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U.S. Competitiveness in the Global Environmental Technology and Services Industry

Environmental management is rapidly becoming an important worldwide industry in which the United States has developed strong global competitive advantages. Currently, environmental-protection equipment is one industry in which the United States has attained a positive balance of trade by exporting far more than it imports. This industry will become more important in the future because the global market for environmental technology and services will continue to expand rapidly over the next decade. The Organization for Economic Cooperation and Development (OECD) estimated that the worldwide market for environmental equipment and services reached more than \$200 billion in 1990 and could increase to about \$300 billion by the year 2000.¹ International Finance Corporation projections indicate that the global market for environmental equipment and services — only one segment of the environmental management market — could grow from \$300 billion to \$600 billion by end of the 1990s if current demand accelerates and governments around the world adopt and enforce more stringent environmental-protection regulations.²

Although the United States claims a strong position in the global environmental market, the competitiveness of U.S. environmental goods and

services industry is beginning to weaken in some regions. Noting that competition — especially from Japanese, German and other European companies — has become more fierce in recent years, the U.S. Congressional Office of Technology Assessment (OTA) reports that “the U.S. environmental industry’s overall international performance is mixed. In many foreign markets, U.S. firms remain competitive but not dominant; in other areas, the U.S. position has eroded.”³ The competitive position of U.S. firms has become weaker, for example, in the environmentally related capital goods and physical-infrastructure segments in Asia and the Pacific Rim, one of the world’s fastest growing markets. At the same time, Japanese and European firms are beginning to penetrate the United States market. The OTA notes that foreign-owned companies now are the ten largest manufacturers of wastewater treatment equipment in the United States.

To maintain and increase their competitiveness, United States companies must learn how to explore foreign-market opportunities and to follow through with market leads more effectively. Matching global-market potential with the competitive advantages of U.S. companies, however, will require coherent and systematic efforts by entrepreneurial

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firms, federal and state governments, foreign trade and investment organizations as well as industry associations to more actively promote business linkages between U.S. companies and users of environmental technology and services abroad. U.S. technology for water supply, wastewater treatment, and solid and hazardous waste disposal, for example, is as good as or better than Japanese, German, British, or French technology. Often the major problem with U.S. technology is that it may be too advanced or too costly for many foreign customers, especially in developing and emerging market countries where the demand is growing rapidly. U.S. companies must become more concerned with *adapting* U.S. technology to local needs and financial capabilities in developing and emerging market countries.

Most small- and medium-sized U.S. environmental firms do not know how to compete in foreign markets. New efforts at information dissemination, training, institutional development and facilitation of business transactions must be made to help U.S. environmental companies enter and compete effectively abroad. Small- and medium-sized companies, especially, require assistance in (1) identifying new markets, (2) assessing market segments in which U.S. technology is competitive, (3) making effective contacts with government and private-sector purchasers and distributors of environmental technology and equipment, (4) selecting appropriate and effective foreign trade and investment entry channels, (5) adapting technology, equipment, and services to foreign market requirements, and (6) staying abreast of new and emerging market opportunities.

This article explores the worldwide demand for environmental technology, equipment, and services and for U.S.-made environmental goods and services; examines the factors driving global demand in the industry; describes the factors that could inhibit U.S. competitiveness in the future; and outlines ways in which the U.S. government is trying to assist U.S. firms to become more competitive in exports, foreign-direct investment and participation in environmentally related infrastructure projects overseas

and the other actions that are needed to improve U.S. competitiveness in the future.

Demand for Environmental Technology, Equipment, and Services

Although by estimates the market for environmental technology, equipment, and services is growing worldwide, the size of the market has never been accurately measured. Three obstacles remain to measuring global demand. One is that the environmental goods-and-services industry remains ill-defined both in the United States and in other countries. Another is that, lacking a well-defined structure for the industry, reports on production and sales are scattered over standard industrial codes (SIC) and are hidden among industries that are more encompassing. The third is that all estimates of future demand rely on economic growth and social development projections that are difficult to make and inevitably imprecise.

Estimates of Worldwide Demand

Although rough estimates by the OECD placed the size of the global market for environmental goods and services in 1990 at about \$200 billion, this underestimates true demand because the OECD limited its studies to waste treatment/management, air-quality control and similar equipment. It also did not take into consideration the wide range of energy equipment, many types of environmental services and physical infrastructure related to environmental health/safety. Important environmental industry segments include not only equipment for air-pollution control, water treatment, water supply, sanitation, trash disposal and waste recycling but also systems for hazardous waste treatment and disposal, clean-energy provision/distribution, and environmental-consultancy services for the public and private sectors. An emerging but not yet well-

defined segment of the market (clean manufacturing and processing technology that prevents environmental degradation rather than relying on end-of-pipe environmental controls) is usually excluded from estimates of demand for environmental products.

