

Issues and Options | 2

It is increasingly difficult to separate environmental policy issues from those of trade, technology, and competitiveness. It is also becoming harder to consider economic and technology policies without also considering their environmental ramifications.

This is so because:

- Environmental problems became a major policy concern in the United States (and in a few other advanced industrial countries like Japan and Germany) about two decades ago, at a time when many took U.S. industrial supremacy for granted. Since then, a number of events—a slow-down in productivity growth, oil embargoes and energy shocks, and the emergence of Japan as an economic superpower, to name a few—have deepened concerns about U.S. economic competitiveness.
- U.S. industry now competes not only with Japan, Germany, and other Western European countries having comparatively strong environmental regulations, but also with producers in newly industrialized or advanced developing countries. Manufacturers operating in these countries pay lower wages, and usually do not have to meet environmental, health, and safety standards as strict as those in the United States.
- There is a growing sense that economic development in all regions of the world will need to be carried out in ways that produce less harm to the environment (see ch. 3). Some environmental issues (depletion of stratospheric ozone, global warming, loss of biological diversity) are now widely viewed as globally significant problems. Major regional environmental problems (e.g., those in Eastern Europe and the former Soviet Union) have dramatized the serious health and eco-

conomic costs that can result when industry and government pay too little attention to the environment.

Global expenditures to address environmental problems are increasing rapidly, creating new markets for environmental goods, technologies, and services. In the next decade or so, many more countries are likely to begin enforcing environmental standards to a greater extent than before.

These concerns have prompted interest in the commercial implications of environmental policies and the environmental implications of different commercial policies.

Environmental policies and policies to promote competitiveness both aim to influence industrial behavior. Environmental policies often require industries to control their processes and modify products to meet certain standards. Other domestic policies, including technology policies (R&D support, extension services, and tax policies to encourage R&D and capital investment) also influence industrial actions.

The competitiveness of U.S. industry (including the environmental industry) is affected by trade, export promotion, and foreign assistance policies—for example, policies to open foreign markets to U.S. goods and services, to promote U.S. exports, and to link foreign aid to commercial benefits for U.S. firms.

OPTIONS FOR U.S. POLICY

This assessment takes it as a given that U.S. air, water, and waste standards will continue to be among the world's toughest.¹ Within this framework, OTA has examined many options to further two competitiveness objectives:

1. realizing the opportunities for benefit to U.S. business and society from providing environmental technologies to a growing global market; and,

2. reducing adverse competitive impacts faced by U.S. firms in complying with environmental regulations.

Later sections of this chapter discuss six issue areas and related policy options pertinent to these competitiveness concerns. The issue areas are:

- a. Technology and R&D policy;
- b. Diffusion of best practices and technologies to industry;
- c. Regulatory reform and innovation;
- d. Export promotion, development assistance, and environmental fins;
- e. Interactions between trade policy and environmental policy;
- f. Data and information needs for policymakers.

This chapter discusses the pros and cons of over 30 options in these issue areas. The policy tables in the chapter list options for each issue area along with the goals furthered by these options and their likely costs to the Federal Government. All of the options are presented in table 1-4 (in ch. 1).

The options could be adopted either singly or in different packages. Some pertain to one objective only (e.g., development assistance options are limited to environmental technologies and services) while others apply to both (e.g., technology policy, trade, and environment policy).

In many cases, successful implementation of these options will depend on extensive and continuing involvement by industry, environmental organizations, and other affected parties. Outcomes would depend not only on specific packages of options and resources available, but also on strategy, leadership, and continuing commitment to implementation. Two strategies for government action, incremental and aggressive, are discussed below.

¹ This assessment does not examine the interactions between competitiveness and other types of environmental laws and regulations such as those affecting land use, fisheries, and species protection.

