protection has resulted in serious deterioration's of air and water quality standards in many countries. The threat of declining environmental conditions has in turn led to stricter legislation and enforcement. The impetus for much of the legislation stems from increasing citizen awareness and concern and from the lobbying efforts and pressure of international environmental groups and "green" domestic political groups.

New market opportunities for environmental goods and services are thus emerging rapidly in transforming and developing countries. Recent economic, political, and demographic trends both in the more advanced developing countries and in Central and Eastern Europe now offer many technically feasible, commercially viable, and economically sound trade and investment opportunities for U.S. firms involved in the provision of environmental goods and services.

Private U.S. firms possess a wide range of environmental technologies that could be effectively transferred to developing countries through sales, licensing agreements, direct investment, government tenders and other commercial transactions. These technologies can take the form of capital equipment which minimizes effluents in production processes, improved packaging materials, patented process technologies, or technical assistance.

The underlying assumption that provides the rationale for this study is that the current volume and scale of U.S. technology transfers in environmental goods and services is not sufficient, given the needs identified and the comparative advantages

that many U.S. firms possess in supplying these technologies. This apparent "market failure" can be explained by a host of reasons, including lack of necessary information on both the demand and supply side, lack of financing, and the propensity of U.S. firms to focus first (or exclusively) on the home market. Accordingly, this study will help determine what types of initiatives will overcome the market failure and assist U.S. firms to become more active in the international market for environmental goods and services.

B. Methodological Approach

To a large extent, the market for environmental goods and services is like any other market in that it is subject to the forces of supply and demand. Accordingly, the methodology employed in the preparation of this report concentrated on identifying and assessing the major factors that affect both supply and demand. The first step was to examine variables influencing demand in a representative sample of transforming and developing countries. These demand factors include:

- The physical nature of environmental problems;
- Political pressures that exert influence on demand;
- Policies and regulations directed toward environmental protection; and
- Financial capacities that determine "effective" demand.

The problem inherent in this market is that environmental goods and services are often considered "luxury goods." Firms, regions, and nations would all prefer to carry out economic activities under environmentally sound practices, but these incur costs that the poorest firms or countries are unwilling or unable to bear. In addition, environmental despoliation is often created by "the few" but felt by all within society. Protected environments are thus in a sense public goods, in which benefits are enjoyed by all, but for which costs are borne by a much narrower segment of society.

After addressing the demand side of the equation, the next step was to turn to supply. A large number of both large and small firms are sources of environmental goods and services, far too many to be meaningfully assessed in this report. Since the object of the study was to identify potential initiatives by AID, the approach taken was therefore to examine the "inventory" of major environmental technology transfer programs administered by Japan, the European Community (EC) and the United States. The analysis focuses on initiatives designed to engage the private sector. This supply-side survey begins with the identification of mechanisms through which Japan and the EC have involved their national firms in transferring environmental technologies. This is followed by an overview of current U.S. initiatives and the major players involved,

Once these demand and supply factors were assessed, the next step of the project methodology was to identify potential private sector opportunities in the market for environmental technologies. This includes an assessment of technology options, financing considerations, and specific commercial opportunities through cost-effective means.

The final task in the study was to review all of the information collected to identify gaps that create or reinforce failures in environmental goods and services markets, and explore potential project and program options for AID. These gaps and needs could include mechanisms to engage U.S. private sector firms, project opportunity identification, market intelligence, policy and regulatory assistance, technical assistance, and creative financing mechanisms.

II. ASSESSMENT OF DEMAND FOR ENVIRONMENTAL GOODS AND SERVICES

Environmental problems in developing countries may be generally classified into one of two categories: a) The destruction of the natural resource base through deforestation, soil erosion, desertification, and other activities that overexploit land and marine resources; and b) environmental degradation arising from industrialization and urbanization, including severe air pollution caused by uncontrolled industrial and vehicular emissions, inadequate industrial and municipal waste water treatment facilities, and lack of disposal, treatment, and storage systems for solid and hazardous wastes.

Targeting the environmental problems resulting from industrial and urban activities offers the best potential opportunities for technology transfer between the U.S. private firms involved in the provision of environmental goods and services and potential end-users in developing countries. The need for solid waste management facilities, water treatment systems, and air pollution control equipment is strongest in the transforming economies of Central and Eastern Europe and the industrializing countries in Southeast Asia and Latin America. Central and Eastern Europe's heavy industry-oriented economic base, its extensive reliance on coal for energy, and the lack of market and regulatory incentives for energy-efficient alternatives have resulted in the region's severe pollution of air, water and soil. The political and economic restructuring currently being undertaken provides a favorable climate for the adoption of new environmental technologies. Developing economies in the Middle East and South and Central America also provide considerable opportunities.

In Asia, rapid urban population growth and unchecked industrial expansion are the principal factors for the region's environmental degradation. While environmental conditions may be worse in Central and Eastern Europe, pollution affects far more people in Asia. The region contains half of the world's mega-cities with populations of over 10 million. The World Bank expects the number of "large" cities in Asia -- those with more than 4 million people -- to increase from 20 to 50 by 2025. Based on current trends, about 40 percent of Asia's projected population will live in cities by 2025. Asia's public infrastructure and support services—such as roads, water and sewage treatment facilities, and waste management systems—are woefully inadequate to meet this rapid urbanization and industrialization.

Environmental problems in Latin America are more commonly associated with deforestation, erosion, displacement of native populations, and loss of bio-diversity resulting from economic activities in the frontier areas. But many of the region's urban areas also suffer from environmental problems, including severe contamination of air and water resources and inadequate handling of solid and toxic wastes. (See Table II.1 for Economic and Population Indicators, and Table II.2 for Current Status of Environmental Problems in Selected Countries.)

Table II.1
Economic and Population Indicators in Selected Countries, 1991

| Country | GNP | GNP Per Capita | Population (Millions) | | Share of Urban Population |
|-----------------------|----------------|----------------|-----------------------|-------|---------------------------|
| | (US\$ Billion) | (US\$) | 1991 | 2025 | (%) |
| Europe | | | | | |
| Hungary | 60.9 | 5,800 | 10.4 | 10.1 | 59 |
| Poland | 158.5 | 4,200 | 38.2 | 42.0 | 62 |
| Czechoslovakia | 120.3 | 7,700 | 15.7 | 17.0 | 75 |
| Southeast Asia | | | | | |
| Thailand | 79.0 | 1,400 | 58.8 | 78.1 | 18 |
| Malaysia | 43.1 | 2,460 | 18.3 | 34.7 | 35 |
| Indonesia | 94.0 | 490 | 181.4 | 282.5 | 31 |
| Latin America | | | | | |
| Chile | 27.7 | 2,130 | 13.4 | 19.8 | 84 |
| Mexico | 236.0 | 2,680 | 85.7 | 143.3 | 71 |

Source: World Fact book, 1991, Central Intelligence Agency, Population Reference Bureau

Table II.2
CURRENT STATUS OF ENVIRONMENTAL PROBLEMS IN
SELECTED COUNTRIES*

| Country | Air Quality | Water Quality | Solid and Hazardous Waste Management |
|-----------------------|-------------|---------------|--------------------------------------|
| Europe | | | |
| Hungary | ● | ● | ● |
| Poland | ● | ● | ● |
| Czechoslovakia | ● | ● | ● |
| Southeast Asia | | | |
| Thailand | ◐ | ● | ◐ |
| Malaysia | ◐ | ◐ | ○ |
| Indonesia | ○ | ◐ | ○ |
| Latin America | | | |
| Chile | ◐ | ◐ | ◐ |
| Mexico | ● | ◐ | ◐ |

Source: SRI International

- = Severe problems causing serious public health hazards
- ◐ = Significant pollution problems
- = Moderately good quality
- = Good quality; very few pollution problems

*Almost solely focused on major urban and other industrialized areas.

A. Classification of Environmental Problems

Air Pollution

Urban areas are the prime locus of air pollution problems because of the concentration of pollution sources, such as motor vehicles, industries, and residences. Because of the serious health and environmental implications of certain air pollutants -- notably particulates (smoke and soot), sulfur dioxide, nitrogen oxides, ozone (photochemical smog), carbon monoxide, and lead -- most industrialized and many developing countries have set legal air quality standards for some or all of these pollutants.

Motor Vehicle Emissions. Rising incomes and a growing need for personal and mass mobility, as well as increasing demand for fast and reliable distribution of goods, have resulted in the rapid increase of motor vehicles in industrializing countries. In these countries, most vehicles operate on leaded gasoline and are often not equipped with emission control instruments. Consequently, urban populations are constantly exposed to airborne lead. Bangkok's 2.2 million motor vehicles emit an estimated 5 tons of lead each day. A study by Bangkok's Siriraj Hospital reportedly found newborn infants with an average of 18.5 micrograms of lead in their blood, with some cases ranging as high as 33 micrograms. (The U.S. Environmental Protection Agency considers 10 micrograms dangerous in children.)

In Mexico, vehicle emissions account for 65 percent of the air pollution in the three major urban areas—Mexico City, Guadalajara, and Monterrey. Similar to the situation in Bangkok, Mexico City residents reportedly show higher than average exposure to lead compared to the city residents in most industrialized countries.

Central and Eastern Europe has a substantially lower number of cars compared to Western countries, but pollution emissions per car—particularly from the popular Trabants and Wartburgs—are much higher. The Trabants and Wartburgs have outmoded two-stroke engines that emit 8-10 times the hydrocarbons, 3-4 times the formaldehyde, and 2-3 times the benzopyrene emitted by the more efficient four-stroke varieties. About 35 percent of Hungary's autos have these two-stroke engines.

Motor vehicles account for about 44 percent of Hungary's carbon monoxide and nitrogen oxides, about one-third of the hydrocarbons, and most of the lead emissions. In Poland, motor vehicles account for about 30 to 40 percent of the country's emissions of carbon monoxide, hydrocarbons, nitrogen oxides, and lead.

Energy Use. The burning of indigenous supplies of lignite, also known as brown or soft coal, is the major contributor to air pollution in Eastern Europe. Lignite has a high ash content and the variety burned in Central and Eastern Europe is high in sulfur. Its energy yield is about half that of hard coal; thus more brown coal has to be burned

to meet a given energy demand. The former East Germany relied on brown coal for 72 percent of its primary energy consumption. Czechoslovakia relies on brown coal for 41 percent. Together these two countries have burned nearly one third of the world's lignite.

Coal accounts for almost 80 percent of Poland's primary energy supply, with lignite accounting for about 27 percent and the majority by the relatively less-polluting hard coal. But, like in many coal-burning plants in Central and Eastern Europe, almost all of Poland's coal is burned without pre-treatment or any application of sulfur removal technology.

The combination of coal dependence, inefficient pollution controls, and energy inefficiency has resulted in levels of sulfur dioxide in Central and Eastern Europe that are among the highest in the world. In the city of Most (Czech and Slovak Federal Republic), sulfur dioxide concentrations average 132 micrograms per cubic meter annually and peak levels in the area soar to 1,000. (The World Health Organization standard is an average of 40 to 60 micrograms per cubic meter.)

In addition to the type of fuel consumed, the use of inefficient household and industrial energy technologies also contributes to atmospheric degradation. In most cases, industrializing countries focus first on expanding industrial output and pay scant attention to efficiency or pollution control. In general, the efficiency of energy-intensive industries -- including steel, cement, chemicals, and paper -- are often much lower than in industrialized countries, thereby emitting relatively higher carbon dioxide and other particulates into the atmosphere.

In Central and Eastern Europe, the former socialist governments traditionally set prices of energy and natural resources at below market levels such that there was no incentive to employ more efficient technologies. In contrast, dramatic improvements in energy efficiency in Western industrialized countries took place following the oil price shocks of the 1970s. The energy required to make steel in Central and Eastern Europe, for example, has been two to three times greater than in Western Europe.

In Indonesia, preliminary energy audits reportedly found that 23 percent of current energy consumption by industry could readily be saved and that energy use in new buildings in Indonesia could be reduced by 50 percent if investments for upgrading the facilities are undertaken. In Thailand, industries reportedly could save 23 percent of current energy consumption if all plants were as efficient as the best of similar facilities elsewhere. In Chile, few industries invest in energy efficient technologies, with the exception of the very largest firms, such as Chile's copper companies (see Table II.3 for Energy Indicators in Selected Countries).

Table II.3
Energy Indicators in Selected Countries, 1989

| Country | Per Capita Energy Consumption | Energy Intensity of Industry Production |
|-----------------------------|----------------------------------|--|
| | (Gigajoules) | (Megajoules per US\$ of Industrial GDP) |
| <i>Developing Countries</i> | | |
| Europe | | |
| Hungary | 127 | 34 |
| Poland | 136 | n.a. |
| Czechoslovakia | 190 | 40 |
| Southeast Asia | | |
| Thailand | 29 | 7 |
| Malaysia | 48 | n.a. |
| Indonesia | 16 | 11 |
| Latin America | | |
| Chile | 46 | n.a. |
| Mexico | 56 | 23 |
| <i>Developed Countries</i> | | |
| USA | 324 | 12 |
| United Kingdom | 158 | 7 |
| Germany | 176 | 6 |
| Japan | 135 | 5 |

Source: World Resource Institute

Water Pollution

Water pollutants may be classified into three major types:

- Excess nutrients from sewage and soil erosion, causing algae blooms that eventually deplete the oxygen content of the water;
- Pathogens from sewage that spread disease; and
- Heavy metals and toxic (sometimes radioactive) chemical compounds from industry, mining, and agricultural activities.

The quality of ground water, surface waters, and (eventually) coastal waterways in the developing countries is deteriorating at an increasing pace. The situation is particularly acute in the urban areas, posing serious health hazards to urban residents. Many cities lack sewer systems and sewage treatment facilities. Municipal water supplies are often not treated or disinfected. Industrial and mining processes rarely incorporate waste treatment and disposal systems.

Most rivers, lakes, and seashores in Central and Eastern Europe are contaminated with industrial discharges, untreated sewage and agricultural runoff. Seventy percent of Czechoslovakian rivers are severely polluted. About a third of those in Bohemia (the Czech Republic) and half of those in Slovakia are biologically dead. Some 1.3 billion cubic meters of untreated sewage is discharged into Hungary's surface waters every year. Roughly 40 percent of all industrial waste in Poland that needs treatment does not receive it.

Clean drinking water is in scarce supply throughout Central and Eastern Europe. Around 700 cities and towns in Hungary rely on bottled water or water piped in from neighboring communities because their own wells are contaminated with pesticides and nitrates from fertilizer runoff. Because of nitrate contamination, pregnant women and infants in many regions of Czechoslovakia are advised not to drink tap water. In Poland, the percentage share of Class I water -- defined as drinkable after disinfection - has dramatically decreased from 31 percent of the total length of monitored rivers in 1967 to only about 5 percent in 1987. Unclassed water -- considered so polluted as to be unusable even for industrial purposes -- rose from 29 percent to 42 percent over the same period.