Neither is the "energy-efficiency" industry, which includes makers of environmentally effective windows, lighting products, motors and appliances, nor energy-service companies included in estimates of worldwide markets for environmental goods and services. Energy-efficiency equipment is a least-cost alternative to building new and very expensive energy-generation capacity; it therefore contributes to environmental protection both by lowering energy use and by reducing the need for new fossil-fuel-burning generation plants. The International Institute for Energy Conservation notes that "based on available data from a variety of sources, the estimated global market for energy-efficiency products and services currently totals \$84 billion per year," but that such products are not included in trade statistics as environmental products.⁴

The accuracy of the International Finance Corporation's estimate that the environmental goods and services market could grow to from \$300 billion to \$600 billion by the turn of the century depends on how seriously governments around the world develop and enforce effective environmental regulations, a factor that will depend in turn on progress toward worldwide economic growth and increases in per-capita incomes. Experts estimated the market for environmental goods and services in Western Europe at \$94 billion in 1992 and growing at about 7 percent a year.⁵

Central and Eastern Europe promise substantial markets in the future as former socialist countries are forced to deal with more than forty years of extensive and unattended air and water pollution as well as new requirements for hazardous-waste disposal and cleanup. Poland's Central Statistical Office, for example, estimates the cost of cleaning up the country's environmental problems at \$20 billion to 100 billion.⁶ Industry analysts claim that the Latin American market for environmental goods

and services could exceed \$10 billion by the end of the 1990s. Brazil, Argentina, and Chile now absorb about \$2 billion worth of environmental products; and the market is estimated to be growing by 25 percent to 30 percent a year.⁷ Mexico purchases more than \$1 billion worth of environmental goods and services a year, and the market is likely to increase to \$3 billion annually by the end of this decade.⁸

All estimates agree that the fastest growing market for environmental goods and services during the next decade will be in the Asian Pacific Rim countries. Some industry associations estimate the current market for environmental goods and services in Asia at about \$31 billion and predict that regional demand will grow by 16 percent to 35 percent a year.⁹ Clearly, the potential market for environmental-management equipment and services in Asia is even larger if one takes into consideration the development of environmentally related infrastructure.¹⁰ Hong Kong, Taiwan, Singapore, and South Korea are large buyers of environmental goods and services, as increasingly are Thailand, Indonesia, and Malaysia. China, Vietnam, and the Philippines are likely to offer new opportunities as their economies develop. China announced in 1993 a major effort to clean up its environmental problems, reduce energy consumption and air pollution, create a stronger environmental legal framework, and reduce sulfur dioxide emissions. China budgeted nearly \$14 billion for environmental spending for the 1990-1995 period and is seeking foreign assistance in environmental management.¹¹ The official plans of Hong Kong, Taiwan, and South Korea were to spend more than \$5 billion on waste disposal during the first half of the 1990s. Equipment suppliers for incinerators, emission-control technology, furnaces, and waste-to-energy power generation systems as well as for garbage collection trucks and refuse transfer stations, along with companies specializing in landfill construction and operation, could all participate in the growing waste disposal industry in Asia.

Thailand offers one of the potentially fastest growing new markets for multinational companies.¹² Currently, the market for pollution-

control equipment alone in Thailand is estimated at more than \$210 million a year and is expected to grow by 20 percent to 25 percent annually until the year 2000, when spending in this segment of the industry is likely to reach \$1.5 billion. Moreover, the government of Thailand, recognizing the adverse impacts that environmental pollution, hazardous-waste problems and environmental degradation are having on the Thai economy and on the health of the Thai people, is committed to heavy investment in environmental-protection facilities. Thai officials estimate the demand for all types of environmental technology and services at nearly \$10 billion during the next decade. This includes \$3 billion for energy-efficient products, \$2 billion each for municipal water supply and vehicle-air-pollution equipment and more than \$2.5 billion for municipal and industrial wastewater-treatment facilities, industrial air pollution and solid and hazardous waste disposal.¹³

Thus, despite problems of identifying precisely the scope and size of the industry and of measuring accurately the size of the market for environmental goods and services, substantial evidence supports the claim that global demand is large and growing rapidly.