ONE: The incremental approach would entail continued implementation of existing policies, with some new emphases:

- Efforts to develop more cost-effective or improved technology for Federal site clean-up, especially Department of Defense and Department of Energy sites, would continue. Cleaner energy technology R&D would continue to be the largest category of environmentally preferable technology supported by the Federal government. Federal programs for other industrially pertinent technologies for pollution control and prevention or cleaner production would continue at recent modest levels of support. Government-industry cost-sharing of cooperative research and development agreements (CRADAs) on environmental matters might increase, subject to budgetary constraints.
- Programs for independent evaluation or verification of the performance of U.S. technologies would be expanded to give more emphasis to prevention and control technologies in addition to the current emphasis on contaminated site remediation. Such information, which is needed for domestic users, could also help foreign consumers select among competing technologies.
- Clearinghouses, trade publications and associations, and State technical services programs would be used to disseminate information about cleaner technology and more cost-effective compliance approaches to small and medium-sized manufacturing firms.
- On the regulatory front, EPA and State regulatory agencies would experiment with incentives for technological innovation and with alternative permitting and compliance procedures, and encourage wider replication of successful approaches.
- Federal export assistance programs would better coordinate services. The U.S. Trade and Development Agency would fund more feasibility studies in developing countries, creating business for U.S. consultants and some follow-on orders for U.S. exporters. Other export

promotion services, including commercial representation abroad, training of foreign nationals in U.S. technologies and approaches, and trade missions, would expand modestly.

- Efforts to develop multilateral guidelines addressing interactions between trade and environmental issues would continue.

TWO: The aggressive approach differs from the incremental approach in strategy, degree of high-level leadership, and level of resources.

- Much effort would be made to integrate environmental and economic issues at a high level within the government. Technology policies, trade policies, and environmental regulations would be developed and implemented with awareness of their interactions and their synergies—positive and negative.
- A major effort would be made to enlist U.S. industry—especially industry sector technology organizations—in cleaner technology development and diffusion. Government would share the cost of R&D, demonstration, and diffusion, and better address regulatory problems for those sectors with high environmental impact or compliance costs.
- Steps would be taken to integrate pollution prevention services with manufacturing modernization services offered at the State level and in new Federal manufacturing extension centers.
- There would be accelerated experimentation with more flexible regulatory approaches that meet environmental requirements. Companies with excellent environmental records might be eligible for expedited whole facility permitting. For example, such companies might be given facility-wide emissions caps and more options to choose among different pollution abatement approaches. Regulations would be made more friendly to environmental technology innovators.
- On the international scene, the United States would signal to developing and newly industrializing countries that their environmental stand-

ards would need upgrading well in advance of possible bilateral discussions on trade liberalization. Through framework agreements or other agreements, the United States might offer more aid for technical assistance and technology transfer to developing countries (with U.S. companies gaining some business from the aid).

- The executive branch would assess differences in regulatory stringency among countries, and related competitive impacts on U.S. firms; alternatives for addressing adverse impacts would be developed for congressional consideration.
- Government efforts to promote U.S. exports, including environmental exports, would intensify.
- Foreign assistance would be tapped to encourage exports of environmentally and developmentally sound technologies and services (e.g., renewable energy technologies, pollution prevention services) to developing countries. On a life cycle basis, such projects could be less expensive for developing countries than conventional technology. In some cases, capital project financing would be made available to encourage transfer of U.S. technology.
- The United States would continue to work to limit commercial advantage from use of mixed credits and other tied aid credits by aid donors; however, when other countries use these credits for unfair commercial advantage, it would respond in kind but use environmental guidelines to prevent transfer of inappropriate technologies.

This strategy might recognize the need to give more priority to broad-based adjustment assistance for U.S. workers. It is seldom feasible to isolate the causes of plant closings and layoffs;

the major causes are patterns of trade and investment, changes in consumer preference, and obsolescence of plant and equipment from technological change. Sometimes environmental factors also contribute. While the implications of technological upgrading for U.S. employment as a whole are likely to be positive, the diffusion of cleaner, more energy efficient technologies to industry is bound to produce some displacement.

Not all of the steps listed in either strategy would require new legislation, as several recent laws authorize pertinent programs and initiatives along these lines. Examples include the Energy Policy Act of 1992 (EPACT, Public Law 102-486), the Export Enhancement Act of 1992 (Public Law 102429), and the Aid, Trade, and Competitiveness Act of 1992 (Title III of Public Law 102-549). The Clinton administration has announced several plans and initiatives related to commercial and environmental technology policy, export promotion, and pollution prevention. Depending on future levels of funding and other indicators of commitment to implementation, these laws and initiatives could form part of a basis for the strategies.