In Asia, over half of the rivers in Java, the most populous island in Indonesia, are contaminated. Serious pollution occurs in the Bandung/Jakarta/Jabotabek region (Citarum and Jabotabek Rivers), in the Surabaya region (Surabaya River) and around the cities of Solo and Semarang. Even the Banjar canal, the raw water supply for Jakarta's water treatment plant at Pejompongan, is contaminated. Meanwhile, Bangkok relies on four rivers and a series of canals to dispose of an estimated 10,000

metric tons of raw sewage and municipal waste every day. The city is just now in the process of considering plans for a sewage system.

In Mexico, discharges of effluents and untreated residual waters have badly polluted 20 of the country's approximately 270 rivers. Mexico's municipal and industrial water treatment plants only have the capacity to treat 16 percent of all municipal and industrial waste waters. In Santiago, Chile, none of the sewage is treated although 90 percent of the populace are served by sewage lines. The sewage is discharged into a river from which irrigation water is taken -- a situation that has resulted in outbreaks of typhoid fever (see Table II.4 for Access to Safe Water and Sanitation Services in Selected Countries).

Table II.4
Access to Safe Water and Sanitation Services in Selected Countries, 1985

| Country | Percentage Share of the Population | |
|-----------------------|------------------------------------|----------------------|
| | Access to Safe Water | Access to Sanitation |
| Southeast Asia | | |
| Thailand | 64 | 52 |
| Malaysia | 84 | 75 |
| Indonesia | 38 | 37 |
| Latin America | | |
| Chile | 87 | 84 |
| Mexico | 83 | 58 |

Source: Population Reference Bureau

Solid and Hazardous Waste Pollution

Solid waste—generated by both households and industrial firms—increases in proportion to the country's social and economic development. Moreover, the proportion of organic matter generally decreases and the content of plastics, paper, chemicals, and other toxic matters increases. Waste management problems are particularly serious in the urban areas since the volume of household and industrial waste generated far outstrips the handling capacity of existing waste disposal facilities. In general, only part of the total volume of municipal solid waste generated daily are collected and transported to (both legal and illegal) open dumpsites or poorly managed landfills. Open-air burning and uncontrolled waste accumulation are common alternative practices.

Industrial waste, especially from small companies and workshops, tends to be mixed and dumped with domestic waste. With the number of factories using toxic and other hazardous materials increasing in industrializing countries, toxic waste contamination is a growing problem. Treatment plants are limited or nonexistent and the lack of qualified personnel hinder any effective practice.

In most of Central and Eastern Europe, soil contamination is a critical problem since hazardous wastes have been indiscriminately dumped and most waste disposal sites are not equipped with even the most basic pollution prevention equipment. Similarly, in Asia and Latin America, solid wastes produced by the mining, energy, chemical, metal, and textile industries are mostly discharged into the environment without any form of treatment. Illegal disposal of hazardous waste is a particular problem in the *maquiladora* areas in Mexico.

B. Political Pressures Influencing Demand

Protecting the environment bears costs, and the benefits derived are not readily apparent in the goods and services produced under environmentally sound methods. Polluting households, industries and governments therefore need incentives to alter behavior and/or pay for pollution prevention or abatement equipment. Very few industries are willing to increase their costs voluntarily to deal with pollution or environmental problems unless they can readily pass on the costs or unless they are pressured by public opinion (e.g., boycotts against tuna caught with drag net methods that endanger dolphins) or by overt government regulations. Pressures can be both positive (affirmative consumer response to environmentally conscious products) and negative (boycotts). The pressures can be exerted by a general public movement and awareness, or by concentrated interest group action.

Environmental Organizations and Citizen Movements

A strong "green vote" is yet to emerge in the developing world. Public awareness of environmental issues, however, is growing and becoming an important source of pressure for environmental improvements. Local citizen movements are gaining strength, especially in cases where serious health and environmental damages are involved. In many countries of Latin America and Asia, activities of ecological groups are becoming noticeable, especially at the universities.

In Thailand, the destruction of a tantalum plant in Phuket by villagers in 1986 signified growing public concern over the damages caused by rapid industrial development. Local publicity about the recent Bangkok port chemical fire that killed 12 people, with hundreds more complaining of health problems such as skin rashes and breathing difficulties, has further reinforced growing public pressure over the deteriorating quality of the environment. Pollution is already having an adverse effect on the tourism industry -- the country's major foreign exchange earner. The city of Chiang Mai, a popular tourist destination, is now shrouded in smog. The waters off seaside resorts, such as Hua Hin, Pattaya and Phuket, are heavily contaminated and hence are attracting less tourists.

In Indonesia, several NGO's led a boycott of eight local companies whom they claim have been polluting heavily for years. In a separate incident, angry residents broke the doors and windows of a textile factory found polluting the river they use for almost all their water needs. Government officials eventually suspended the factory's operations, but only after the public's furor. So far, the government continues to be lax with industrial polluters, but more stringent enforcement could follow to appease an increasingly restive public.

So-called "green" political parties and movements have for many years been active in Western Europe. The most extreme of these pressure groups have opposed nearly all forms of development. The more moderate "greens" have pressured for environmentally responsible policies and projects. A broad-based green movement also exists in Central and Eastern Europe. Starting as underground movements that were frequent targets of governmental repression, environmental groups have become an integral part of the political landscape since the revolutions in 1989.

Under the former socialist regimes, official nature protection clubs existed, focusing mainly on the politically "safe" issues of wildlife conservation and nature reserves. The Polish Ecological Club, founded in September 1980, was the first fully independent environmental group established in Central and Eastern Europe. The rest of the region saw the creation of independent environmental movements thereafter. These groups played a major role in the European revolutions of the late 1980s. In many instances, environmental protests in the pre-revolution days served as a rallying point from which broader demands for political change emerged.

In Hungary, mass protests against the Nagymaros Dam were instrumental in developing an effective political opposition which eventually toppled the Communist Party's exclusive hold on power. The clandestine release by the Slovak Union of Nature and Landscape Protectors (Bratislava, Czechoslovakia) of a report detailing the region's environmental crisis helped turn the people against the Communist regime there. Similarly, concern over severe pollution helped fuel pro-democracy demonstrations in Leipzig in the former East Germany.

International Initiatives

International initiatives that reflect concern over the "global commons" -- particularly the threat to the ozone layer and the prospect of global warming -- are principally drawn up by the industrialized countries and are therefore often viewed with suspicion by many developing countries. Furthermore, developing country leaders fear that efforts to curtail gas emissions that contribute to global warming would constraint their nations' growth. Many developing countries have indicated that their commitment to specific international initiatives, however, such as the 1987 Montreal Protocol on substances that deplete the ozone layer, is contingent on the industrialized countries' financial assistance to help them make the transition to more environment-friendly technologies.

Recent global efforts culminated in the U.N. Conference on Environment and Development (UNCED) held in June 1992 in Rio de Janeiro. The Rio Conference and Summit concluded two years of international negotiations on treaties regarding environmental concerns. The expressed purpose of the Rio Summit was to develop environmental solutions dedicated to the concept of "sustainable development."

Twenty-seven general principles on sustainable development were contained in the Rio Declaration. Although the Declaration did not require binding signatures by member countries, it did set forth a number of important agreements that could eventually lead to global standards of behavior. While the Summit did get bogged down on North-South issues related to blame and financial responsibility, it did provide further attention and impetus to burgeoning environmental movements in developing countries.

Malaysia's attitude is probably representative of that of many developing countries. While the Malaysian government has become environmentally conscious in recent years, it does not take kindly to international pressure, particularly with regards to its logging activities. (Timber is Malaysia's second largest commodity export.) Prime Minister Datuk Seri Mahathir Mohammed argues that now that the developed countries have sacrificed their own forests and have reached high standards of living, they want to preserve other countries' rain forests -- in the name of global heritage -- indirectly keeping countries like Malaysia from achieving the same level of development.

While North-South issues can hamper environmental efforts, developing countries may ultimately have no choice but to bow to international pressures that seek to control the use of chemicals as well as manufacturing and agricultural processes. Recent developments signal a closer connection between trade and environment in future international commercial relations. Conservationists in industrialized countries are increasingly pushing for trade sanctions to force other countries to improve their environmental performance. More significant, business groups in industrialized countries -- with those in the United States being the most vocal -- are becoming intolerant of what they perceive as competitive advantages gained through lax environmental standards and enforcement commonly found in many developing countries.

The issue of establishing a "level playing field" and protection against imports from countries that provide an "ecological subsidy" (i.e., lower costs of production because of lax environmental controls) are major points of contention in the current GATT negotiations. Meanwhile, the proposed trilateral U.S.-Mexico-Canada free trade agreement is expected to exert pressure on Mexico to harmonize its environmental practices with those of the other signatory parties.

The new conditions for international development financing will likewise exert pressure on governments to implement effective environmental regulations. With the establishment of an environmental department in 1987, the World Bank is starting to implement new project development procedures in which extensive environmental assessments are required. More than half of all World Bank loans now contain environmental components (see Table II.5 for Level of Local and International Political Pressures in Selected Countries).

Table II.5
LEVEL OF LOCAL AND INTERNATIONAL POLITICAL PRESSURE IN SELECTED COUNTRIES

| Country | Local Political Pressure | International Political Pressure |
|-----------------------|--------------------------|----------------------------------|
| Europe | | |
| Hungary | ● | ◐ |
| Poland | ● | ◐ |
| Czechoslovakia | ● | ◐ |
| Southeast Asia | | |
| Thailand | ◐ | ◐ |
| Malaysia | ○ | ◐ |
| Indonesia | ◐ | ○ |
| Latin America | | |
| Chile | ○ | ◐ |
| Mexico | ◐ | ● |

Source: SRI International

- = High
- ◐ = Moderate
- = Low

C. Environmental Policies and Regulations

Many governments are beginning to tackle environment problems, although these compete with more pressing social and economic issues for attention and resources. The trend in recent years has been the enactment of more stringent regulations. Weak enforcement, however, is a universal problem. Moreover, fines are usually so low that enterprises simply include them as a cost of doing business. In Poland, for example, the penalty for excessive emissions of sulfur dioxide in 1988 was 12,000 zloty per ton, or about US\$4.00 per ton.

The new governments in Central and Eastern Europe are beginning to formulate environmental strategies. Though many of the environmental declarations by the ministries and the newly formed parliaments are impressive, balancing these strategies with other economic interests and the public's desire for rapid improvements in material well-being will be difficult.

In varying degrees, Asian and Latin American governments are also becoming active in promoting environmental issues, passing pollution-control legislation, and undertaking environmental institution-building. In addition to their increased willingness to undertake environment-related public sector projects, various governments are beginning to ask the industrial sector to make reasonable investments to treat waste generated by its own operations or provide funds for publicly-owned environmental protection facilities. Environmental impact assessment studies are also being required more often from potential investors wishing to construct new production facilities. Some of the key government initiatives in selected countries are discussed below.

Poland. Since the government change in 1989, major policy initiatives have been introduced, including:

- Reshaping of the environmental policy to fit the country's reorientation to market economics;
- Planning to bring environmental regulatory policies in line with European Community norms; and
- Establishing a three-phase policy to restore the country's environmental quality.

The Environment Ministry's clean-up program includes the following:

- Closing or restructuring the 80 worst polluting enterprises, as well as 500 additional plants to be included in a list prepared by the provincial governments;
- Increasing the size of the coal washing program;
- Desalination of waste water from hard coal mines; and
- Improving drinking water supplies in urban areas.

Hungary. The Ministry for Environment and Water Management was created in 1987 through the merger of the National Office of Environmental Protection and Nature Conservation and the National Office for Water Management. Its name was officially changed in 1990 to Ministry of Environmental and Regional Planning (MERP). This change has freed the environmental regulatory function from the influence of the more established water supply and management function. It is not yet clear whether the separation will eventually make the environment ministry more effective.

In 1990, MERP launched a comprehensive Program of Environmental Protection. The five priority areas identified by the program included:

- Improvement of air quality;
- Treatment and risk-free recycling or disposal of hazardous waste;
- Protection of drinking water reserves from further pollution;
- Placement of endangered natural resources under urgent protection; and
- Development of regional solutions to environmental problems.

Specific actions taken under the auspices of the program included protection of the Danube. For example, the government proposes to develop Czechoslovak-Hungarian regional development projects, such as establishing an international conservation park for the Danube region.

Thailand. Recent governments have shown more commitment than their predecessors to bring environmental problems to the forefront. Previous governments have either ignored the issues or treated them as a political matter. An ambitious plan is being mapped out that includes the following environmental priorities:

- Establishing an industrial environment fund;
- Requiring annual renewal of factory operation licenses;
- Initiating a system of audit on environmental programs funded by the government;
- Giving a higher priority to government investments in industries that are more environment-friendly; and
- Encouraging formation of industrial estates to centralize industrial pollution.

Indonesia. The government enacted the necessary standards for environmental quality, effluents and emissions in 1988 for the fifth five-year national plan (1989-1993). The plan puts priority on three environmental issues:

- Abatement of pollution by hazardous waste;
- Prevention of ocean pollution; and
- Prevention of excessive destruction of forests.

Since the Ministry of Population and the Environment is only an administrative body with no enforcement authority, the government recently established an environmental protection agency (Bappedal) that reports directly to the president. Bappedal, however, is reportedly constrained by the lack of trained personnel.

A major undertaking by the Indonesian government is the Clean River Program (Prokasih). Began in 1989, Prokasih serves as the foundation for enforcement actions related to industrial effluents draining into the 20 key Indonesian rivers. Standards for waste quality for specific industries, for example, have already been issued under the program. Beginning in mid-1991, plants in many industrial sectors, including food and agricultural processing, textile, and oil-refining industries must provide daily records of liquid waste flows. While new facilities are required to comply with the new regulations, most existing plants are expected to be grandfathered. Thus, dumping of untreated waste in the rivers is not likely to be resolved in the immediate future.

Malaysia. Environmental Impact Assessments are now required in feasibility studies for certain sectors, such as agriculture, airport construction, mining, petroleum, and power generation. Government officials are also reviewing the Environmental Quality Act of 1974 to give the Department of Environment more power to manage environmental issues. The government has expressed its concerns for the environment, being a signatory to the "Langkawi Declaration on the Environment," resulting from the Commonwealth Heads of Government Meeting in Malaysia in 1989 as well as to the "The Kuala Lumpur Accord on the Environment and Development" resulting from The Fourth Asean Ministerial Meeting on the Environment in 1990. But the political weakness of the central government, relative to state governments, makes the enforcement of environmental regulations difficult and often ineffective.