Demand for U.S. Environmental Technology and Services

The environmental industry in the United States has developed a strong, competitive position, the U.S. Office of Technology Assessment reports, because it has been able to establish itself in a large domestic market. It has a head start in developing products that meet the toughest environmental standards and a high level of technical capability and research and development capacity in the industry.¹⁴ The same research and development has been supported by federal and state governments, universities and the entrepreneurial efforts of many small, innovative firms.

Market studies show that the United States has become a major exporter of environmental-protection technology — especially of air and water

pollution control and cleanup equipment. The most recent estimates by the U.S. Department of Commerce indicate that U.S. exports of environmental-protection equipment grew from \$975 million in 1989 to \$1.7 billion in 1991. It yielded a positive trade balance that grew from \$565 million to \$1.1 billion over the three-year period.¹⁵ Although they still remain a relatively small portion of total U.S. exports, the U.S. Environmental Protection Agency (EPA) reports that U.S. exports of environmental-protection equipment grew substantially during the 1980s, and totaled more than \$9.5 billion between 1980 and 1991.¹⁶ In 1990, the volume of exports in environmental-protection equipment was comparable to that of machine tools, book publishing, fabricated textile products or the sporting- and athletic-goods industries. However, neither the Department of Commerce nor the EPA offers information on other components of the environmental-management industry (such as equipment and devices that prevent pollution rather than control it), environmental-management services or about foreign-direct investment by U.S. environmental firms in foreign countries.

The information that is available indicates that, since 1980, Canada has been the single largest importer of U.S.-made air- and water-pollution-control equipment. France, Germany and the United Kingdom also imported significant amounts.¹⁷ In recent years, however, Japan, Mexico, South Korea and the People's Republic of China have purchased larger amounts of air and water pollution equipment as well as, presumably, other environmental products and services. The government of China has estimated that it will need to spend about \$35 billion to fit old Chinese factories, which are major producers of greenhouse gases, with air-pollution-control equipment.¹⁸ In Latin America, the U.S. Overseas Private Investment Corporation (OPIC) has offered about \$1.7 billion in financing and insurance for U.S. environmental companies to export or invest.¹⁹ OPIC saw the potential for substantial growth in exports of U.S. environmental goods and services in Central and Eastern Europe. It has committed \$1.2 billion in financing and insurance to U.S. compa-

nies involved in projects in Poland, Hungary and the Czech Republic and is reviewing projects worth more than \$6 billion in the Czech Republic and Slovakia.²⁰

Market Drivers for Environmental Technology and Services

Despite its comparative advantages in some segments of the market, the global competitiveness of the U.S. environmental industry in the future will depend on the continued strength of forces driving worldwide demand for environmental goods and services. These include the following:

Continued Growth of World Trade and Investment

Important factors driving the market for environmental equipment and services have been the opening of world trade in new areas with environmental problems as well as trade and investment policies that allow U.S. companies to take advantage of growing foreign demand. The opening over the past decade of many developing and emerging market countries in Asia, Latin America and Eastern Europe to trade and foreign investment has created new opportunities for U.S. environmental firms. In formerly socialist countries such as Poland, Hungary, the Czech and Slovak Republics, and China, demand is driven as well by the privatization of their infrastructure development, equipment companies, and energy industries. Continued expansion of world trade and investment will allow the U.S. environmental-goods-and-services industry to internationalize through acquiring foreign firms, licensing to and from abroad, and attaining greater access to government procurement and contracting opportunities.²¹

The new World Trade Organization that is scheduled to replace the General Agreement on Tariffs and Trade (GATT) in 1995 will have an

environmental-affairs committee that focuses attention on environmental-trade matters. The approval of the North American Free Trade Agreement (NAFTA) has focused U.S. and Mexican leaders' attention on environmental hazards along the border and within Mexico. It will also: give Mexican companies increased access to international capital to purchase pollution control equipment; require the United States and Mexico to commit hundreds of millions of dollars to the U.S.-Mexico Integrated Border Environmental Plan; attract new private capital and World Bank funding for environmental projects in Mexico. NAFTA's lower tariffs and freer trade conditions will increase the ability of U.S. companies to penetrate Mexican markets with environmental products and services.²²

Increasing Public Awareness and Concern for Environmental Hazards

In much of the rest of the world, as in North America and Europe, public demand for environmental protection increases with growing public awareness and concern about environmental hazards.²³ Public concern about environmental protection increases with expanding public awareness of the adverse health impacts of environmental degradation and pollution. This concern also rises with improved technical capability to detect toxic substances in the environment at lower concentrations. Demand for enforcing more stringent environmental regulations is enhanced by growing public fear and resistance to accepting involuntary environmental risks as well as by more public emphasis on industrial responsibility for the health and environmental impacts of its operations and products. These are two trends that are becoming stronger in Europe, North America, and Japan. As public awareness and concern for environmental hazards spreads in countries with rising per-capita incomes and growing middle classes, such as Japan, Korea, Taiwan, and Singapore, public demand for environmental protection increases.²⁴