■ Issue Area A. Technology and R&D Policy

Debate is underway in Congress about the Federal role in encouraging the development and commercialization of innovative commercial technologies. Environmental technology has been gaining attention in this debate. The Energy Policy Act of 1992, enacted at the end of the 102d Congress, authorized expanded Federal support for development and application of energy-related environmental and industrial technologies. Several environmental technology bills have been proposed in the 103d Congress,² as well as bills pertaining to the Federal role in commercial technology development as a whole.³ An admin-

²See, for example, S. 978, the proposed National Environmental Technology Act of 1993, as reported by the Senate Environment and Public Works Committee on July 30, 1993; S. 811, the proposed Environmental Competitiveness Act of 1993; and H.R. 3603, the proposed Environmental Technologies Act of 1993.

³See H.R. 820, the proposed National Competitiveness Act of 1993 passed by the House on May 19, 1993, and S. 4.

Table 2-1—issue Area A. Federal Technology R&D Policy

| | | Policy goals promoted ^b | | | |
|------|--|---|--|--|--|
| | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| 1 | Review Federal progress to: | | | | |
| | • set priorities and coordinate R&D for environmentally critical technologies | S | Y | P | P |
| | • integrate cleaner production in R&D program missions | S | Y | P | P |
| 2 | Review Environmental Protection Agency (EPA) clean technology priorities | S | N | Y | P |
| 3 a) | Fund pertinent Department of Energy (DOE) RD&D programs; | L | N | Y | P |
| b) | Make cleaner production a central mission of DOE's Office of Industrial Technology | M-L | N | Y | P |
| 4 | Increase support for National Science Foundation clean technology work | M | N | Y | P |
| 5 | Fund startup or expansion of industry sector R&D technology consortia | L | Y | Y | P |

a S=small (\$10 million or less); M=moderate (\$10 to \$100 million); L=large (\$100 million plus); a range indicates that it depends on how the option is implemented.

b Y=yes; P=potentially yes; N=no; ?=effect is unclear

SOURCE: Office of Technology Assessment, 1993.

istration environmental technology initiative is also under development.

For the most part, Federal environmental regulations—their form and strictness—have been the primary government action determining development and use of environmental technology by industry. This will continue to be the case. However, nonregulatory forms of technology policies—support for research, development, and demonstrations, for example—could spur development and use of environmentally preferable products and processes. While not necessarily developed to further specific regulatory aims, such products and processes in some cases could make compliance easier and cheaper for firms.

Discussed below are three issues germane to the question of whether the U.S. Government should expand its support for development of

cleaner, more cost-effective technology by industry:

- goals and objectives for Federal environmental technology policy,
- coordination of Federal activities relevant to cleaner technology, and
- partnerships with industry to develop cleaner technologies.

Five options pertinent to these issues are summarized in table 2-1, and presented in greater detail at the end of the discussion for this issue area.

GOALS FOR FEDERAL POLICY

An expanded Federal role in developing cleaner technologies or more cost-effective pollution controls could require more funding and new

ways to conduct government-industry partnerships. The Federal Government already spends nearly \$2 billion per year on R&D pertinent to the environmental technologies covered in this report.⁴ (See ch. 10.) Over \$650 million is spent by the Department of Energy (DOE), the Department of Defense (DOD), and the Environmental Protection Agency (EPA) on remediation technologies for contaminated sites. Large commitments, nearly \$1 billion, are also made to cleaner energy research, development, and demonstration (RD&D). This includes renewable energy programs, the Clean Coal Technology Demonstration Program (which demonstrates pollution control and prevention technologies), advanced engine and fuel cell R&D, and electric and other cleaner vehicle technologies, among other areas. Federal R&D support for cleaner industrial process technologies and for improved end-of-pipe controls for manufacturing operations is only a small share of the total—probably on the order of \$150 million.

The question of whether, how, and to what degree the Federal Government should support additional initiatives to develop innovative environmental or environmentally preferable technologies depends in part on available resources and Federal priorities.