Chile. The administration of President Aylwin has given environmental matters a higher priority than the Pinochet regime. At the moment, environmental legislation is dispersed in numerous laws and regulations addressing specific problems and are implemented by various government bodies. No general environmental law exists and a national environmental policy has yet to be defined.

To address the situation, President Aylwin set up the National Environmental Commission (Commission Nacional del Medio Ambiente or CONAMA) in June 1990. CONAMA is an inter ministerial commission tasked to define and coordinate environmental policy and activities. Led by the Minister of the National Resources, the Committee of the Ministers include the Ministries of Health; Economy, Development and Reconstruction; Agriculture; Mining; Housing and Urbanism; and Transport and Telecommunications. One of the Secretariat's task is to help set up Environmental Subcommissions in the Ministries. CONAMA is finishing an inventory of all Chilean regulations and laws (more than 2,000) and the agencies involved (over 20). The next stage of CONAMA's work is to draft a modern Environmental Code to be submitted to Congress for discussion and approval. It is probable that the Commission may function as a supervisory environmental agency in a later phase.

Mexico. The economic program of President Carlos Salinas de Gortari includes important social and environmental components. Since he took office in mid-1988 to January 1991, 77 new national regulations were issued on environmental matters. In response to the serious pollution generated by unregulated assembly plants along the US-Mexican border, the Mexican environmental agency (SEDUE) has worked with the U.S. Environmental Protection Agency in developing a Comprehensive Mexico-United States Environmental Border Program. Under this program, the Mexican Government plans to track movements of hazardous wastes and invest \$460 million in 1992-94 for water treatment plants in the border region. In a separate move, the government introduced unleaded gasoline and closed heavily-polluting industrial plants, such as the huge Axcapotalco refinery in Mexico City, to improve air quality in the urban areas (see Table II.6 for Environmental Regulatory Status and Enforcement Capacity in Selected Countries).

**Table II.6
ENVIRONMENTAL REGULATORY STATUS AND ENFORCEMENT CAPACITY IN
SELECTED COUNTRIES**

| Country | Main Environment Regulatory Body | Adequacy of Environmental Legislation | | | Enforcement Capacity |
|-----------------------|--|---|-------|---------------------------------|-------------------------|
| | | Air | Water | Solid and Hazardous Waste | |
| Europe | | | | | |
| Hungary | Ministry of Environmental Protection, Natural Resource and Policy | ○ | ○ | ○ | ** |
| Poland | Ministry of Environmental and Regional Planning | ○ | ○ | ○ | * |
| Czechoslovakia | | ○ | ○ | ○ | * |
| Southeast Asia | | | | | |
| Thailand | National Environment Board | ◐ | ◐ | ◑ | * |
| Malaysia | Ministry of Science, Technology and Environment | ◐ | ◐ | ◑ | * |
| Indonesia | Bappedal and the State Ministry for Population and Environment | ◐ | ◐ | ◐ | * |
| Latin America | | | | | |
| Chile | National Environmental Organization and the Ministry of Natural Resources | ◑ | ◑ | ◑ | * |
| Mexico | Ministry of Urban Development and Ecology (SEDUE) | ○ | ○ | ○ | * |

| | | | |
|---|--|------------|------------|
|  | = Inadequate or non-existing laws and regulations | *** | = High |
|  | = Flaws in laws and regulation | ** | = Moderate |
|  | = Generally good laws and regulations | * | = Low |
|  | = Protection fully consistent with OECD regulations | | |

Source: SRI International

Handwritten mark

D. Financial Considerations

As discussed above, potential demand is influenced by political pressures, enforcement of laws and regulations, and governmental plans. But realization of actual demand will be triggered by availability of appropriate financing.

Government Resources

Governments at the central, regional, and municipal levels are the principal potential buyers of environmental goods and services in the developing countries. Many governments in industrializing countries show increasing willingness to appropriate funds to address environmental problems. They either use the regular budget or special environmental funds fed by revenues from levies, fines, fees, custom tariffs, and others.

In Thailand, new legislation was passed to provide \$20 million for an environmental fund. The fund will be used to provide for low-interest loans to small- and medium-sized companies for the installation of air and water pollution control devices. Furthermore, in an effort to reduce the amount of industrial and residential waste that end up in the country's waterways, the government approved a 50 billion baht program to build waste treatment systems in Bangkok, Chiang Mai, Phuket, Pattaya, and Sakon Nakhon. The first phase is a 5 billion baht project to construct treatment facilities in five Bangkok districts starting this year.

Private Sector Investment

Companies in developing countries lag behind their U.S. and European counterparts in positioning themselves with an environmentally conscious image. In general, firms in the developing world tend to disregard environmental protection, and purchase anti-pollution equipment only if required by the government. In truth, this is not different from the situation in industrialized nations in the past. However, it is clear that the global trend towards more stringent environmental regulations will force many more companies to invest in pollution abatement and control products in the near future. In view of the lack of financial strength of many developing-country firms and the capital investments required, the introduction of pollution abatement equipment will exert significant financial impacts on private producers.

Privatization of state enterprises will be a prime generator of demand for environmental products. Modernization of the capital infrastructure, including application of energy-efficient technologies, generally follows privatization since private investors want to achieve market efficiencies as soon as possible. In Central and Eastern Europe, foreign investors plan to invest billions of dollars over the next five years upgrading industrial facilities throughout the region. In addition, companies in the environment industry may be direct privatization participants as governments transfer the operations of public utilities -- such as water and sewage system

management, and collection, transport and disposal of solid and hazardous waste -- into private hands. Thailand, for example, plans to privatize the provision of waste water treatment services for its 18 industrial estates.

Foreign Sources

Foreign aid is an important source of finance in helping developing countries resolve environmental problems. The developing world frequently receives loans from multilateral institutions as well as from various bilateral and non-governmental sources for this purpose. For instance, 42 percent of the approximately \$2.5 billion that the central government plans to invest to control air pollution in Mexico City will be provided by foreign governments and multilateral financial institutions.

In Central and Eastern Europe, the clean-up costs are so staggering that foreign aid is a critical factor for any effective remediation to take place. In Poland alone, environmental clean-up is projected to cost \$20 billion over the next 10 to 20 years. The political and economic restructuring being undertaken in this region has already attracted considerable financial support from Western governments and international lending institutions. The financing of environmental projects is an extension of the economic restructuring initiatives now under way.

The European Community has so far committed \$65 million for environmental programs in Poland and Hungary. The United States has provided Hungary and Poland with \$40 million in environmental aid with future plans to provide funds to Bulgaria, Czechoslovakia, and Romania. In addition, the World Bank made an \$18 million loan to Poland to help improve environmental management practices (see Table II.7 for Ability and Willingness to Pay for Environmental Goods and Services in Selected Developing Countries).

Table II.7
ABILITY AND WILLINGNESS TO PAY FOR ENVIRONMENTAL
GOODS AND SERVICES IN SELECTED DEVELOPING COUNTRIES

| Country | Government (National, Regional and Local) | Private Industry | Foreign Aid Organization |
|-----------------------|---|---------------------|--------------------------------|
| Europe | ○ | ○ | ● |
| Hungary | ○ | ○ | ● |
| Poland | ○ | ○ | ● |
| Czechoslovakia | | | |
| Southeast Asia | ◐ | ◐ | ● |
| Thailand | ◐ | ◐ | ◐ |
| Malaysia | ◐ | ◐ | ◐ |
| Indonesia | | | |
| Latin America | ● | ◐ | ◐ |
| Chile | ◐ | ● | ◐ |
| Mexico | | | |

● = High
◐ = Medium
○ = Low

Source: SRI International

III ASSESSMENT OF SELECTED ENVIRONMENTAL ASSISTANCE PROGRAMS

A. Japan's Environmental Assistance Program

Overview

The Japanese government has increasingly recognized the importance of safeguarding the environment in developing countries. In Japan, the public sector has been the leading actor in efforts to facilitate the introduction and transfer of environmental goods and services to developing countries. The government has channeled its environmental-oriented assistance primarily through the Overseas Economic Cooperation Fund (OECF), the Japan International Cooperation Agency (JICA) and several other government development ministries.

Japan's overseas environmental assistance programs have focused on pollution control, waterworks and sewers, urban sanitation, water resource development, afforestation and forest conservation, and disaster prevention. The areas of water purification, waste water treatment, and waste disposal have typically accounted for about 70 percent of Japanese environmental aid.

The government's environmentally-related assistance consists almost exclusively of:

- Bilateral loans and grants;
- Technical assistance; and
- Multilateral aid.

In 1989, Prime Minister Souseke Uno pledged that Japan would provide ¥300 billion (US\$2.1 billion) in official development assistance (ODA) in the area of environmental protection to developing countries between 1989 and 1991. The dollar amount of ODA environmental sector grants and loans as well as its share of total ODA assistance has increased gradually but steadily since 1986 (See Table III.1 for Official Development Assistance). The majority of this aid -- like most Japanese development assistance -- consists of loans to large-scale infrastructure projects implemented by Japanese firms.

In addition to bilateral grants and loans, the Japanese government provides technical assistance consisting of three types of activities:

- Acceptance of trainees into group training courses in Japan;
- Dispatch of Japanese experts to developing countries; and
- Equipment grants including technical assistance components.

Table III.1
Japan's Official Development Assistance (ODA) in the Environmental Sector

| Fiscal Year | Grant Aid (¥100 Million) | Share (%) | ODA Loans (¥100 Million) | Share ¹ (%) |
|----------------|--------------------------------|--------------|-----------------------------|---------------------------|
| 1985 | 176.5 | 18.4 | 748.9 | 10.7 |
| 1986 | 144.9 | 13.9 | 117.2 | 2.8 |
| 1987 | 252.2 | 23.8 | 321.1 | 4.6 |
| 1989 | 206.2 | 21.3 | 851.9 | 8.0 |
| 1989 | 227.4 | 21.2 | 920.2 | 9.4 |

Source: Ministry of Foreign Affairs, Japan's Official Assistance , 1990.

In 1989, the Japan International Cooperation Agency (JICA) -- Japan's main organization responsible for technical cooperation -- accepted 245 participants from developing countries into group training courses on environmental topics. This initiative has provided the most direct collaboration between the government and the private sector. One major private sector participant is Keidanren, the highly influential association of large Japanese industrial firms.

The Japanese government also provides multilateral aid through international environmental organizations such as the United Nations Environmental Program, with a Japanese contribution of \$5 million in 1989, and the forest conservation programs of the U.N. Food and Agriculture Organization and the International Tropical Timber Organization. Japan is also promoting the establishment of a U.N. Global Environmental Conservation Center, to be based in Japan. A major purpose of the center would be to support environmental technology transfers to developing countries,

¹ Share of total project loans.

particularly those addressing global environmental problems such as the emission of gases causing the "greenhouse" effect.

Overseas Economic Cooperation Fund (OECF)

OECF is the agency responsible for administering Japanese ODA loans for capital-intensive infrastructure projects such as dams, roads, power plants, and mines. Loans continue to account for a large share of Japanese aid (48.1 percent in 1987), although grants have been increasing.

OECF has recently undertaken several environmentally-related initiatives. First, an environmental adviser was appointed in October 1988, although there is no environmental division within OECF. Secondly, in November 1989, OECF published guidelines for environmental considerations in some types of projects. The Ministry of Foreign Affairs announced on May 25, 1991, that it will draft new guidelines to ensure that road, agricultural and electrical development projects are environmentally sound, later expanding these to include transportation, water supply, and pipeline projects. The Ministry indicated that developing countries will be asked to revise projects not meeting the guidelines, the first of which will be implemented in 1992.

OECF's collaboration with the private sector has been limited to activities by Japanese firms to help recipient developing countries to prepare their requests for Japanese aid. The role of Japanese firms in actual project implementation remains significant but has declined somewhat in recent years. According to the Ministry of Foreign Affairs, Japanese companies won contracts for 38 percent of all ODA loans in 1989 (down from 67 percent in 1986); developing-country firms won 41 percent of contracts, U.S. firms won 5 percent, and firms from other OECD countries won the remaining 16 percent. Japanese ODA loans have been widely criticized as promoting the economic interests of Japanese companies; however, 80.5 percent of Japan's ODA loans in 1989 were provided on a generally untied basis.

Japan International Cooperation Agency (JICA)

JICA, a quasi-independent agency established in 1974, administers Japan's technical cooperation programs as well as some general grant aid. In August 1989, JICA established an Environment Section within its Planning Department, with a director and a part-time staff of three JICA personnel. JICA has also developed environmental guidelines for use in design of individual categories of projects, such as dams and roads. However, full environmental impact assessments are not required except in specific cases. Much like OECF, JICA's environmental programs have been carried out almost exclusively by the private sector.

JICA's technical cooperation programs promote technology transfers through the acquisition of technical skills within developing countries. JICA conducts group training courses for developing-country personnel, mainly from the public sector, in a variety of topics related to environmental protection. In addition, the agency sends individuals and teams of experts to provide technical assistance to developing countries, often in the form of development surveys. These development surveys usually lead to a request by the developing country for Japanese aid in the form of grants or loans. Equipment used in these surveys, such as pollution-monitoring devices, is often donated to the host country.

JICA also provides "project-type" technical assistance, combining experts, surveys, and training in a single project (see Table III.2 for summary of recent JICA technical assistance activities).

A current example of JICA project technical cooperation is the establishment of an environmental research and training center in Thailand, with construction being financed with ¥2.3 billion in grant aid. Construction of a similar center is in progress in China; in addition, 180 Japanese-made environmental monitoring stations have been placed throughout China.

Table III.2
Japanese Technical Cooperation on the Environment (Fiscal Year 1989)

| | Number of Participants in Group Training | Number of Dispatches of Individual Exports | Number of Technical Cooperation Projects | Number of Development Studies |
|-------------------------------------|--|---|---|-------------------------------------|
| Environmental Administration | 26 | 9 | 2 | - |
| Air Pollution | 36 | 12 | - | 4 |
| Water Pollution | 18 | 12 | - | 5 |
| Ocean Pollution | 4 | 1 | - | 1 |
| Water Supply and Sewerage | 30 | 18 | 2 | 11 |
| Ground water Development | - | 12 | - | 11 |
| Waste Disposal | 22 | 1 | - | 4 |
| Mining Pollution | 21 | - | 3 | - |
| Conservation of Ecosystems | 20 | 5 | - | - |
| Afforestation | 61 | 16 | 12 | 5 |
| Disaster Prevention | 17 | 45 | 3 | 5 |
| Flood Control | 10 | 6 | - | 9 |
| Energy Conservation | - | - | - | 2 |
| TOTAL | 265 | 137 | 22 | 57 |

Source: Japan International Cooperation Agency

In Mexico City, from 1986 to 1989, JICA conducted a development survey on air pollution control. During the course of the survey, Japanese experts were sent to Mexico, and Mexican trainees participated in group courses in atmospheric conservation in Japan. The measuring equipment used in the survey was given to Mexico as an equipment grant. In June 1990, following on the results of the survey, Japan and Mexico jointly announced a ¥69.33 billion (\$485 million) Japanese ODA loan for a project to desulfurize heavy fuel oil and diesel oil in Mexico City.