Enactment and Enforcement of Environmental Regulations

Experience in North America and Europe suggests that the single strongest factor affecting demand for environmental management is enactment and effective enforcement of environmental-protection laws and policies. Improvements in environmental protection require, at a minimum, effective and appropriate environmental-protection laws and regulations as well as institutional structures that can monitor and assess environmental conditions and enforce those environmental-protection regulations. Effective laws and institutions for environmental management depend on political will to enact and enforce environmental-protection laws. This depends, in turn, on public perceptions about the need for stronger environmental policy.²⁵ In China, new environmental-protection regulations are being adopted because of increasing evidence that pollution and environmental degradation are imposing economic losses. The government estimates that \$11 billion a year in economic losses — nearly 7 percent of China's gross domestic product — can be attributed to the effects of environmentally related illnesses and diseases, tainted water, and destruction of fisheries, forests, and crops.²⁶ Enforcement of China's regulations to clean up polluting industries could generate a \$23 billion market for pollution-control equipment over the next decade. In Chile, regulations adopted by presidential decree and new environmental-protection laws under consideration by the Chilean Congress are likewise creating substantial markets for: pollution control and abatement equipment; solid and hazardous waste management; air, water, and waste cleanup projects.²⁷

Acceptance of Market-Oriented Approaches to Environmental Management

In the United States and Western Europe, the trend toward market-oriented approaches is emerging from the realization that regulation and control

alone are insufficient for effective environmental management. Regulation requires stringent monitoring and assessment, which is difficult to achieve even in Western industrial countries. Regulations are often more difficult to implement and enforce in many developing and emerging market countries, especially where corruption undermines the process. Moreover, responsibilities for implementation are usually fragmented among a wide variety of government agencies. More importantly, a purely regulatory approach simply reinforces an adversary relationship between government and business.

A market-oriented approach, on the other hand, emphasizes a combination of policies that: internalizes the costs of pollution; relies on interventions that do not depend primarily on enforcement of regulations/controls; and creates value for the private sector in environmental protection and cleanup.²⁸ Such an approach uses a judicious combination of regulation and incentives. It focuses on the use of such market-based instruments as: polluters-pay programs; emissions-permit trading; location incentives and fees; development of industrial estates with adequate environmental infrastructure; advertising and persuasion; property rights as a conservation and protection device; commercialization of environmental services (especially waste disposal, water supply, and sanitation).

Western European countries are increasingly adopting such market-oriented measures as charges on packaging to promote recycling and reduce the solid-waste stream. Denmark has adopted charges on glass and plastic beverage containers, metal beverage cans, cardboard and laminated beverage packaging and liquid-dairy-products containers. Belgium places charges on packaging waste and Sweden, on returnable glass and aluminum beverage containers. Australia, Canada, Germany, and the United States have turned to tradeable permit systems to reduce air pollution and water pollution.²⁹ In its unified investment code, Tunisia is providing financial incentives to new investors for environmental cleanup, use of air- and water-pollution-protection equipment and treatment/recycling of waste products.³⁰ Market-oriented policies are likely to attract more

households and businesses to adopt environmentally friendly practices and to seek new environmental technology and services.

Pressures and Incentives from International Development Agencies

The demand for environmental technology, equipment, and services is also being driven by pressures of international-funding institutions (e.g., the United Nations and the World Bank with its regional counterparts — such as the Asian Development Bank and the European Bank for Reconstruction and Development) on national governments to give environmental protection and cleanup a higher priority for investment. These pressures are accompanied by larger numbers of loans for environmental projects that require new technology and equipment. In 1994, the United States and other industrial countries pledged more than \$2 billion in contributions to the Global Environmental Facility (GEF) to finance environmental projects in developing countries that were identified at the United Nations 1992 Earth Summit.³¹ The GEF will focus on reducing environmental problems that produce (1) climate change, (2) the destruction of biodiversity, (3) pollution of international waters, and (4) ozone depletion.³²

Furthermore, between 1989 and 1992, the World Bank made nearly \$1.5 billion in loans to developing countries for environmental cleanup, industrial-pollution control, water-supply and sewage systems, waste disposal, and energy-resource management.³³ In 1993, it added nearly \$1.3 billion in loan commitments to Brazil, China, India, South Korea, Mexico and Turkey for similar projects. From 1989 to 1993, it made another nearly \$2 billion in loans for natural-resource management in developing countries that will also spur demand for environmental technology, equipment, and services.