Several candidate R&D priorities may vie for limited funds, including:

Putting the Federal House in Order—Most remediation R&D centers on clean-up of contaminated defense-related facilities—clearly a Federal or national responsibility. Developing lower cost or more effective clean-up technologies is likely to be a key Federal environmental and fiscal priority for many years to come. Defining technology goals and objectives and securing clean-up R&D resources for this area alone will pose continuing challenges.

Estimates suggest that, using current technologies, it could cost the U.S. taxpayer tens of billions of dollars in the coming years to clean up hazardous and radioactive wastes at DOD and DOE facilities. Improved remediation technologies might reduce clean-up costs and also aid in managing abandoned hazardous waste sites—a Federal responsibility under Superfund.

To some degree, the improved technologies and processes resulting from Federal clean-up R&D could produce export opportunities for U.S. environmental firms. However, most countries now give much more priority to pollution control and prevention than to clean-up of contaminated land. Remediation markets abroad are relatively modest. Also, some of the U.S. R&D no doubt may support further development of processes created by firms in other countries.

Helping Industry Meet Requirements at Less Cost—Another Federal R&D priority might be to encourage development of cleaner production technologies (or, in some cases, more cost-effective end-of-pipe or clean-up equipment). This might further both environmental and industrial competitiveness goals. U.S. industries spend more on environmental compliance than their counterparts in most other countries. Even when compliance costs are comparable, some countries, such as Germany, provide more government technical and financial help to their firms.

It would make sense to concentrate on industry sectors that produce large environmental impacts or that have high compliance costs. For example, as is discussed in Option 5 at the end of this section, the government might share the costs of RD&D efforts with industrial consortia to address industrywide environmental challenges. Regulatory and tax incentives for development and early

⁴Larger estimates exist, but they include other technology support, such as for agriculture, climate monitoring, health effects, management of nuclear wastes, and mass transit that are not addressed in this report. See U.S. Library of Congress, Congressional Research Service, *The Current Status of Federal R&D: Environmental Technologies*, 92-675 SPR (Washington DC: Congressional Research Service, Aug. 25, 1992).

use of innovative environmental approaches can also be useful.

Spurring Development of Environmentally Preferable Products and Processes—The Federal Government can help ensure that cleaner technology or production priorities are considered in the technology development activities that it supports, directly or indirectly. With the wide range of R&D funded by the U.S. Government, the long-term effect in stimulating development of cleaner technologies could be significant. Additionally, Federal, State, university, and professional association support for integration of environmental matters in engineering education can help effect a cultural change by bringing environmental criteria from the periphery to the core of product and process design.

Meshing environmental with commercial R&D goals could be beneficial. It could produce technologies and techniques that allow companies to meet their environmental obligations at less cost. For the environmental industry as well as manufacturers of cleaner capital goods, better and more economical pollution control and cleaner production technologies offer new business opportunities at home and abroad. And, of course, the economy, the environment, and public health will benefit if new technological approaches allow better environmental protection at less cost.

Government procurement practices could be used to spur markets for environmentally favorable products and processes, as well. Some examples include specifying cleaner printing and painting, procurement of recycled materials, promotion of energy efficiency in Federal buildings, and acquisition of cleaner vehicles. Military specifications also could be rewritten to address

the environmental impacts arising from manufacture of products for DOD. Several executive orders on these matters have been issued or are under consideration in the Clinton administration. Using government buying power as an instrument of environmental policy is controversial with suppliers of conventional products and other industries who fear they might be adversely affected.

Supporting Sustainable Development and Export Opportunities for U.S. Firms—In the years to come, global demand for cost-effective, environmentally preferable technologies can be expected to grow in a wide range of industry sectors. One objective of Federal technology policy might be to encourage development of such technologies in the interest of global environmental improvement and boosting export earnings and jobs for American firms. Joint R&D and industrial consortia among environmental firms, regulated industries, and government can help develop and demonstrate technologies that provide environmental solutions both at home and abroad. In addition to support for R&D, the U.S. Government can help by disseminating information on U.S. technologies abroad and developing export awareness in the United States. Technical assistance to improve foreign environmental management capacity and negotiation of standards and practices in other countries compatible with those employed in the United States can also promote this country's interests.