JICA has stated that it intends to deploy environmental officers in overseas diplomatic posts. However, JICA is severely understaffed, with a total of only 47 staff members overseas in 1988 (as compared to more than 2400 USAID overseas staff); therefore, implementation of environmental guidelines and initiatives in its development assistance may prove difficult.

Government Ministries

The Ministry of International Trade and Industry (MITI) sponsors Japanese private-sector participation in technology transfers through its Association of Overseas Technical Scholarship (AOTS), which funds training of managers and engineers from developing countries at Japanese host companies. In 1988, AOTS sponsored 2700 trainees, covering all fields of business and engineering.

The Japanese Environment Agency assists in transferring some environmental technologies to developing countries, particularly in the area of pollution monitoring and control; however, its budget for foreign assistance was less than \$1 million in 1989.

Japan Federation of Economic Organizations (Keidanren)

Keidanren, a highly influential association representing large Japanese industrial firms, has begun developing closer ties with official aid agencies. In April 1989, OECF and Keidanren founded the quasi-governmental Japan International Development Organization Limited (JAIDO) to promote Japanese private-sector involvement in development assistance. JAIDO cooperates with Japanese development agencies, as well as U.N. agencies and the World Bank.

On April 23, 1991, Keidanren issued a Global Environmental Charter calling for increased environmental responsibility on the part of its affiliated firms. The charter included two recommendations on technology transfers related to the environment:

- Companies shall seek appropriate means for the domestic and overseas transfer of their technologies and expertise for dealing with environmental problems and conserving energy and other resources.
- In participating in official development assistance projects, companies shall carefully consider environmental and anti pollution measures.

Non-Governmental Organizations

In contrast to the situation in most aid-donor nations, non-governmental organizations (NGO's) in Japan, including environmental conservation groups, have played almost no role in foreign aid, whether in consulting, lobbying, project implementation, or as sources of development funds.

B. The European Community's (EC) Environmental Assistance Programs

EC Environmental Development Assistance

The European Aid Program is mainly carried out under the auspices of the Lomé Convention, currently in its fourth round. The Convention organizes EC financing of projects in the 69 African, Caribbean, and Pacific countries forming the ACP Group. More than half of EC aid goes to sub-Saharan Africa. While EC agreements with Asian and Latin American aid recipients are not as elaborate as those under the Lomé Convention, Lomé is the overall model for EC aid.

Title I of the Lomé IV Convention deals specifically with EC environmental aid to ACP Group countries. This section promotes a long-term, comprehensive approach to environmental preservation, including environmental impact assessments of proposed projects "as appropriate." Regarding environmental technology transfer, the Convention calls for incorporation of "suitable educational, training, information and research schemes in projects and programs." In addition, parties to the Convention may request consultation on potential ecological hazards resulting from the application of industrial technology. However, apart from these statements, the Convention does not outline specific programs for environmental technology transfers.

In recent years, co-financing of projects with private-sector lenders and NGO's outside the framework of the Convention has increased. Beginning with Lomé III, measures were initiated to promote greater private investment in developing countries, including investment promotion and guarantee arrangements; joint insurance of

investments; and export-stabilization grants and loans. These sorts of measures could potentially be directed toward environmental technology transfer.

EC Research Programs

European Community research funding is structured and guided through a series of four-year Framework Programs. In April 1990, the Council of Ministers approved the Third Framework Program, covering the period 1990-1994. Total funding available for this period, including funds remaining from the Second Framework Program, is 8.8 billion European Currency Units (ECUs), or about \$11.8 billion. Several of the specific programs within the Second and Third Framework Programs directly or indirectly involve environmental technology transfers to developing countries.

EC research programs provide funding for industrial firms, universities, and research institutes in EC member states. Forms of support include contracted research with cost sharing, coordination of collaborative research, and the EC's own research activities. The latter consists of work carried out by the Joint Research Center (JRC), which has environmental protection as one of its priorities. Part of the JRC's mission is to develop technical and research cooperation with industry as a mechanism for technology transfer.

The three research programs with the greatest emphasis on environmental technology transfer programs are listed below:

- **STD: Science and Technology for Development**

The purpose of STD is to promote scientific cooperation between EC member states and developing countries. Conservation and environmental management are among the research priority areas for STD. Technology transfer activities include training and mobility of developing-country scientific personnel; provision of equipment; and creation of research networks. The program is funded at a level of 80 million ECUs over a 5-year period.

- **NETT: Network for Environmental Technology Transfer**

NETT promotes cooperation between suppliers and users in the field of environmentally clean technologies. The network was established by the EC Commission as an independent association in 1988. Consulting services are provided by industrial and university-based experts associated with the network. NETT also makes information available on environmental technology markets; technical options open to industry; current or prospective environmental standards and regulations; and existing programs of financial and technical support by the EC and

national governments. In addition to its present role in technology transfers among EC member countries, NETT could potentially serve as a conduit for environmental technology transfers to developing countries.

- **International Scientific Cooperation**

The EC promotes international scientific cooperation through a network of agreements with countries throughout Latin America and Asia. Within these agreements, the EC sponsors joint research projects, organizes workshops, and provides grants to developing-country scientists to perform research at European laboratories in a range of fields, including environmental protection.

EC Environmental Assistance to Central and Eastern Europe

The European Community's support for economic reconstruction in Central and Eastern Europe is organized under the PHARE (Poland and Hungary Action for Restructuring of the Economy). Originally targeted at Poland and Hungary, PHARE also encompasses Bulgaria, the Czech and Slovak Federal Republic, Romania and Yugoslavia.

The majority of PHARE aid consists of financial and technical assistance for economic restructuring projects. In addition to sectoral projects in such areas as agriculture, investment, and services, PHARE places a high priority on environmental protection and repair of environmental damage in Central and Eastern Europe, in order to improve the long-term prospects for balanced, sustainable development and to attract investment.

PHARE funds are made available as grants, not loans. For 1991, PHARE budget allocations totaled ECU 785 million; for 1992, the projected total is ECU 1 billion. Annually, the EC outlines an "indicative program" with each recipient country setting out the priority areas of PHARE funding. Implementation of specific projects, including procurement of supplies and technical assistance, is conducted by the recipient country in consultation with the PHARE Operational Service.

While PHARE does not have a formal role in promoting Western exports of goods or services, PHARE programs typically call for technical assistance by western consultants and procurement of western technologies, such as environmental monitoring equipment. In addition, although PHARE is not intended to replace private investment or to serve as an investment guarantee fund, PHARE financial assistance within a project may be used as equity funding for starting up new ventures and joint ventures with western firms.

In 1990, the first year in which PHARE assistance was made available, environmental protection and cleanup projects received high priority, accounting for ECU 102.5 million out of a total of ECU 430.6 million in economic restructuring assistance. The projects listed are the ECU 102.5 million of PHARE environmental assistance in 1990 (see Table III.3 for PHARE Environmental Impact Programs, 1990).

**Table III. 3
PHARE Environmental Impact Programs, 1990 and 1991**

| Country | Program | Value | Goal |
|------------------------|----------------------------------|-----------------|--|
| Poland | Environmental Protection Program | ECU 22 million | To help Poland strengthen and improve its air and water monitoring network and to support urgent measures to improve conservation, waste disposal, and reduction of harmful emissions. |
| Hungary | Environmental Protection Program | ECU 25 million | To improve Hungary's air and water monitoring capacity and to finance improvements to waste disposal, regeneration of lake ecosystems, reduction of harmful emissions, and training in environmental protection. For the longer term, the program supports environmental strategic planning and institutional strengthening. |
| Hungary | Regional Environment Center | ECU 2 million | EC participation in an independent, non-profit environmental research and policy center which will address environmental problems throughout Central and Eastern Europe. |
| Bulgaria | Air Pollution Monitoring Program | ECU 3.5 million | To provide immediate improvements in the existing network for regular monitoring of air pollution in Bulgaria, by providing equipment for air quality and emission control. |
| Czech Federal Republic | Environmental Protection Program | ECU 30 million | To improve the country's capacity for environmental monitoring, and to assist with hazardous waste disposal and nuclear safety. The program provides for toxicological testing of food and water quality. |
| Former East Germany | Environmental Protection Program | ECU 20 million | To improve air and water quality monitoring, strengthen treatment capacity, and reduce emission of pollutants. |

Table III. 3 (continued)
PHARE Environmental Impact Programs, 1990 and 1991

| Country | Program | Value | Goal |
|--------------|--|--------------------------|--|
| Hungary | Assistance for Energy Sector Restructuring | ECU 5 million | To assist Hungary in diversifying its energy resources and improving its capabilities in energy efficiency and conservation. |
| Region-wide | Joint Venture Support | ECU 20 million | To stimulate small-scale and medium-scale enterprises in the EC to create and/or expand joint ventures in Central and Eastern Europe, with the long-term purpose of transferring technology and know-how into the region. The program will provide assistance in identifying potential projects and partners; supporting feasibility studies; contributing start-up capital; and supporting technical and managerial training. |
| TOTAL | | ECU 127.5 million | |

C. U.S. Private Sector Capabilities and Environmental Assistance Programs

Private Sector Programs

With the expansion of U.S. private sector participation in international trade, there is increasing opportunity for U.S. industry and trade associations to enhance their role in assisting U.S. firms introduce and transfer environmental goods and expertise to developing countries.

U.S. industry associations have been classified by major areas of environmental expertise or technology. These areas include:

- Pollution Control
- Recycling
- Environmental Quality
- Waste Management
- Water Management
- Environmental Education
- General Environmental Technology

The following matrices provide an illustrative overview of the current activities of nearly fifty U.S. associations. A complete list of associations and their contact information is provided in Appendix 1. Association membership generally consists of executives representing manufacturers, suppliers, and contractors which produce, utilize or monitor developments in environmental technology. Consultants, government officials and other related industry associations (e.g., umbrella associations) are also included in association memberships.

The major functional activities carried out by the associations which might be of some relevance to possible AID-sponsored initiatives have the following characteristics:

- International presence or representation;
- Distributing business leads or trade inquiries to association members;
- Collaborating with government agencies and bodies on industry policy and regulation;

- Providing technical assistance and services;
- Providing technical training for association members;
- Conducting conferences or seminars; and
- Sourcing and disseminating technical and industry information.

The matrices illustrated in Table III.4 suggest that maintaining a resource facility which gathers and assembles statistical, scientific, and legislative materials has been the primary activity of most associations. The associations often serve as information "clearinghouses" for their members, compiling materials for journals and other publications. Conducting conferences and annual meetings ranks as the second leading activity. These events provide forums for company and industry experts to introduce and exchange environmental technical or market developments, and to discuss potential business opportunities.

Providing technical training and technical assistance at the state and local level ranks third. The associations provide technical training seminars, workshops or continuing education courses as well as publish technical handbooks or texts for other organizations or educational institutions. In addition, some associations award certifications upon course completion and provide job placement assistance. Activities of associations providing technical services include assisting government bodies implement legislated programs, structuring and operating community services such as recycling programs or arranging for environmental industry experts to provide technical assistance.

Fewer associations engage in lobbying efforts at the national, state and local levels. Associations may represent both manufacturers and resource producing industries whose operations are affected by environmental legislation. Likewise, they may provide legislators with analytical materials and information. Of the associations surveyed, pollution control associations appear to be most actively involved in liaising with the government to influence regulatory and policy developments. Clean air legislation, in particular, has been a major issue for pollution control groups.

Few associations are actively involved in distributing trade and business leads among their members. In order to promote the industry's business activities, however, some associations provide advertising in their publications for environmental goods and services suppliers and buyers. They may also conduct public relations or public affairs programs.

Currently, most trade associations are not involved in international market development activities. There is untapped potential for associations to establish offices or representatives overseas as well as links with overseas affiliates. Trade associations could also consider developing industry missions which sponsor overseas visits by U.S. environmental experts or executives to provide technical or advisory services.

Educationally-based environmental programs or institutions, unlike their commercial counterparts, have been very active in working with private and public sector clients in developing countries addressing environmental issues. In many cases, these institutions have developed close working relations with environmental experts in overseas universities and development agencies.