The World Bank's pressures on governments of developing countries to promote environmentally sustainable development expand the market for

environmental goods and services. In addition, the Bank's requirements that environmental impact assessments be done on its own development projects also have made, as one group of analysts concludes, "... a start in incorporating environmental concerns into project design — potentially affecting an annual pipeline of more than 200 investment projects worth over \$11 billion."³⁴ More environmentally sustainable development projects are likely to increase demand for equipment to prevent pollution and clean up hazardous conditions.

Spread of the Industrial Ecology Movement

The demand for environmental-technology equipment and services is also being driven by the industrial ecology movement.³⁵ The willingness of manufacturing and processing industries to comply with environmental laws and regulations and to adjust their business practices depends on making business leaders aware of the impacts of environmental degradation on their operations and profits. The major trends that are likely to contribute to greater private-sector responsiveness to environmental policy include growing public demands for businesses to take responsibility for their environmental impacts; the growing realization among business leaders that their environmental practices and their environmental image will affect their companies' profitability; and the increasing costs of not complying with environmental regulations.³⁶ The private sector responds more effectively to environmental regulations as it incurs legal and financial liabilities for environmental hazards, and insurers, financial institutions, and shareholders become increasingly sensitive to company environmental practices. Industrial firms also become more sensitive to environmental issues as they incur increasing costs of end-of-pipe pollution control and waste disposal.

The growing awareness of the potential savings from pollution prevention rather than cleanup through in-process changes in manufacturing and distribution are leading an increasing number of

manufacturing companies to address environmental problems more directly. A primary incentive is the potential for companies to save money by building environmental considerations into their production, distribution, and processing systems to prevent pollution rather than attempting to control end-of-pipe emissions or end-of-distribution wastes. Faced with increasing public hostility to their factories and increasing threats of legal liabilities, the chemical industries in most industrial countries have adopted the principles of the Chemical Industries Association's "responsible care" program.³⁷ Large multinational companies such as Volvo, Allied-Signal, 3M and Union Carbide have adopted environmental auditing programs in their worldwide operations to maintain central control over their companies' compliance with regulatory standards in the countries in which they have manufacturing plants. Many multinational companies — such as IBM's subsidiaries in Argentina and Chevron's in Nigeria — have devised their own safe hazardous-waste-disposal arrangements in countries lacking adequate facilities.³⁸

The leading companies in the industrial ecology movement — including McDonald's, Kodak, and AT&T — are examining ways of creating an "environmental value chain" that includes: (1) source reduction of environmentally sensitive inputs and use of recycled materials; (2) "cradle-to-grave" product design to eliminate waste in production and at the end of product-life; (3) emission and waste reduction in manufacturing; (4) volume reduction and recyclability in packaging; (5) green labeling and product marketing; (6) consumer education and environmental advertising; (7) collection of used or replaced products; and (8) post-use product recycling.³⁹ The spread of the industrial-ecology movement is likely to expand the market for environmental goods and services among private firms and generate new environmental products as multinational and domestic companies test innovative ways to prevent and control pollution.

Increasing Interest in Public-Private Partnerships

The movement toward the use of public-private partnerships will change the way in which governments expand environmental services, and finance and operate large-scale environmental infrastructure and service facilities. Governments in Europe, Asia and Latin America are involving non-government organizations (NGOs), not-for-profit organizations, and private businesses as partners in a variety of environmental services. These include water provision, sanitation, garbage/trash collection and energy generation/distribution. Build-operate-transfer (BOTs) and build-operate-own (BOO) arrangements between government and private consortia are now being widely used to expand infrastructure and facilities for water supply and energy provision. Malaysia, for example, has made use of BOTs for privatizing water supply in its Labuan, Ipoh, and Larut-Matang projects.⁴⁰

Increasingly, governments are looking to the privatization of services, including environmental services, as an important instrument of public policy. Privatization includes a whole range of alternatives — from sale of state enterprises to concession arrangements with private companies and from management contracts providing public services to deregulation of service industries.⁴¹ Contracting and concessions are increasingly being used for water supply, sanitation, recycling, environmental monitoring and assessment, and energy generation/distribution in such countries as Chile, Guinea-Bissau and the Cote'd'Ivoire.⁴² The increasing use of both privatization and public-private partnerships for providing environmental infrastructure and services will open more opportunities for both the public and private sectors to acquire environmental technology and equipment and for U.S. companies to supply them.