COORDINATION AND FUNDING

As additional Federal roles in environmental technology are considered, some see an emerging need to articulate an overall strategy⁵ and priori-

⁵Developing an environmental technology strategy is one purpose of some environmental technology proposals under consideration in the 103d Congress. The strategy proposed in S.978 as reported by the Senate Environment and Public Works Committee would, among other matters, identify and rank priorities that would benefit from critical environmental technologies; recommend public-private partnerships; recommend measures to encourage commercialization and use of the technologies, especially by small business; and identify barriers, incentives, and appropriate actions for development, use, and exports of the technologies. Critical environmental technologies, as defined in the bill, would embody a significant technical advance, have potential to bring about large, cost-effective reductions in health or environmental risks; apply broadly at the precommercial stage; and be likely to have a favorable ratio of social to private returns if adopted.

ties for a coordinated response by pertinent agencies.

Several agencies play, or could play, prominent roles in environmental and/or commercial technology development—including DOE, DOD, the Department of Commerce, and EPA. Working out appropriate roles among these and other agencies will be an important issue for policy makers in Congress and the Executive Branch. Lack of coordination of these programs could limit their effectiveness, as well as complicate technology transfer to industry.

Administration efforts and plans to address environmental technology include:

- an environmental technology strategy. In April 1993, President Clinton directed the Secretary of Commerce to chair an interagency group for creation of a national strategy for environmental technology development, diffusion, and export promotion. Other key agencies include EPA and DOE. This body was expected to issue a report in the fall of 1993.
- an expanded EPA role in environmental technology development. Over a 9-year planning horizon, the projected increase would be \$1.85 billion (much of which might pass through EPA to other agencies). The purpose would be to develop more advanced environmental systems and treatment techniques to produce environmental benefits and exports of environmental technologies.
- more funding for RD&D activities under the 1992 Energy Policy Act. (Among other things, EPACT authorized increased Federal support for environmentally significant energy technologies, including renewable energy, cleaner vehicles and fuels, advanced engines, fuel cells, and heating, cooling, and other building technologies. One title authorizes more R&D support for industrial technology related to energy conservation, including waste reduction. For example, it calls for more work on pulp and paper technologies and improvement of energy

efficiency and cost-effectiveness of pollution prevention technologies in energy intensive industries-activities supported by the DOE's Office of Industrial Technology. Funding for this office's work on energy efficiency and waste reduction is authorized to grow from about \$97 million in fiscal year 1992 to about \$137 million in fiscal year 1994.)

- the administration's overall technology initiative calls on key Federal agencies including the Departments of Commerce, Defense, and Energy, to incorporate environmental goals when supporting manufacturing R&D. The National Institute of Standards and Technology (of the Department of Commerce) would help small and medium-sized firms improve energy efficiency and performance (see Issue Area B below).

Two subgroups of the interagency Federal Coordinating Council on Science, Engineering, and Technology (FCCSET) are working on environmental technology priorities. The Subcommittee on Environmental Technology of the Committee on Earth and Environmental Sciences was established to focus on environmental technology issues. Also, the Committee on Manufacturing, which seeks to define Federal priorities for developing and diffusing manufacturing technology to the private sector, plans to look at the environmental aspects of Federal manufacturing R&D. These activities could be affected by plans to reorganize FCCSET.

With so many Federal activities underway or soon to be proposed, Congress might wish to conduct early oversight—with special attention to overall goals and objectives, and the extent to which clean technology objectives are addressed. (See Option 1 at the end of this section). It might also review funding and priorities for specific Federal programs pertinent to cleaner technology development, such as those by EPA, DOE, and the National Science Foundation (NSF), as discussed in Options 2 through 4 below.

PARTNERSHIPS WITH INDUSTRY TO DEVELOP CLEANER TECHNOLOGY

As standards become tougher, more cost-effective ways to improve environmental performance will be needed. To date, industrial pollution prevention efforts typically involve simple housekeeping and process modifications, which often offer large payoffs for little effort. More fundamental improvements in manufacturing process technologies to make manufacturing both cleaner and more productive could require substantial R&D. In some cases, advances in control and disposal technologies also could require more R&D.