Table III.4 Industry Associations Specializing in Water Management Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/ education for members | Conducts workshops or seminars | Sources and disseminates technical/ industry information |
|--|---|--|--|---|---|--|--------------------------------|--|
| American Water Works Association | Utilities Technicians Scientists | √ | √ | | √ | √ | √ | √ |
| Industrial Water Conditioning Institute | Contractors | | √ | | | | √ | |
| National Association of Water Companies | Utilities Technicians | | | | √ | | √ | √ |
| National Water Alliance | Utilities Umbrella Assoc Government | | | √ | | √ | √ | √ |
| Water and Wastewater Equipment Manufacturers Association | Manufacturers Distributors | | √ | | | | √ | √ |
| Water Pollution Control Federation | Manufacturers Technicians Consultants | √ | √ | | | √ | √ | √ |
| Water Quality Association | Manufacturers Distributors Retailers | | √ | | | √ | √ | √ |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

11

Table III.4 (continued) Industry Associations Specializing in Waste Management Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/ education for members | Conducts workshops or seminars | Sources and disseminates technical/ industry information |
|---|---|--|--|---|---|--|--------------------------------|--|
| Air and Waste Management Association | Manufacturers Government Technicians | | √ | √ | | √ | | √ |
| American Coal Ash Association | Utilities Technicians | | √ | | √ | √ | | √ |
| Center for Hazardous Materials Research | Consultants Technicians Government Executives | | √ | | | √ | √ | √ |
| Coalition for Responsible Waste Incineration | Manufacturers Academics | | | | √ | √ | √ | √ |
| Council on Plastics and Packaging in the Environment | Manufacturers Suppliers Marketers Umbrella Assoc. | | √ | √ | | | √ | √ |
| Governmental Refuse Collection and Disposal Association | Government Executives Manufacturers Suppliers Consultants Contractors | | | √ | √ | √ | √ | √ |
| Hazardous Waste Treatment council | Government Executives Manufacturers Suppliers Consultants Contractors | √ | √ | √ | √ | √ | √ | √ |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

Source: SRI International/Encyclopedia of Associations/IMCC

75

Table III.4 (continued) Industry Associations Specializing in Waste Management Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/ education for members | Conducts workshops or seminars | Sources and disseminates technical/ industry information |
|--|--|---|---|--|--|---|---------------------------------------|---|
| National Resource Recovery Association | Government Contractors Suppliers Consultants | | | | √ | | √ | √ |
| National Solid Wastes Management Association | No Members | | √ | | | √ | √ | √ |
| Potable Sanitation Association International | Contractors Manufacturers Retailers | | √ | | | √ | √ | √ |
| Secondary Lead Smelters Association | Recyclers Manufacturers Suppliers Consultants | | | | √ | | √ | √ |
| Underground Injection Practices Council | Suppliers | | | √ | | √ | √ | √ |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

Table III.4 (continued) Industry Associations Specializing in General Environmental Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/education for members | Conducts workshops or seminars | Sources and disseminates technical/industry information |
|--|---------------|--|--|---|---|---|--------------------------------|---|
| Association of Environmental Engineering | Academics | √ | | | | | √ | √ |
| Chemical Manufacturers Association | Manufacturers | | √ | | √ | √ | √ | √ |
| National Association of Manufacturers | Manufacturers | | | √ | | | | √ |

Educational Environmental Technology Associations

| | | | | | | | | |
|--|--|---|--|---|--|---|---|---|
| Alliance for Environmental Education | Academics | √ | | | | √ | | √ |
| Bank Information Center | No Members | √ | | √ | | | √ | √ |
| Coolidge Center for Environmental Leadership | Executives Academics | √ | | | | √ | √ | √ |
| Institute for Environmental Education | Manufacturers Producers Government | √ | | | | √ | | |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

Table III.4 (continued) Industry Associations Specializing in Environmental-Quality Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/ education for members | Conducts workshops or seminars | Sources and disseminates technical/ industry information |
|--|--|--|--|---|---|--|--------------------------------|--|
| American Gas Association | Distributors | | √ | | | | | √ |
| American Petroleum Institute | Producers | | √ | | | | √ | √ |
| Association of Environmental and Resource Economists | Economists Government Academics | | | | | | √ | √ |
| Association for Rational Environmental Alternatives | Engineers Planners Architects Attorneys | | | √ | | | √ | √ |
| Center for International Development and Environment | No Members | | | | √ | | | √ |
| Coalition for Resource Recovery and the Environment | Government Manufacturers Executives | | | | | | √ | √ |
| Environmental Action Coalition | No Members | | | √ | √ | √ | | √ |
| Environmental Defense Fund | Individuals | | | | | √ | √ | √ |
| International Bio-environmental Foundation | Technicians Scientists | | | | √ | | | √ |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity.

Source: SRI International/Encyclopedia of Associations/IMCC A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

Table III.4 (continued) Industry Associations Specializing in Environmental-Quality Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/ education for members | Conducts workshops or seminars | Sources and disseminates technical/ industry information |
|---|--|--|--|---|---|--|--------------------------------|--|
| International Center for the Solution of Environmental Problems | Technicians Scientists Executives | | | | | | | √ |
| International Ecology Center | Individuals | | | | | | | √ |
| National Environmental Development Association | Executives Academics | | √ | √ | | | √ | √ |
| Resource Policy Institute | Consultants Academics | √ | | | | | | √ |
| World Environment Center | Executives Consultants Technicians | √ | √ | | √ | | √ | |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

Table III.4 (continued) Industry Associations Specializing in Pollution Control Technology

| ASSOCIATION | Members | International Presence or Representation | Distributes business leads or trade inquiries to members | Collaborates with Gov't on industry policy & regulation | Provides technical assistance or services | Provides technical training/education for members | Conducts workshops or seminars | Sources and disseminates technical/industry information |
|---|---|--|--|---|---|---|--------------------------------|---|
| Center for Clean Air Policy | Manufacturers Producers Umbrella Assoc. | | √ | √ | | | √ | |
| Environmental Industry Council | Manufacturers Umbrella Assoc. | | | √ | | | √ | |
| Federation of Environmental Technologists | Manufacturers Government Consultants | | | | | √ | √ | √ |
| Industrial Gas Cleaning Institute | Manufacturers Technicians | | √ | √ | | | √ | √ |
| Manufacturers of Emissions Controls Association | Manufacturers | | | √ | | | √ | √ |
| National Clean Air Coalition | Umbrella Assoc. | | | √ | | | √ | |
| National Institute for Chemical Studies | Manufacturers Executives | | | | | | √ | √ |
| Spill Control Association of America | Manufacturers Contractors Suppliers | | | √ | √ | √ | √ | √ |

Note: Blank space suggests that, based on readily available materials, the association may not engage in this activity. A definitive assessment of its activities, however, requires further analysis and discussion with industry experts.

41

United States Government Environmental Assistance Programs

This section provides a brief summary of the principal U.S. Government environmental programs with the most potential for impact on the supply of environmental goods and services to developing countries. This list is not inclusive, since many new projects or programs are now being planned or are in the initial phases of implementation. A significant number of these initiatives are funded by or receive active support from AID.

United States-Asia Environmental Partnership (US-AEP)

Michael Met
US-AEP Secretariat
1133 20th Street, N.W., Suite 300
Washington, DC 20036
Tel. (202) 835-0333
Fax: (202) 835-0366

US-AEP is an Asia-wide environment initiative implemented by a sub-cabinet coordinating committee which involves over twenty U.S. Government agencies, including the EPA, Commerce, USAID, USTR, Eximbank, OPIC, the Trade Development Program, etc.

Organizational Goal. The goal of US-AEP is to establish a coalition of American and Asian business, governments and community groups to enhance Asia's environment through training, technology cooperation, trade and investment support, and development of environmental information networks.

Program Activities. The program consists of four components:

- The Environmental Fellowships, Exchange and Training component includes four separate programs which offer fellowships, collaborative problem solving and other training activities for professional personnel from governments, industries, and universities.
- The Technology Cooperation component seeks to coordinate U.S. Government and private sector programs in introducing U.S. products, processes and services to the Asian markets through trade and investment linkages.
- The Environmental and Energy Infrastructure component will provide professional assistance to help business seek financial support for specific projects through interagency finance facility, involving the EXIM Bank, OPIC, TDP, AID, and the Small Business Administration.

- The Regional Biodiversity Conservation Network component will initiate a competitive grant program and information network to support the preservation of natural resources in Asian countries.

Project in Development and the Environment (PRIDE)

Curt Nissly
PRIDE Project Officer
USIAD/Bureau for the Near East
515 22nd Street, NW
Room 208, SA-2
Washington, DC 20523-0225
Tel. (202) 663-2493

The PRIDE Project is a new five-year, AID centrally-funded project which provides technical assistance in environmental and natural resource management to USAID missions and to host-country institutions in Egypt, Jordan, Morocco, Oman, Tunisia, and Yemen. It also supports activities in Eastern Europe. The PRIDE Project has four components: Strategic planning, environmental policy analysis, environmental education, and private sector initiatives.

The goal of the PRIDE Project is to support AID objectives of fostering environmental and natural resource management consistent with sustainable with economic growth. The project will be jointly implemented by the World Environment Center and a consortium led by Chemonics International.

Environmental Pollution Prevention Project (EP3)

The Environmental Pollution Prevention Project (EP3) is a new ten-year project designed by the Research and Development Bureau of AID, with the goal of reducing environmental pollution associated with urbanization and industrialization. EP3 was developed on the premise that pollution prevention through waste minimization and cleaner production technologies is the most cost-effective and sustainable environmental strategy in the long run. EP3 seeks to promote pollution prevention and cleaner production primarily by:

- Providing a broad range of technical assistance, training, and information services for environmental awareness and pollution prevention at the plant, industry category, and national levels;
- Strengthening and expanding in-country sources of technical expertise for pollution prevention, including establishing national centers of pollution prevention training, information, and technical assistance;

- Identifying, promoting, and expanding sources of financing for pollution prevention technology and creating linkages between firms and agencies in EP3-assisted countries and U.S. suppliers in pollution prevention expertise and equipment;
- Helping to improve national environmental policies, laws, regulations, and their implementing institutions so as to expand incentives for cleaner production; and
- Promoting Cleaner Production Worldwide, an initiative to coordinate the pollution prevention efforts of AID and other US and donor agencies.

EP3 will operate on three closely linked tracks:

- At the AID/Washington level, the project will establish an early project learning system, a pollution prevention information and training resource center, and will put into place the Cleaner Production Worldwide initiative.
- The Country Support Programs will include technical assistance in developing national strategies, policies, and programs in environmental pollution prevention as well as plant and industry-level innovations.
- Under EP3, short-term training and technical assistance will be made available for all AID-assisted countries in a wide range of activities covered by the project components.

ASEAN Environmental Improvement Project

The ASEAN Environmental Improvement Project is being implemented by AID/ASEAN, with the purpose of promoting private sector initiatives to address urban and industrial pollution, and to strengthen local, national, and regional capabilities in environmental management. The project will have three inter-related components:

- The Policy and Institutional Development Component will help ASEAN countries to develop regional and national standards, regulations, and effective compliance mechanisms, and assist government agencies and private organizations to develop and implement effective environmental policies and programs.
- The Technical Assistance and Training Component will assist ASEAN private and public sector organizations and NGOs in developing skills and information systems to evaluate and implement effective environmental practices and technologies.

- The Technology Commercialization and Investment Promotion Component will promote environmental technology transfer and commercialization activities within the region and between the ASEAN and US private sectors.

A Project Steering Committee comprised of representatives of the ASEAN Senior Officials for Environment (ASOEN) and the ASEAN and U.S. private sectors will provide policy guidance and oversight to the project. The day-to-day operations and management of the project will be the responsibility of the Management and Technical Assistance contractor. Each ASEAN country will organize a Project Advisory Group as a means for involving governmental, NGOs, and other private organizations at large in the project.

The Environmental Enterprises Assistance Fund

Helen A. Chaikovsky
Vice President for Financial Assistance
1611 N. Kent Street
Suite 600
Arlington, VA 22209
Tel. (703) 522-5928
Fax: (703) 522-6450

The Environmental Enterprises Assistance Fund is a non-profit, international development organization, established in September 1990 with the help of AID, Winrock International, and the Rockefeller Foundation. It seeks to promote and facilitate the proliferation of commercially renewable energy and other environmentally sound technologies in developing countries.

Organizational Goal. The basic goal of the Environmental Enterprises Assistance Fund is to harness grant-based assistance with loans, investment capital, and technical and management assistance to help entrepreneurs overcome the economic barriers associated with the start-up of commercially sound, smaller-scale, renewable energy systems. The Fund also supports the efforts of small and medium-sized U.S. companies as they seek to establish markets in developing countries for renewable energy and other environmental management technologies.

Funding. The Environmental Enterprises Assistance Fund has set a funding target of \$30 million, to be achieved over a period of four years. Of this, the Fund seeks a total of \$10 million to capitalize its investment fund. Some of these funds will take the form of grants provided to support specific investment activities, and some will represent general support grants for the investment program as a whole.

In September 1990, the Fund signed a loan agreement with AID's Bureau for Private Enterprise (PRE) for \$2.4 million, the proceeds of which will be used for loans to qualified projects. This loan agreement presents a matching challenge to the Fund in that it requires the Fund to raise, from other sources, funds equal in amount to those it proposes to utilize from the AID loan.

Program Activities. The Environmental Enterprises Assistance Fund identifies project sites and participants, supports prefeasibility and feasibility studies, and makes loans to and equity investments in carefully targeted environmental projects. Areas targeted by the Fund include commercially viable renewable energy, technologies that improve energy efficiency, techniques to improve forest management, and waste management systems such as anaerobic digestion that provide energy and produce valuable fertilizer as byproducts.

Grant support will permit the provision of technical assistance, and, where needed, business skills to prepare projects for investment. The Fund maintains a strong team of experienced private-sector specialists who can assist less experienced managers in developing countries.

The Fund works closely with AID, Winrock International, and other development institutions with a field presence to identify promising smaller scale project opportunities. Because of the importance of on-site project identification and development, the Fund will establish for-profit, in-country investment subsidiaries in key developing countries. A subsidiary has already been incorporated in Costa Rica and local advisors have been selected for a subsidiary in Indonesia. Earnings from investments and the local subsidiaries will be used to cover operating costs and to support further grants, loans, and investments.

The management of the Environmental Enterprises Assistance Fund has been handled by a small staff with extensive experience in the field of renewable energy and developing country finance. Staffing has been provided by Winrock International for the first year under a loaned staff agreement between the two organizations, and negotiation for a second year agreement is under way. Operating costs and a portion of its technical assistance activities for the Fund will be covered by a grant from the AID Office of Energy for the first three years. AID's Life of Project Funding is set at \$5 million.

Environment Investment Fund of OPIC
Overseas Private Investment Corporation
Graham Williams
1100 New York Ave. NW
Washington, DC 20527
Tel. (202) 336-8479
Fax. (202) 331-4234

The Environment Investment Fund, a privately owned and managed investment fund, has been created with financial guarantees from the Overseas Private Investment Corporation (OPIC) and partial funding from AID.

Organizational Goal. The Environmental Investment Fund represents a concentrated effort to involve the U.S. private sector in improving and maintaining the global environment through environmentally sound and profitable projects. The Fund will identify and make equity investment in private business enterprises in developing countries which sustain natural resources and practice sound environmental management. Each enterprise must have a business connection with one or more U.S. company, which could take the form of ownership, management, license, supply of equipment, or a marketing agreement.

A secondary goal of the Fund is to demonstrate the financial viability of investing in environmentally-beneficial projects in developing countries. It is also OPIC's intent that a successful Fund operation would stimulate other private-sector oriented development initiatives.

Funding. The actual amount of the Fund capitalization will be determined by the market size of projects meeting the Fund's criteria. However, the Fund's initial capital will be in the range of \$60 to \$100 million. OPIC plans to commit 40 percent of this capital and will raise the other 60 percent through the sale of limited partnership interests to U.S. firms and institutional investors.

Program Activities. The Environmental Investment Fund will make substantial equity and equity-related investments in a business that will contribute directly to sustainable natural resource development or successful environmental management. Although the Fund will not be involved in the day-to-day operations of funded projects, it will participate actively in their strategic planning processes, advise on issues concerning operations, management and profitability, and monitor environmental performance.

The Fund intends to focus its investments in four sectors: Sustainable agriculture, forest management, ecotourism, and pollution prevention, especially in energy-conserving technologies, non-polluting fuel sources, substitutes for CFCs, recycling and biological waste treatment.

The Fund has selected Kidder Peabody to serve as its investment firm. Funds have become available to qualifying projects since late 1991.