Forces Inhibiting U.S. Competitiveness in Global Markets

The U.S. environmental industry's competitive advantages could easily be diminished over the next decade unless it recognizes and corrects its potential weaknesses in an expanded world market. The Office of Technology Assessment identified a long list of weakness that could undermine the U.S. competitive position in environmental markets, including (1) U.S. companies' reluctance to export because of their large domestic market; (2) overseas perceptions that U.S. technology is too expensive or sophisticated; (3) weak public-private links in research and development and in export promotion; (4) slow transfer of technology to the marketplace; (5) limited efforts to understand foreign cultures and business practices; and (6) the limited role of environmental-industry associations in trade and research and development.⁴³

The most crucial obstacle to stronger competitiveness seems to be the reluctance of U.S. companies to explore foreign-market opportunities and to follow through with market leads. Aside from a few large U.S.-based multinational engineering, construction and waste-collection companies, many small- and medium-sized U.S. environmental firms do not know how to compete effectively in foreign markets. In many developing and emerging market economies, for example, small U.S. companies do not have access to information about market opportunities until project plans are well under way or tenders are actually let, which in nearly all cases is too late for a U.S. company to respond effectively. The U.S. Congressional Office of Technology Assessment concluded that U.S. government and private organizations are behind their competitors in Europe in providing specific market information and leads to potential foreign customers and that the programs that do exist "are often less ambitious than programs in competitor countries."⁴⁴

U.S. companies often do not have the same networks of contacts as do their European and

Japanese competitors in the appropriate ministries (or with local companies that do have such contacts) to be able to get the information and establish themselves as serious contenders for contracts on large environmental infrastructure projects. Many small- and medium-sized U.S. environmental companies do not have local offices, branches, or agents who can develop, over a long period of time, relationships with the influential people in the ministries or agencies who will review and decide on contract proposals.

Even when U.S. companies do venture abroad, they often do not receive the same level of support from the U.S. government that foreign competitors receive through their governments in (1) facilitating trade missions, (2) providing information, (3) assigning embassy staff to companies to "walk them through" the marketing and bidding process, (4) tying aid grants to U.S. procurement, and (5) restricting the use of U.S. loans or grants to specific types of projects in which U.S. companies would have competitive advantages. The U.S. General Accounting Office reports that the number of foreign commercial service officers in U.S. Embassies abroad and the amount of money in relation to gross domestic product spent on commercial-service staffing is far less than that of France, Germany, Italy, the United Kingdom, and Japan.⁴⁵ The British, French, and Japanese governments often give preference on each large contract to one or two of their companies and then work with that company to win its bids. The U.S. government, on the other hand, often keeps an "arms length" relationship with American companies and rarely promotes "national champions."

Finally, U.S. companies often do not understand the subtleties of the political situation in foreign countries or the way to work the political system in order to get a competitive edge. Moreover, U.S. companies' competitors are not constrained by the U.S. Foreign Corrupt Practices Act, which prohibits U.S. companies from making payments to foreign government officials in return for favorable consideration on contracts. Japanese companies, on the other hand, are often able to provide gifts to gov-

ernment officials in the forms of trips abroad, overseas "training," or assistance to their families in getting jobs or higher education.

Improving Competitiveness: Government Support for Environmental Exports and Investment

In order to overcome some of the obstacles to competitiveness of U.S. firms in the global environmental technology, equipment and services industry, the U.S. government is seeking to provide greater assistance and support for exporting, forming joint ventures, and participating in environmental-infrastructure projects abroad. In 1994, the Clinton administration announced the Technology for a Sustainable Future Program that will promote the export of U.S. environmental and energy technologies.⁴⁶ The program seeks to help U.S. companies compete in international markets more effectively by: (1) facilitating innovation and technological development; (2) encouraging new approaches to environmental protection through regulatory policy, market stimulation, and fiscal policy in other countries; (3) supporting companies exporting U.S. environmental technologies; (4) working with domestic and foreign organizations through partnerships and collaboration on environmental education, training, and information dissemination. Technology development and dissemination will focus on remediation and restoration of environmental resources, environmental pollution control, environmental monitoring/assessment and avoidance of environmental hazards and degradation.

The administration's program will supplement and help coordinate government efforts in providing four existing types of support: (1) information services, (2) export support, (3) financial assistance for pre-feasibility analyses, and (4) loan guarantees and concessionary lending.⁴⁷

Information Services and Technical Assistance

A large number of U.S. government agencies are now providing information and technical assistance to U.S. environmental companies interested in foreign trade and investment.

Trade Leads and Business Information.