While U.S. firms are making some progress in integrating environmental concerns into manufacturing process and product development, most efforts are small and ad hoc. The risks to individual companies in proceeding alone with the needed R&D often appear too great, given technical uncertainties, questions about the acceptance of new technologies in the regulatory system, and difficulties in capturing benefits that accrue widely across an industry or to society as a whole. Companies have been reluctant to develop and try new generations of add-on pollution controls for similar reasons.

Programs carried out through industry consortia or cooperative research and development agreements with Federal laboratories may offer useful vehicles for assuring industry involvement.⁶ An industry sector focus for these activities could help allocate efforts toward those sectors that pose the most significant environmental threat or that face the highest compliance costs. While DOE supports some cooperative R&D in specific sectors (e.g., pulp and paper, steelmaking, and foundries), firms tend to sign on

for a specific project rather than develop the continuing relationship that a consortium implies. A more aggressive alternative, centered on high environmental impact, high compliance cost industries, is discussed under Option 5 below.

While consortia may hold promise, there are drawbacks. Funding more industrial RD&D could take scarce dollars away from other worthwhile claims on Federal resources. To the extent that new Federal funds are available, getting the Federal Government's own house in order through clean-up of Federal sites might seem a more pressing claim. The substantial funds for technology development in this effort offer promise for new remediation technologies that could be applicable to commercial remediation.⁷

However, the Federal clean-up efforts are needs-driven and highly specialized. Clean-up R&D is not intended to produce technologies for industry to control emissions or to produce cleaner technologies that prevent pollution. Instead, the technology is mostly intended to deal with already contaminated sites.

Many in both government and industry look askance at partnerships and similar attempts by government to influence private sector R&D. Some believe that such partnerships amount to favoritism. Others contend that most such activities would be ineffective, thus wasting the taxpayers money, or, worse, could deflect R&D away from other objectives that could turn out to be more important.

One skeptical analysis of the premise that strict environmental regulations might enhance industrial competitiveness also questioned the contention that R&D subsidies for environmental tech-

⁶ In this regard, Title II of the House passed version of H.R. 820, the proposed National Competitiveness Act, would authorize the Commerce Department's National Institute of Standards and Technology to support large-scale research and development consortia. Among criteria for an award: significant contribution to environmental sustainability.

⁷ Further, Federal funds supporting research on environmental sciences are limited. Such research could lead to better understanding of the risks that environmental degradation poses to human health, natural processes, and ecosystems. Improved understanding of the nature of such risks could contribute to more effective policymaking.

nologies would help promote U.S. industry.⁸ Government R&D subsidies might be needed to obtain socially desirable investments in environmental improvements. However, in a world of multinational firms and international markets, capturing the benefits of the R&D for domestic developers might be difficult.

Even so, the long-term benefits to U.S. industry and society from cleaner industrial technologies could be very large, and it is not certain that industry will act on its own to develop these technologies unless it is clear that the government is committed to their use in environmental compliance.

Following from the discussion above, a number of options might be considered by Congress if it wishes to broaden the Federal role to encourage development and deployment of new generations of environmental technology by industry. Some are discussed in the two following sections (technology diffusion, and regulatory reform and innovation). Among those that relate to the Federal Government's direct role in supporting R&D activities are the following:

OPTION 1: Begin oversight at an early date on the administration's progress to:

- coordinate and rank Federal R&D priorities for environmentally critical technologies (including those most pertinent to industry);
- integrate cleaner production objectives into missions of commercial technology R&D programs.

OPTION 2: If Congress expands EPA's role in technology development, it could direct the agency to work with other agencies and industry to emphasize cleaner technology and pollution prevention, and to seek to link regulatory development more closely with technological priorities.

OPTION 3: With regard to Department of Energy programs:

- Review funding priorities and monitor progress on Energy Policy Act R&D for renewable energy, clean coal, and other environmentally pertinent technologies. (Option 18 below discusses EPACT provisions for export promotion and transfer of some of these technologies).
- Explicitly add environmental technology to the mission of DOE's Office of Industrial Technology;
- Fund more research, development, demonstrations, and evaluations on cleaner production technologies and pollution prevention processes.