**Environmental Markets Trade & Investment Promotion Project
U.S.-ASEAN Council For Business and Technology**

Levi Richardson
1400 L Street
Suite 650
Washington, DC 20005
Tel. (202) 289-1911
Fax: (202) 289-0519

The ASEAN Environmental Markets Trade and Investment Promotion Project was established by the U.S.-ASEAN Council for Business and Technology under partial funding from the AID Private Investment and Trade Opportunities (PITO) Project, the Environmental Protection Agency (EPA), the Commerce Department, and private sector firms.

Organizational Goal. The goal of this project is to enhance the competitiveness of U.S. firms in the growing environmental markets in ASEAN. The project focuses on increasing the awareness of U.S. firms of the business opportunities in the environmental sector in ASEAN, and involving the ASEAN and U.S. private sectors and government agencies in the promotional effort. Targeted areas in the environmental sector include waste water management, hazardous waste control and disposal, solid waste disposal, air pollution control, pollution prevention technologies, energy conservation, and environmentally sound industrial technologies.

Funding. This project is jointly funded by AID, the Department of Commerce, and private sector firms that supply technologies, equipment, and services in the environment sector. For fiscal year 1991, AID has allocated approximately \$300,000 to the U.S.-ASEAN Council to manage trade and investment promotion under the PITO (Private Investment and Trade Opportunities) Project.

Project Activities. Project activities are to be carried out in five phases:

- Conducting market research to examine alternative approaches to serve the emerging ASEAN markets for environmental services and equipment.
- Identifying qualified U.S. firms that are interested in the ASEAN environment markets as well as the local end-users, potential joint venture partners, agents, and distributors, etc.
- Packaging and distributing information on ASEAN environment markets and opportunities to a broad base of American companies through informational seminars in selected U.S. cities.

- Sponsoring and organizing missions of U.S. environmental industry executives to travel to selected ASEAN countries to assess markets, make contacts with senior government and corporate leaders, pursue business transactions, identify local distributors, and discuss American technologies.
- Providing pro-active follow-up assistance to U.S. companies participating in the missions by supplying additional information on markets and opportunities, and directing firms to appropriate U.S. Government agencies, multilateral organizations, and private financing sources.

U.S. Trade and Development Program (TDP)

David Denny
SA-16 Room 309
Washington, D.C. 20523-1602
Tel. (703) 875-4357
Fax: (703) 875-4009

The Trade and Development Program provides funding for U.S. firms to carry out feasibility studies, consulting and other planning services related to major projects in developing countries. TDP activities cover a wide range of sectors of high priority to host governments and international development efforts, one of which is the environmental sector. Currently, more than one fifth of TDP's grants have an environmental component.

Funding. In fiscal year 1991, TDP budgeted \$34 million for program activities, 18 percent of which was obligated to projects in the environmental sector, including solid waste treatment, water management, pollution prevention, and environmental symposia.

Program Activities. TDP funds project planning and feasibility studies to help U.S. companies compete for, and participate in, major projects in developing countries. TDP funding has in recent years increasingly shifted towards the environment sector, including environmental goods and services, in which U.S. firms are recognized to have comparative advantage.

TDP will provide a grant to a developing country government to finance planning services for a public-sector project on the condition that a U.S. firm is selected by that government to perform the study. While U.S. firms interested in these projects are encouraged to bring them to TDP's attention, TDP must have an official request from the host government before considering a public-sector project. TDP's contribution usually ranges from \$150,000 to \$750,000 for public-sector projects.

TDP also offers direct financing to U.S. firms for feasibility studies connected with potential investments in developing countries. Currently, such financing is provided in the form of a four-year, interest-free loan, secured by the potential investor's promissory note.

The basic criteria for TDP financing for both investor studies and public sector projects are: (1) The project must be a priority project; (2) Project financing is available; (3) Potential for substantial U.S. exports exists; and (4) The project is environmentally sound.

TDP sponsors a variety of technical symposia geared to the needs of specific U.S. export industries. The symposia are intended to familiarize officials of foreign governments and enterprises with U.S. goods and services as well as to encourage U.S. companies to export to major projects in developing countries.

TDP also maintains a grant at the World Bank for environmental projects to support U.S. consulting for projects in these areas.

Private Sector Energy Development Program (PSED) of AID

Environment and Development

AID/ENE/DR

Dr. James J. Tarrant

Political Economist

3020 "O" Street, NW

Washington, DC 20007

Tel. (202) 333-1736

Fax: (212) 683-5053

The PSED program of the Center for International Electric Power Development operates under the auspices of AID's office of Energy. The Center sponsors the Private Sector Energy Development Feasibility Study Fund which provides financial support to the private sector for the development of private sector energy/power projects, including hydroelectric, waste-to-energy, geothermal power stations and combined cycle plants in AID-assisted countries.

Funding. Since its inception in September 1989, 6 grants have been awarded to private power development projects in the Dominican Republic, Jamaica, Turkey, Poland, and the Philippines, with an average size of \$125,000 per grant. The Fund will cover up to 50 percent of the cost of prefeasibility and feasibility studies. Should the project be implemented, the PSED share of the costs shall be refunded to the U.S. Treasury.

Program Activities. An applicant to the Fund must propose an environmentally sound, privately-owned and operated energy/power project in an AID-assisted country. The environmental standard of the World Bank for that country will be used as the benchmark for environmental soundness. Applicants must be companies under U.S. management, have 51 percent of the stock owned by U.S. citizens or be owned by citizens of AID-assisted countries. The proposed project should also provide an opportunity for the export of U.S. goods and services over the course of the project's development, implementation and operation.

Pollution Control
U.S. Department of Commerce
Loretta S. Jonkers
International Trade Specialist
Room 2213
Washington, D.C. 20230
Tel. (202) 377-0564
Fax: (202) 377-8304

The U.S. Department of Commerce is very active in promoting U.S. exports of environmental technology and other goods and services. Operating in 66 U.S. embassies around the world, the Foreign Commercial Service (FCS) of the International Trade Administration disseminates information, including specifications and prices, on U.S. products. Most FCS offices have catalogues displaying a wide variety of agricultural and industrial goods. The FCS also assists U.S. firms to locate agents and representatives overseas.

A second department within Commerce which assists foreign businesses to locate sources of U.S. goods is Trade Development, operating under the International Trade Administration. Trade Development advises U.S. exporters on trade and investment issues and participates in trade fairs and other promotional activities.

Environmental goods and services such as pollution control equipment are promoted by the Energy and Environmental Systems Division. The Division sponsored and organized Ecologia '91, an environmental trade fair held at the U.S. Trade Center in Mexico City in November 1991. However, this activity reportedly failed to generate a significant amount of interest from U.S. firms in exporting environment goods and services.

AID Bureau of Research & Development
Office of Energy and Natural Resources
U.S. Agency for International Development
Gerald Kamens
Room 509 SA-18
Washington, DC 20523-1811
Tel. (202) 663-2514

AID's Bureau of Science and Technology identifies project ideas for productive technology transfers to developing countries. In recent years, projects that conserve and develop the global environment have been emphasized. The amount of support is determined on a project-by-project basis by the AID Mission in the targeted country.

The Office of Energy in the S&T Bureau, in cooperation with EPA, drafted a proposed action plan for the U.S. Government to coordinate its efforts in promoting technology cooperation to address the issue of global climatic change. The proposed plan emphasizes the role of the private sector in developing and commercializing climate-related technologies, and outlines potential areas for inter-agency and government-private sector cooperation and coordination.

The plan calls for (1) greater participation by the private sector; (2) identification of developing needs; (3) international dissemination of information; (4) identification and mobilization of existing sources of technical assistance and training; (5) promotion of more efficient and coordinated use of existing sources of financial assistance; and (6) improving the capability of developing countries to absorb transferred technologies.

An ad hoc working group which comprised staff members from EPA, the Department of Energy, and the Office of Energy in the S&T Bureau also drafted a proposed Global Energy Efficiency Initiative (GEEI), outlining steps to improve energy efficiency in developing countries. The proposed initiative consists of three components: (1) Training activities to upgrade technical and managerial capabilities in developing countries, and improving information dissemination; (2) Providing financing to ease constraints on energy efficiency-improving investments in developing countries; and (3) Providing technical and financial assistance to support local, on-going energy efficiency initiatives in developing countries.

U.S. Environmental Protection Agency (EPA)

Office of International Activities

Scott Bidner

Intergovernmental Liaison

401 M Street, S.W. (A-106)

Washington, D.C. 20460

Tel. (202) 260-2087

The Office of International Activities of EPA has been active in promoting environmental technology transfer in developing countries. Several of the initiatives involve active participation from the U.S. and developing country private sectors.

In cooperation with the U.S.-ASEAN Council for Business and Technology, EPA is co-sponsoring and providing technical assistance to the U.S.-ASEAN Environmental Markets Trade and Investment Promotion Project. The goal of the project is to enhance the competitiveness of U.S. firms in the emerging ASEAN environmental markets through an active promotional effort that involves the U.S. and ASEAN private sectors and government agencies.

EPA works closely with Trade Development of the International Trade Administration in the Department of Commerce to promote U.S. environmental technologies and services overseas. Staff from EPA head the Subcommittee for Environment, Infrastructure, and Energy in the Trade Promotion Coordination Committee of Commerce. EPA sponsored two technical seminars on air pollution and water management at Ecologia '91.

In cooperation with AID and the Department of Energy, EPA developed an Environmental and Energy Efficiency Technology Transfer Clearing House (EEETTCH), which is a database containing information on U.S. environmental and energy businesses and industry experts.

The Office of International Activities is also drafting a proposed environmental training initiative that would involve a "partnership" between the U.S. public and private sectors. Under this program, participating private sector firms will provide environmental technology and management training to developing countries, exposing them to U.S. technologies, and shoulder the majority of the program operating costs. This initiative is intended to enhance the technology absorption capabilities of developing countries, and to stimulate exports in the U.S. environmental sectors in the long term.

In addition, EPA has been actively involved in a number of international cooperative activities, especially involving Eastern Europe. EPA sponsors the Regional Environmental Center for Central and Eastern Europe, which was established in September 1990 in Budapest. The Center's program focuses on information collection and dissemination, institution building, environmental education and clearinghouse functions.

EPA concluded a bilateral agreement with the Polish Ministry for Environment, Natural Resources, and Forestry in 1987 and signed a new bilateral Science and Technology (S&T) agreement with a significant environment component with Hungary in 1989. These types of agreements provide support for joint research and demonstration projects, and exchange of scientists and technical information in a variety of environmental fields, including water quality modeling, hazardous waste management, environment health effects, waste water treatment, and pollution monitoring. The EPA's current budget appropriation also provides \$1 million for environment programs in Poland.

The International Environment and Development Service of the World Environment Center

Mr. Ron Michaleck
Director
Technical Programs
World Environment Center
419 Park Avenue South
Suite 1800
New York, NY 10016
Tel. (212) 683-4700
Fax: (212) 683-5053

Dr. James Tarrant
Political Economist
Environment and Development
AID/ENE/DR
3020 "O" Street, NW, Suite 1404
Washington, DC 20007
Tel. (202) 333-1736

The World Environment Center (WEC) is a nonprofit, non-advocacy organization with the mission of supporting sustained development by strengthening urban and industrial health and environmental management practices worldwide.

Organizational Goal. Under a cooperative agreement with AID (ENE and PRE), the World Environment Center provides *pro bono* technical assistance in industrial pollution control to the developing economies of Eastern Europe, Near East and Asia, involving extensive participation from multinational corporations. This program is administered by the International Environment and Development Service (IEDS) within WEC.

Funding. Travel expenses, per diem, and management costs are primarily covered by AID under a cooperative agreement established in 1982. Participating private sector firms, most of which are Fortune 500 companies, provide in-kind contributions such as staff time, benefits, and office support.

Program Activities. The International Environment and Development Service provides technical and policy experts to conduct policy and institutional assessments of industrial pollution control for host country governments, technology assessments of pollution abatement and prevention to developing country industries, and technology transfer and training workshops. IEDS also arranges study tours and on-the-job internships for developing country environmentalists and government and industry officials.

Requests for assistance from host country governments or private firms are often channeled through AID Missions. More than 70 Missions have been involved in this program, and more than 500 individuals from 24 countries have been trained.

Although the IEDS program does not involve the direct sale of U.S. environmental equipment and services, it facilitates the development of business relationships between developing country industry sectors and participating U.S. firms. The IEDS program also provides valuable training opportunities and experience for U.S. technical staff in diagnosing and devising solutions for industrial pollution problems in developing countries. Thus, such *pro bono* services could lay the groundwork for future exports of U.S. goods and services.

IV. INDICATIVE ENVIRONMENTAL PRIVATE SECTOR OPPORTUNITIES

To effectively engage U.S. private sector in programs designed to assist developing countries in meeting the environmental challenge requires a basic understanding of the technological processes involved and their cost-effectiveness to achieve the necessary levels of protection. This section assesses the relative costs and effectiveness of some of the currently available environmental technologies, and identifies potential private sector opportunities in developing countries.

A. Pollution Detection

Technology Options

Pollution detection is an important means of determining whether or not an environmental problem exists or warning that one may arise. Three basic methods of pollution detection are currently available:

Remote Sensing. Through satellite or aircraft borne detection/observation, remote sensing can give an indication of large area changes due to pollution. Changes in the known characteristics of a geographical area are observed using a number of imaging technologies by means of visual, infrared and microwave radiation's. Although it is highly effective in detecting pollution, especially in areas with difficult access, remote sensing is technically complex and it involves high capital expenditure and operational costs. Satellite or aircraft are needed to transport the sensors, and in large or remote areas, sensing from aircraft would be necessary to cover the area under survey. Thus, the remote sensing technique is not considered a highly feasible option for developing countries.

Biological Sensors. Utilizing the sensitivity of biological organisms and their response, biological sensors can determine whether a certain pollutant is present at a site. The advantage of biological sensors is their effectiveness, if properly applied, and their relatively low cost and low levels of technical complexity. However, the conditions under which biological sensors can be effectively are extremely difficult to establish in most pollution sites in both developing and developed countries. Until further research increases the sensitivity and the flexibility of positioning biological sensors, it would not become the most widely used method of pollution detection.

Other Sensors. Location of gases and liquid pollutants using open-path and guided-wave optical sensing techniques, biosensors and thin-film sensing technologies, together with analytical instruments in external locations, the laboratory, or within a process plant, will establish the presence and concentrations of specific chemicals, allowing suitable action to be taken if levels exceed a predetermined safety threshold.