U.S. companies can obtain trade leads and information on potential environmental business opportunities, including infrastructure development, from the U.S. Department of Commerce (DOC), the State Department, and the Departments of Agriculture, Labor, and Energy as well as from the Overseas Private Investment Corporation (OPIC) and the U.S.-Asia Environmental Program (US-AEP). The US-AEP, for example, assists U.S. companies to identify the markets in Asia for environmental products and services in solid- and toxic-waste disposal, industrial and transportation pollution, water and wastewater treatment, energy efficiency, and forestry. US-AEP has initiated an information service through its network of business representatives in Asia, an information clearinghouse in Washington, and a trade-leads system that informs U.S. companies of business opportunities for environmental infrastructure and services in Asia. It provides companies with advanced notice of opportunities for infrastructure projects, assistance in identifying and obtaining financing from public and private sources, and access to U.S. government-assistance programs.

Export Counseling and Services. EPA assists foreign governments in developing sound environmental policies and in solving environmental problems in order to create more demand for U.S. environmental exports. In addition, EPA promotes the adoption and sale of U.S. environmental technologies that can be part of infrastructure systems in foreign countries. The Export-Import Bank of the United States and the U.S. Trade and Development Program (TDP) provide export counseling services. The U.S. Agency for International Development (AID) has created a Center for Trade and Investment Services (CTIS) that provides individual

counseling and information to companies interested in environmental, energy, and other types of projects that are supported by the foreign-aid program in developing countries. The U.S. Small Business Administration also offers advice to small companies on the legal aspects of exporting technology, equipment, or other goods abroad.

The U.S. Department of Commerce, through its International Trade Administration (ITA) is now helping U.S. environmental firms to obtain the assistance they need to compete for large infrastructure projects outside the United States. ITA identifies and provides information about proposed or scheduled infrastructure projects, offers individual business counseling, and monitors developments in specific sectors.

Support for Export of U.S. Goods and Services

Other forms of support are also available to U.S. companies interested in following up on trade and investment opportunities.

Assessment of Foreign Business Conditions. The U.S. Department of Energy helps energy sector exporters to identify overseas opportunities and discriminatory trade barriers, to identify financing alternatives, and to work with U.S. government agencies to find markets for energy technology and equipment. DOC and OPIC both support overseas trade missions that can help U.S. companies to understand foreign business conditions, tariff and non-tariff barriers, and opportunities for participating in infrastructure-development projects or for transferring environmental technology and equipment that can be used in infrastructure systems. U.S. contractors and exporters seeking to expand their activities in developing countries can obtain political-risk insurance and other forms of specialized insurance and financing services from OPIC.

Coordination of Assistance Resources. US-AEP follows up on specific environmental-infrastructure projects and coordinates the appropriate U.S. government technical and financial re-

sources that are available to help U.S. environmental companies penetrate markets in Asia. AID's commodity import program and its project-procurement activities can open new opportunities for companies interested in participating in infrastructure projects in developing countries.

Pre-feasibility Analysis Assistance

Several U.S. government agencies also assist foreign governments and private organizations to assess the feasibility of proposed infrastructure-development projects using U.S. consulting and service firms.

Financial Assistance for Pre-feasibility Studies. To countries eligible for U.S. bilateral assistance, TDP provides non-reimbursable grant funding for studies and consultancies to determine the technical, economic, and financial feasibility of projects in which U.S. technological expertise can help to accelerate the development process. The grants focus on a wide range of environmental infrastructure including energy, water supply, and waste-management systems. TDP sends U.S. technical specialists to developing countries to gather information on the proposed project, to work with local authorities to create the scope of work and budget for the feasibility study or consultancy, and to make recommendations concerning TDP support for the study. The host country's grant-recipient organization (a public agency or private sector organization) selects the U.S. firm to conduct the study under approved competitive bidding procedures. TDP pays grantee-approved invoices for the expenses of the feasibility study directly to the contractor. Up to 20 percent of the grant can be used to enlist the participation of the host country's private-sector expertise to work with the U.S. contractor, a provision that encourages joint venture cooperation.

OPIC and the US-AEP jointly operate the Environmental Enterprises Development Initiative (EEDI), which provides pre-investment assistance to U.S. companies that are establishing or expanding environmental infrastructure projects in Asian and Pacific countries. EEDI offers assistance to private-

sector companies that are at least 25 percent U.S.-owned and whose activities in Asia do not result in diversion of U.S. jobs or negative environmental impacts in the host country. The activities eligible for funding include market-entry assessments, investor reviews, business plans, technology reviews, prototype or pilot-project implementation, and other types of pre-investment analysis.