OPTION 4: Increase National Science Foundation support for cleaner technology research, through industry-university research centers, engineering research centers, and individual investigator grants offered through NSF's environmentally benign manufacturing program.

OPTION 5: Authorize support for initiating (or expanding) R&D cost-sharing with industry sector organizations to:

- serve as a forum for industry to collectively identify R&D needs related to environment;
- arrange partnerships among researchers, equipment makers, and industrial users to develop manufacturing technologies that are more energy efficient and cleaner;
- arrange similar partnerships to develop more cost-effective control, recycling, and disposal technologies for pollution and wastes;
- support demonstration of cleaner technologies and new control, recycling, and disposal technologies;
- identify and diffuse innovations and best practices in pollution prevention and control to industry; and share information on cost effectiveness of pollution prevention relative to control technologies; and
- identify regulatory barriers to more efficient environmental solutions, and train inspectors

⁸ Karen L. Palmer and R. David Simpson, "Environmental Policy and Industrial Policy," *Resources: Resources for the Future*, summer 1993, No. 112, pp. 17-21.

Table 2-2—issue Area B. Diffusion of Best Practices and Technologies to Industry

| | | Policy goals promoted ^d | | | | |
|---|--|---|---|--|--|--|
| | | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| 6 | Evaluate incentives to diffuse cleaner technology to industry | L ^c | Y ^c | Y | Y | P |
| 7 | Make cleaner production and pollution prevention a mission and service of manufacturing extension services | M | N | Y | ? | ? |
| 8 | Direct EPA to oversee more technology evaluations, and disseminate results here and abroad | M | N | Y | Y | Y |
| 9 | Support efforts to integrate environmental components in engineering and business school curricula | S | N | Y | P | P |

^aS=small (\$10 million or less); M=moderate (\$10 to \$100 million); L=large (\$100 million plus); a range indicates that it depends on how the option is implemented.

^bY=yes; P=potentially yes; N=no; ?-effect is unclear

^cassumes action is taken after review or evaluation

SOURCE: Office of Technology Assessment, 1993.

and permit writers on pollution prevention and control in particular industries. (See further discussion below in Issue Area C: Regulatory Reform and Innovation.)

To be eligible, an organization would need to serve an industry sector with significant environmental impact or high compliance costs (e.g., chemicals, petroleum refining, primary metals, metals finishing, and pulp and paper). In sectors that now have such organizations, Federal support could focus on pollution prevention and environmental technical assistance. While industry governance and funding would be crucial, the organization could work with Federal laboratories.

■ Issue Area B. Diffusion of Innovations to U.S. Industry

As discussed in chapter 8, there is a wide gap between best environmental practices in industry and prevailing practice. Many firms, especially

small and medium-sized companies, have limited knowledge or access to information about innovations that might help them address environmental problems in a more cost-effective manner. The existing regulatory system often encourages compliance-driven approaches that, in the long run, are often not optimal from either an environmental or a competitiveness standpoint. In the final analysis, better integration of environmental and economic considerations will require changes in the educational system for both engineers and managers. Discussed below are several issues and options to encourage diffusion of innovations to industry: incentives; technical help to smaller companies; evaluation of technology performance; and integration of environmental matters in business and engineering curricula. Table 2-2 lists these options,

INCENTIVES FOR DIFFUSION

Companies are often reluctant to install innovative technologies. The costs and risks of being

first lead many companies to stick with tried-and-true environmental control approaches. In addition to alteration of regulations and programs for technology verification and demonstration (described elsewhere in this chapter), Congress could consider a range of incentives for innovative environmental technology development and use. To aid in this process, Congress might direct the administration to provide analysis of the costs and benefits of several specific mechanisms (see Option 6 at the end of this section).