Private Sector Opportunities

As the effects of individual pollutants become better known, early detection helps to prevent exacerbation of the problem. Moreover, pollution cannot be controlled, nor regulations enforced, unless the levels of pollutants are effectively monitored. As a first step in addressing management of waste and pollution, sensors and other analytical instruments used in environmental monitoring represent a growing market in the environment sector. Sensor units range from hand held units to systems installed as fixed components in a process plant. Advanced sensors are already an essential component of many chemical process plants controls in industrialized countries. While some of the high tech sensing techniques are quite sophisticated, most of them do not require massive capital expenditure. Sensors and other analytical instruments represent a potential market for U.S. firms in developing countries.

B. Water Pollution Control

Technology Options

Waste water treatment includes primary treatment to remove solid particles (filtering and clarifying), secondary treatment to remove bacteria (such as biological treatment and chlorination) and tertiary treatment to remove chemical or metal compounds (such as reverse osmosis and chemical recovery systems). Newer types of treatment of waste water include aerobic methods, ion exchange and membrane technologies.

Chemical, physical, and increasingly biological treatments 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 only yields moderate effectiveness. *Physical* conversion involves the use of activated carbon. It is highly effective but more costly and more technically complex compared to chemical conversion. *Biological* conversion involves such processes as digestion and oxidation of the pollutant. It is highly effective if appropriately applied and it represents a relatively low cost means that should be explored by developing countries.

Cost varies 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.

Private Sector Opportunities

Extensive private sector opportunities exist in the water pollution control equipment sector in developing countries. Equipment for water and effluents treatment generally refers to those designed to remove pollutants from an aqueous stream or body of water or to convert the pollutant to a non- or less-polluting form prior to discharge or use. The market includes raking, screening, and flotation equipment, gravity separators, sand traps, settling basins, etc., as well as chemicals used in the process of neutralization, precipitation, and adsorption common in chemical conversion. Equipment for monitoring water and groundwater quality and use of specialty chemicals for water treatment are important sub-markets. Auxiliary products include pumps, pipes, tanks and handling equipment.

Currently, firms supplying equipment for water and effluent treatment tend to be large systems suppliers since water treatment is generally more than just a pollution control activity. The largest firms in the international water pollution control equipment market are European, predominantly Swedish and German. The largest American firms in the market are NALCO and Calgon Carbon.

C. Air Quality Control

Technology Options

The key gases usually requiring emission control are carbon dioxide, sulfur dioxide, and nitrogen oxides -- simply because of the high volume being generated all over the world. High levels of concentration of sulfur dioxide and nitrogen oxide cause acid rain, while carbon dioxide, chlorofluorocarbons, methane, and nitrous oxide are believed to be the major contributors to the depletion of the ozone and the greenhouse effect.

As with water pollution, physical separation or filtration can remove some of the pollutants from the waste gases, but gas washing with solvents (scrubbing), chemical and physical absorption and conversion through catalyzers combine to provide the technical means to remove noxious gases from emissions. Though highly effective, such treatment requires a relatively high capital expenditure and involves a high degree of technical complexity.

Private Sector Opportunities

Equipment for air quality control is generally designed to remove pollutants from a gaseous stream or to convert pollutants to a non-polluting or less-polluting form prior to discharge into the atmosphere. The market for air pollution control equipment may be divided into one treating (1) particulates, which include fabric filters, electrostatic precipitators, mechanical collectors; (2) acid emissions from power stations and other large-scale combustion plants, such as scrubbers, catalytic reduction, electron beam methods; and (3) the emissions of gases and vapors, including equipment for desulphurization, oxidation, carbon absorption, etc.

Currently, particulate emissions collectors are estimated to account for about 60 percent of the value of air pollution control equipment sold worldwide. Equipment for the control of acid emissions such as flue gas desulphurization, scrubbers, fluidised bed combustion and selective catalytic reduction will continue to be important. Leading U.S. air pollution control equipment firms include General Electric, Engelhard and Wheelabrator. Emerging and more rigorous enforcement of environmental regulation in developing countries will increase private sector opportunities in the market for particulate emissions collections and gaseous emissions control devices.

D. Solid Waste Management

Technology Options in Waste Disposal and Treatment

Burial is a widely used method of waste disposal, or, in cases where the waste is not fully degraded to a harmless form, a way of storing waste. 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 a good opportunity for some return on investment. It is important, however, to recognize the lessons learned in developed countries, in terms of ensuring the safety of sites to prevent leaching, and acknowledgment that burial is a short-term rather than long-term solution to waste disposal.

Incineration 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 aiming at convert solid, liquid and gas wastes physically to a safer end-product through high temperatures (often exceeding 1200 degrees Celsius). In spite of the costs involved in building and running the plants, incineration is the most environmentally effective and versatile means currently available to dispose of wastes. Incineration plants can be mobile or located at the sites of waste production. There are opportunities for improving the existing systems and developing new incineration techniques. Opportunities also exist to take

advantage of the excess heat generated produced by incineration, which can be used to drive turbines or provide direct heating for industrial plants or municipal consumption.

Bioremediation, or the use of bacterial digestion, is receiving increasing attention as a means of waste treatment. Bioremediation is a much cheaper method than say, chemical treatment, of cleaning up contaminated sites or removing soils for dumping or incineration. Recent bioremediation treatment of oil spill have indicated another potential area of successful application. Bioremediation has a lot of potential in developing countries because of its moderate cost compared to other means of waste disposal, and its relatively low-tech application that does not require a large number of technically-skilled personnel (see Table IV.1 for Cost Comparison for Different Methods of Waste Disposal).

Table IV.1
Cost Comparison for Different Methods of Waste Disposal

| Method | Estimated Treatment Cost per Cubic Yard |
|---|---|
| On-Site Bioremediation for Contaminated Soil | \$50-\$100 |
| Excavation with Off-Site Landfill | \$200-\$400 |
| Excavation with Off-Site Incineration | \$300-\$1,000 |

Source: SRI International

Where suitable technologies do not exist for effective or immediate waste disposal, or when the available techniques are prohibitively expensive, storage may be an option on both a temporary and permanent basis. Wastes that can be stored range from volatile liquid wastes awaiting incineration, to highly toxic wastes that need to be immobilized before disposal by landfill, to the long-term storage of radioactive materials. Various storage techniques include the following:

Deepwell injection is specifically targeted towards hazardous liquids. It involves pumping the liquid into a permeable earth stratum below water levels (to eliminate ground water contamination), and between impervious shale, clay or granite layers. This method of storing waste is not very technically complex, but would involve high costs of capital expenditure.

Storage tanks both above and below ground can be more closely monitored. 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, they are seldom regarded as a long-term solution because the tanks will only have a finite life-span.

Solidification comprises a variety of treatment techniques designed to entrap wastes within a solid matrix having high structural integrity to minimize the risk of leaching during long-term storage, providing appropriate safeguards in burial sites for waste storage. Typical wastes handled this way are pesticides, heavy metals and cyanide. The cost of solidification varies with the substance being treated, but is in general lower than deepwell injection and higher than using storage tanks. It is, however, a quite effective means of preventing leakage of hazardous materials during storage.

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

Private Sector Opportunities in Solid Waste Management

The convenience, low cost and low technology requirements of burial render it the most attractive of options for waste disposal in those developing countries where land is not at a premium. 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 and leachate collection systems.

The market in waste management includes equipment to collect, transport, treat, and dispose solid, liquid, and toxic wastes. Equipment for waste management is expected to become a large and growing market within the environmental equipment industry, especially for handling hazardous waste. 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 devices, containers and handling equipment. American firms are reportedly competitive in the international market especially in hazardous waste technology (plasma incineration techniques) and in biotechnology. Currently, Waste Management and Browning-Ferris are the leading American firms in the waste management industry internationally.

E. Waste Recycling and Materials Reclamation

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 waste, or the cost of effective disposal. It also lowers the demands on materials resources. The major technical hurdle in recycling is to collect and isolate the material for it to be reintroduced into a production cycle. Collection and sorting of mixed materials in municipal wastes, for example, calls for either highly developed technology or intensive labor levels. Recycling of certain materials is likely to be more appropriate in developing countries than in industrially developed countries due to the scarcity or high cost of both materials and energy, and low labor costs.

Private Sector Opportunities in Recycling

Recycling is a promising area for private sector involvement. Recycling technologies vary because they are material specific, but most recycling processes require technologies that aid in collecting, sorting, separating, cleaning, sizing, grading of processing materials. The market for recycling includes equipment to recover and process recyclable materials, compactors, bailing systems, shredders and conveyors. To date, most recyclers have focused primarily on materials such as ferrous metals, aluminum, glass, paper, and lubricants, which have well-established markets for recycled material.

F. Cost of Technology Options

Although general cost comparisons among alternative environmental technologies are possible, factors such as the variety and the combination of wastes and the clean-up levels sought would render such comparisons meaningless if taken out of context. For instance, the capital costs of various gas scrubbers for reducing carbon dioxide, sulfur dioxide, and other emissions depend on specific gases involved, the quantities of gas emitted, and the abatement levels sought. Some methods are less expensive than others, but they may be less effective. The costs of solutions to environmental problems also depend on the point at which intervention takes place. In general, prospective and preventive solutions are more flexible and less costly than retrospective solutions (See Table IV.2 for Relative Cost Comparison for Selected Environmental Technologies).

Table IV.2
Relative Cost Comparison for Selected Environmental Technologies

| Technologies | Environmental Effectiveness | Relative Costs/ Capital Requirements | Technical Complexity |
|---------------------------------|------------------------------------|---|-----------------------------|
| Sensors | | | |
| Remote | Good | High | High |
| Biological | Good | Low | Low |
| High-Tech | Good | Medium | High |
| Waste Water 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 | | | |
| Deepwell | 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

G. Technical and Other Services

A large share of international exchanges in the environment industry is through technology licensing rather than imports and exports of equipment. Many larger firms which have developed pollution control techniques for their own operations license the technology to other companies for production and sale or for internal use. There is also a large market for the supply of environmental services, which largely involve three main types of activities:

- Technical engineering (such as site assessment, process design, control specifications, project management);
- Environmental consulting (such as impact assessments, environmental audits, environmental monitoring, risk management); and
- Management services (such as financial analyses and database management).

In many developing countries, information on the source, nature, levels, and concentrations of pollution is not available and institutional capabilities to generate such data are weak. The lack of trained personnel, both in the public and private sectors, to conduct required environmental impact assessments, environmental engineering, sampling and laboratory analyses, and so forth, provide opportunities for potential U.S. technology transfer.

In addition, many of the environmental technologies will need to be adapted or developed to meet local conditions and preferences. In most cases, lack of specific know-how mean that training in the administration, operation, and maintenance of the selected environmental technology has to be incorporated in the technology transfer package.

The environmental services industry is dominated by the large engineering firms which provide technical engineering and construction services, many of which have formed special subsidiaries for the environment, supplemented by numerous smaller specialist environmental consultancies. Overall there are an estimated 12,000 consulting and engineering firms in the U.S. environment industry.

V. CONCLUSIONS AND OPTIONS FOR DONOR ASSISTANCE

A. Findings

The information and analysis presented in this report suggests the following findings regarding environmental protection and pollution reduction initiatives:

- There is a clear need for significant increases in transfers of environmental goods, services and technology on a worldwide basis. In the near term, the requirements are greatest in transforming economies in Central and Eastern Europe and in a select number of newly industrializing countries in Asia and Latin America. The quality of air and water in many urban areas in these countries is well below any reasonable standards sufficient to sustain public health and well-being.
- Public awareness of environmental problems and political pressures for changes in laws and regulations is rising rapidly. Some governments are actively putting environmental standards into place, but many are merely offering lip service to the issue and/or do not have the technical capacity, financial resources or political will to take effective, strong actions.
- Private sector manufacturers in developing countries currently have insufficient incentives to invest in pollution abatement equipment, and many are ill prepared to assume the financial burden. Municipalities in transforming and developing countries are struggling to cope with problems associated with accelerating urbanization (e.g., unemployment, shortages of infrastructure, public service requirements, etc.) and have little time or financial resources to deal with pollution control.
- From a strictly economic point of view, environmental protection are often considered a "luxury good" that is affordable only after basic needs are acquired. From a health and standard of living perspective, however, environmental protection is a basic need of equal value to other basic needs.
- Most major donor countries and agencies have initiated programs to address pollution and environmental problems. All of these efforts should be deemed useful in applying resources to serious problems.
- Japan and the European Community have directed considerable amounts of resources to projects and programs that directly benefit their own suppliers of environmental goods and services. By comparison, U.S. programs tend to focus more attention on meeting the direct needs of aid-assisted nations, rather than on assisting U.S. industry to meet those needs.

- AID has become increasingly active in developing and implementing environmental assistance projects and programs. These include the U.S.-AEP, PRIDE, EP3 and the Environmental Enterprises Assistance Fund. Most of these initiatives have been established only recently or are still in the startup process. One could conclude that the environmental issue "is being handled" through these projects. On the other hand, the resources devoted to AID's initiatives are limited, particularly relative to the need and to the scale of other sector activities.
- The most important accomplishment achieved over the past few years is the emergence of a nascent private sector "market" for the international transfer of environmental goods and services. While still in an embryonic stage, this market is witnessing the definition of customer and supplier groups, the formation of broker organizations, and the identification of products and cost structures. As in the past experience in other sectors, over the long run the task of putting into place the equipment and systems to measure, monitor and control pollution will be the responsibility of private enterprise. The key role of governments will be to set and enforce appropriate standards.

B. Options for Donor Assistance

In view of the needs identified -- for all practical purposes an unlimited demand for transfers of environmental technologies, equipment and services -- donor agencies need not be concerned about duplication in the sense that overall "demand" will outstrip any "supply" which will be forthcoming. The challenges yet to be even initially addressed much less effectively met in transforming and developing countries are enormous, and no imaginable level of financial or technical resources applied to these problems will be too high.

Turning back to the "market" perspective pursued throughout this report, the most effective means to tackle the challenges posed by pollution and environmental degradation over the long run will be to overcome market failures or improve market mechanisms that deal with the exchange of environmental goods and services.

Donors have typically approached the problem through traditional perspectives, focusing on interjecting environmental impact assessments of standard projects, providing technical assistance, or funding government-run activities. These initiatives are valuable and should continue and even be expanded.

One can conclude that most donor activities in this area can be characterized as assisting and organizing the "demand side" of the market. That is, donor-funded projects and programs concentrate on increasing the capabilities of locally-based

organizations, both public and private, in assisted countries. These efforts are valuable in stimulating awareness, developing needed information, enhancing technical understanding and institutional capacities, and putting into place appropriate laws and regulations.