Cost-Sharing of Feasibility Analyses. TDP can also share the costs of feasibility studies undertaken by U.S. private-sector investors or suppliers that are proposing to develop a project on an unsolicited "sole source" basis.⁴⁸ It also maintains technical-assistance trust funds to finance consultancies and feasibility studies by U.S. consulting firms through the World Bank and the International Finance Corporation for a variety of project-preparation activities. The U.S. Export-Import Bank also funds feasibility studies in conjunction with its insurance programs, loan guarantees, and exporter credits. Fixed-rate, medium-term loans to help finance feasibility studies and pre-construction design and engineering services for up to \$10 million are available through Eximbank's Engineering Multiplier Program, which can be used to cover up to 85 percent of the U.S. costs.

Concessionary Lending and Loan Guarantees

Finally, the U.S. government is encouraging the private sector to participate in environmental and infrastructure projects through concessionary lending and loan guarantees. Eximbank offers financial assistance to promote the exports of U.S. companies with capital equipment or services related to infrastructure-development projects that are normally financed for a period of longer than one year. It will provide credit or guarantees for up to 85 percent of the U.S. export value of each transaction. Repayment terms range from two to ten years. Eximbank assistance comes in the form of direct loans to public or private organizations abroad purchasing U.S. equipment or services, loans to financial inter-

mediaries who re-lend to international buyers, and guarantees to those who lend to foreign buyers. Eximbank also offers loans and guarantees for up to 85 percent of the export value of U.S. companies' operations and maintenance (O&M) contracts. This is an effective means of promoting the participation of U.S. companies with the technical expertise in maintaining environmental infrastructure or in establishing maintenance systems.

US-AEP has also created an Infrastructure Project Promotion Fund to support creative public-private partnerships that will develop new forms of financing arrangements and reduce the risks of U.S. technology transfers in energy and environmental-infrastructure projects. The infrastructure-finance advisory service provides a one-stop clearinghouse for financial advice and assistance to U.S. companies seeking to participate in Asian environmental infrastructure projects. The services are aimed at U.S. equipment manufacturers, contractors, project developers, and service providers that are interested in bidding on public tenders in Asia, developing private build-own-operate or build-operate-transfer projects, or establishing joint ventures.

Conclusions

Although the U.S. government is now doing a lot to help U.S. companies to maintain and strengthen their competitiveness in the global environmental markets, it is far less than what some other countries are doing to support their environmental technology, equipment, and service industries. Other means are needed to expand the participation of U.S. environmental firms in foreign trade and investment. The industry itself and its trade associations must take a stronger role in promoting exports and foreign direct investment. Both government and industry associations must help U.S. companies to get supply contracts for "backward and forward linkage" equipment, technical assistance, or components from Japanese, British, or French companies that are successful in winning large environmental-

infrastructure-project bids in Asia, Eastern Europe, and Africa.

Small- and medium-sized U.S. companies need help in developing effective licensing agreements, manufacturing agreements, or joint ventures with foreign firms that are likely to be subcontractors or suppliers on large environmental-infrastructure projects because of government "local content" or local participation requirements. Consortia or associations of U.S. environmental companies need to develop a long-term presence in the largest overseas markets in order to be able to obtain the information and establish the relationships that are necessary to take advantage of potential export or investment opportunities. Opportunities may exist for larger U.S. companies to establish export trading companies to expand the exports of small environmental technology and equipment producers. Although the United States has a technological competitive advantage for many types of air- and water-pollution abatement, monitoring, and cleanup equipment and services, Japanese and European companies are often better organized and, therefore, make larger and faster inroads into the most lucrative markets, especially in Asia and Central and Eastern Europe. Their advantages derive not from the superiority of their products but from:

their ability to exploit market opportunities more effectively than U.S. companies — that is, their ability to seek out and close business transactions more successfully in foreign markets.

Helping the U.S. environmental industry to become more competitive will require careful market analyses that are targeted on specific products. Although "early warning" information now provided by several U.S. government agencies about long-term potential projects will be useful to large U.S. multinationals, many of the small- and medium-sized suppliers will not be able to respond effectively. Most of these companies do not have the financing, trained staff, and marketing network needed to track and prepare for long-term opportunities. There is a real danger that unless promotional activities focus on immediate and specific export, contractual, or investment opportunities, many smaller U.S. environmental companies will not respond. Although the global market for environmental technology, services, and equipment is large and growing, the competitiveness of U.S. companies in the future is not assured unless strong efforts are made jointly by environmental companies, government, and industry associations to pursue worldwide opportunities more vigorously.

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