Much remains to be done to establish effective demand for environmental goods and services. Ultimately the binding constraint will be the lack of adequate financial resources. Loans and grants extended to private sector groups will therefore need to rise. An important example of useful financing is the \$2.5 million loan provided to Cultural Survival Enterprises in 1991 under the Private Sector Loan Program sponsored by the Investment Office of the Bureau for Private Enterprise. Cultural Survival Enterprises seeks to assist small entrepreneurs to utilize rain forest resources in non-damaging ways. Additional financing "windows" for environmental projects should be actively considered.

In view of the fact that most donor projects focus on the demand side, the major "gap" or functional area that remains to be filled falls on the supply side of the market equation. That is, the actual suppliers of environmental products and technologies are not sufficiently engaged in sales of their output to transforming and developing countries. To be sure, many donor activities involve trade missions and technical assistance from environmental consulting firms, but trade missions have been very limited in number and scope, and technical assistance typically does not directly involve the firms that eventually sell the appropriate equipment and technical processes.

As pointed out in the report, U.S. firms possess a significant comparative advantage in environmental goods and services, but they by no means have a monopoly position in the market. Very often, U.S. pollution control equipment employs "state of the art" technologies, which tend to be more expensive than alternatives that may be more attractive to developing country producers. Therefore, it may be necessary for U.S. suppliers to market "shelf" technologies and processes, or to develop less expensive versions of equipment. In addition, the U.S. market tends to be highly specialized, with systems tailored to the specific needs of customers. In developing countries, mass produced equipment is likely to be more economical.

A number of possible initiatives could actively assist in reducing market imperfections on the supply side. The options described below merit further exploration:

- A number of U.S. environmental business associations have indicated their desire and willingness to collaborate with AID in providing technical assistance overseas and in marketing business opportunities to their members. Key among these associations are the Water Environment Federation, the Air and Waste Management Association, and the National Solid Wastes Management Association. These and other private sector groups offer a fully established institutional structure and business network that can be employed effectively as "supply side" organizing mechanisms. Many associations have committed to provide technical assistance on a "pro bono" basis, and to use their conferences, publications and newsletters to market environmental business opportunities in transforming and developing countries. These organizations could be easily approached by AID to develop active collaborative efforts.
- The lack of financial resources has been and will remain a constraint on both the supply and demand side. On the supply side, it would be helpful for AID to identify and publicize sources of for financial and logistical support from U.S. agencies such as the Trade and Development Program, Eximbank, the Department of Commerce and OPIC.
- Many donors are initiating environmental programs, but market intelligence on these activities is not readily available. The U.S. business community would benefit from up-to-date information on trade and investment opportunities generated by the World Bank, the Asian Development Bank, the Inter-American Development Bank, and even other bilateral donor programs. In addition, market intelligence could also include information on business opportunities arising from the environmental components of major programs such as the Enterprise for the Americas Initiative, or debt-for-environment swaps.
- In an option that involves both supply and demand, AID management could consider adopting an approach in this area similar to that of the Japanese -- a program in which environmental "infrastructure" projects are initially identified by U.S. firms. Once identified, the projects would be vetted according to standard AID processes. If selected, the projects would then be developed by AID and then contracted out through competitive bidding. This type of initiative would offer powerful incentives for U.S. firms to take proactive marketing stances in transforming and developing countries. This marketing in turn could yield new commercial ventures whether or not the specific projects identified are implemented.

- The U.S.-AEP represents an ambitious but appropriate effort to pursue a coordinated approach involving a considerable number of U.S. Government agencies. Recent attempts to develop collaborative trade and investment programs have yielded both successes and disappointments. AID could consider several options for developing innovative linkages with other agencies. These could include AID funding for environmental trade missions administered by the U.S. & Foreign Commercial Service; AID collaboration with OPIC on investment missions; the creation of a TDP-sponsored environmental projects financing "window" for feasibility studies and bidding; or concessional loans extended by Eximbank to finance sales of environmental goods and services.

The challenge creating the need for increased attention and resources to be devoted to environmental protection is a long-term proposition, rather than a transient "fad." There will be no quick fixes.

The ultimate solution to this long-term challenge rests in market mechanisms responding to public choices which are articulated and translated into responsible environmental standards, laws and regulations. Donor agencies such as AID simply do not have the resources necessary to solve environmental problems. Accordingly, the most effective strategy for donors is to assist in the organization of environmental market mechanisms.

APPENDIX A:

U.S. Private and Multi-Sector Industry Association

APPENDIX A
U.S. Private and Multi-Sector Industry Association

I. PRIVATE SECTOR ASSOCIATIONS

A. General

ASAC International

8301 Greensboro Drive, Suite 260
Maclean, VA 22102
Tel: (703) 356-2455
Fax: (703) 356-2488

Association of Environmental Engineering

Department of Civil Engineering
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
Tel: (703) 231 6021

Association for Manufacturing Technology (AMT)

FORMERLY: National Machine Tool Builders' Association
7901 Westpark Drive
Maclean, VA 22102
Tel: (703) 893-2900
Fax: (703) 893-1151

Chemical Manufacturers Association

2501 M Street, NW
Washington D.C. 20037
Tel: (202) 887 1108

Construction Industry Manufacturers Association (CIMA)

111 E. Wisconsin Ave.
Milwaukee, WI 53202
Tel: (414) 272-0943

National Association of Manufacturers (NAM)

1331 Pennsylvania Ave. N.W. Suite 1500
Washington, D.C. 20036
Tel: (202) 637 3000

National Food Processors Association (NFPA)
1401 New York Ave, N.W. 4th Floor
Washington, D.C. 20005
Tel: (202) 639 5900

National Forest Products Association (NFPA)
1250 Connecticut Ave. N.W. Suite 200
Washington, D.C. 20036
Tel: (202) 463 2700

Pharmaceutical Manufacturers Association (PMA)
1100 15th Street, NW
Washington, D.C. 20005
Tel: (202) 835 3400

Valve Manufacturers Association of America (VMA)
1050 17th Street, N.W. Suite 701
Washington, D.C. 20036
Tel: (202) 331 8105

B. Education

Alliance for Environmental Education
2111 Wilson Boulevard
Arlington, VA 22201
Tel: (703) 875 8660

Bank Information Center
2000 P Street, NW, Suite 515
Washington D.C. 20036
Tel: (202) 822 6630

Coolidge Center for Environmental Leadership
1675 Massachusetts Avenue, Suite 4
Cambridge, MA 02138
Tel: (617) 864 5085

Institute for Environmental Education
32000 Chargin Boulevard
Cleveland, OH 44124
Tel: (216) 464 1775

C. Energy

American Gas Association

1515 Wilson Boulevard
Arlington, VA 22209
Tel: (703) 841 8400

American Mining Congress (AMC)

1920 N St. N.W. Suite 300
Washington, D.C. 20036
Tel: (202) 861 2800
Toll-free (800)262-6387

American Petroleum Institute

1220 I. Street, NW
Washington D.C. 20005
Tel: (202) 682 8000

Export Council for Renewable Energy (ECRE)

777 North Capital Street, N.E. Suite 805
Washington, D.C. 20002
Tel: (202) 408-0660

National Coal Association
1130 17th Street, NW
Washington D.C. 20036
Tel: (202) 463 2625

National Electrical Manufacturers Association (NEMA)

2101 L St. N.W.
Washington, D.C. 20037
Tel: (202) 457 8400

Petroleum Equipment Suppliers Association (PESA)

9225 Katy Freeway
Suite 310
Houston, TX 77024
Tel: (713) 932 0168

D. Environmental Quality

Association of Environmental and Resource Economists

1616 P Street, NW
Washington D.C. 20036
Tel: (202) 328 5000

Association for Rational Environmental Alternatives

256 Alpine Road
West Palm Beach, FL 33405
Tel: (407) 585 7841

Center for International Development and Environment

1709 New York Avenue, NW
Washington D.C.
Tel: (202) 462 0900

Coalition on Resource Recovery and the Environment

U.S. Conference of Mayors
1620 I Street, NW, Suite 600
Washington D.C. 2006
Tel: (202) 293 7330

Environmental Action Coalition

625 Broadway, 2/F
New York, NY 10012

Environmental Defense Fund

257 Park Avenue, South
New York, NY 10010
Tel: (212) 505 2100

Environmental Project on Central America

Earth Island Institute
300 Broadway, Suite 28
San Francisco, CA 94133
Tel: (415) 788 3666

International Bio-environmental Foundation

15300 Ventura Boulevard, Suite 405
Sherman Oaks, CA 91405
Tel: (818) 907 5483

International Center for the Solution of Environmental Problems
535 Lovett Boulevard
Houston, TX 77006
Tel: (713) 527 8711

International Ecology Center
1471 Barclay Street
St Paul, MN 55106-1405
Tel: (612) 774 4971

National Environmental Development Association
1440 New York Avenue, NW, Suite 300
Washington D.C. 20005
Tel: (202) 638 1230

Resource Policy Institute
P.O. Box 298
Livingston, KY 40445
Tel: (606) 453 2105

World Environment Center
419 Park Avenue, South, Suite 1404
New York, NY 10016
Tel: (212) 683 4700

E. Pollution Control

Center for Clean Air Policy
444 North Capital Street, NW, Suite 526
Washington D.C. 20001
Tel: (202) 624 7709

Clean Air Working Group
818 Connecticut Avenue, NW, Suite 900
Washington D.C. 20036
Tel: (202) 857 0370

Environmental Industry Council
1825 K Street, NW, Suite 210
Washington D.C. 20006
Tel: (202) 331 7706

Federation of Environmental Technologists

P.O. Box 1513
Milwaukee, WI 53201
Tel: (414) 251 8163

Industrial Gas Cleaning Institute

1707 L Street, NW, Suite 570
Washington D.C. 20036
Tel: (202) 457 0911

Manufacturers of Emission Controls Association

1707 L Street, NW, Suite 570
Washington D.C. 20036
Tel: (202) 296 4797

National Clean Air Coalition

1400 16th Street, NW
Washington D.C. 20036
Tel: (202) 797 5436

National Institute for Chemical Studies

2300 MacCorkle Avenue, SE
Charleston, WV 25304
Tel: (304) 346 6264

Spill Control Association of America, Detroit, MI

400 Renaissance Center, Suite 1900
Detroit, MI 48243
Tel: (313) 567 0500

F. Recycling

Aluminum Recycling Association

1000 16th Street, NW
Washington D.C.
Tel: (202) 785 0951

Automotive Dismantlers and Recyclers AssociationA

10400 Eaton Place, Suite 203
Fairfax, VA 22030-2208
Tel: (703) 385 1001

Institute of Scrap Recycling Industries

1627 K Street, NW, Suite 700

Washington D.C. 20006

Tel: (202) 466 4050

National Association for Plastic Container Recovery

4828 Parkway Plaza Boulevard, Suite 260

Charlotte, NC 28217

Tel: (704) 357 3250

National Recycling Coalition

1101 30th Street, NW

Washington D.C. 20007

Tel: (202) 625 6406

Steel Can Recycling Institute

Foster Plaza X

680 Anderson Drive

Pittsburgh, PA 15220

G. Water Management

American Water Works Association

6666 West Quincy Avenue

Denver, CO 80235

Tel: (303) 794 7711

Clean Harbors Cooperative

P.O. Box 1375

1200 State Street

Perth Amboy, NJ 08862

Tel: (201) 738 2438

Industrial Water Conditioning Institute

One James Center, 6/F

Richmond, VA 23219

Tel: (804) 775 1005

National Association of Water Companies

1725 K Street, NW, Suite 1212

Washington D.C. 20006

Tel: (202) 833 8383

National Water Alliance
1225 I Street, NW, Suite 300
Washington D.C. 20005
Tel: (202) 646 0917

Water and Wastewater Equipment Manufacturers Association
P.O. Box 17402
Dulles International Airport
Washington D.C. 20041
Tel: (703) 661 8011

Water Pollution Control Federation
601 Wythe Street
Alexandria, VA 22314-1994
Tel: (703) 684 2400

Water Quality Association
4151 Naperville Road
Lisle, IL 60532
Tel: (312) 505 0160

H. Waste Management

Air and Waste Management Association
Three Gateway Center, Four West
Pittsburgh, PA 15222
Tel: (412) 232 3444

American Coal Ash Association,
1000 16th Street, NW, Suite 507
Washington D.C. 20036
Tel: (202) 659 2303

Center for Hazardous Materials Research
320 William Pitt Way
University of Pittsburgh Applied Research Center
Pittsburgh, PA 15238
Tel: (412) 826 5320

Coalition for Responsible Waste Incineration
1330 Connecticut Avenue, NW, Suite 300
Washington D.C. 20036
Tel: (202) 659 0060

Council on Plastics and Packaging in the Environment

1275 K Street, NW, Suite 900

Washington D.C. 20005

Tel: (202) 789 1310

Governmental Refuse Collection and Disposal Association

8750 Georgia Avenue, Suite 123

P.O. Box 7219

Silver Spring, MD 20910

Tel: (301) 585 2898

Hazardous Materials Control Research Institute

9300 Columbia Boulevard

Silver Spring, MD 20910

Tel: (301) 587 9390

Hazardous Waste Federation

c/o New Mexico Hazardous Waste Management Society

Division 3314

P.O. Box 5800

Albuquerque, NM 87185

Tel: (505) 846 2655

Hazardous Waste Treatment Council

1440 New York Avenue, NW, Suite 310

Washington D.C. 20005

Tel: (202) 783 0870

National Resource Recovery Association

1620 I Street, NW

Washington D.C. 20006

Tel: (202) 293 7330

National Solid Wastes Management Association

1730 Rhode Island Avenue, NW, Suite 1000

Washington D.C. 20036

Tel: (202) 659 4613

Portable Sanitation Association International

7800 Metro Parkway, Suite 104

Bloomington, MN 55425

Tel: (612) 854 8300

Secondary Lead Smelters Association

6000 Lake Forrest Drive, Suite 350

Atlanta, GA 30328

Tel: (404) 257 9634

Underground Injection Practices Council

525 Central Park Drive, Suite 304

Oklahoma City, OK 73105

Tel: (405) 525 6146

II. Multi-Sector Promotional Organizations

IESC Trade and Investment Services

8 Stamford Forum 7th Floor

P.O. Box 10005

Stamford, CT 06904-2005

Tel: (203) 967 6000

Fax: (203) 324-3531

National Federation of Exporting Association

4865 Cordell Avenue

Bethesda, MD

Tel: (301) 907 8647

U.S. ASEAN Council for Business and Technology (USAC)

Environmental Markets trade & Investment Promotion Project

1400 L Street, NW, Suite 650

Washington D.C. 20005

Tel: (202) 289 0519

U.S. Chamber of Commerce

1615 H Street N.W.

Washington, D.C. 20036

Tel: (202) 463 5460