Accelerated depreciation and tax credits, loan programs, and environmental taxes are among approaches used in some other countries. Accelerated depreciation is used in the Netherlands, where firms that install innovative pollution prevention or control technologies can depreciate their investment in 1 year instead of 10. The list of eligible technologies is revised each year in consultation with industry and government experts. Technologies that have gained significant market share or that are required to be installed by regulation are ineligible. This kind of approach could also be applied to programs of tax credits or low interest loans.

Environmental taxes applied to production of pollutants or waste is another alternative or complement to the incentives just described. If the added costs are high enough, polluters may seek to avoid such taxes through pollution prevention, or look for alternative technologies. Environmental taxes could provide an incentive for companies to perform better than standards require. Some studies indicate that taxes on pollution and other “bads” can be economically preferable to taxes on “goods” such as labor, investment, and savings.⁹ Revenues from environmental taxes could be used for general revenue, to displace income and other taxes, or to finance the above mentioned environmental innovation incentives.

Government procurement can both encourage or discourage the development of markets for environmentally preferable technologies and products. Environmental objectives underlie recent changes in procurement policies for such items as paper (postconsumer recycled fiber content), light bulbs (energy efficiency), and vehicle fleets (less polluting fuels). Other steps (e.g., an Executive Order by President Clinton to reduce toxic waste emissions from Federal facilities to one half by 1999) could encourage development and markets for alternative products. In some cases, other policy objectives may slow adoption of alternative products. Changes in procurement policies can be highly controversial, and provoke heated opposition by affected industries. As part of the Option 6 evaluation, or separately, Congress might call on the administration to assess the early experiences with these changes in procurement policies.

TECHNICAL ASSISTANCE TO SMALL AND MEDIUM-SIZED COMPANIES

Technical assistance programs can help manufacturers, particularly small and medium-sized enterprises (SMEs), understand and cope with environmental regulations, and select low-cost alternative technologies and approaches, such as pollution prevention. Most States and a few localities have pollution prevention programs, which provide information and technical assistance services.

The Federal Government provides some funding and technical support to these programs. However, resources are small relative to need. Some EPA-supported programs are housed in State environmental agencies. Wary manufacturers may not use these services, for fear of triggering enforcement actions.

Pollution prevention is one of several kinds of State or federally supported technical assistance. Company officials may view other needs (e.g., for

⁹ Robert Repetto, Roger C. Dower, Robin Jenkins, and Jacqueline Geoghegan, *Green Fees: How a Tax Shift Can Work for the Environment and the Economy* (Washington DC: World Resources Institute, November 1992).

manufacturing modernization, worker training, and quality improvement) as more important. Few programs provide fully integrated services; in some states, there may be separate technical assistance programs for energy conservation, worker health and safety, pollution prevention, and technology modernization. Manufacturers may not know which program to contact; the fragmentation of services thus limits opportunities to offer pollution prevention in the context of a manufacturer's needs for productivity and quality improvements. Moreover, most programs focus on fabrication and assembly industries, not on highly polluting process industries, such as chemicals or steel.

There are advantages to offering pollution prevention, energy conservation, and manufacturing technology modernization in an integrated or coordinated fashion. Providing services through one-stop centers (or at least through closely coordinated services) might improve efficiency, technical consistency, and cost-effectiveness. Integrated service organizations can respond to a wide range of industry needs and can rely on existing field staff for leads. These organizations can aid technology transfer, by conveying information to firms about new technologies, and aid technology development by providing information to developers about industry needs. As outlined in Option 7 at the end of the section, there are several alternatives Congress might consider as ways to provide integrated or coordinated services.

Such a broad mission might be given to or coordinated with new manufacturing technology centers administered by the National Institute of Standards and Technology in the Commerce Department.¹⁰ While some of these centers have already been established, President Clinton has

proposed expanding this system, as have various bills proposed in the 103d Congress. The mission of these centers could be broadened to include energy conservation and pollution prevention along with training, modernization, and quality. Such a move could help integrate pollution prevention into the service infrastructure regularly used by manufacturing firms. The centers would not need to offer these services directly, for they could coordinate with the providers.

One disadvantage of this more integrated approach is that it might not target the firms that produce the most waste or cause the most environmental damage.¹¹ If the top priority is to reduce pollution and wastes, putting pollution prevention programs in existing manufacturing modernization programs may dilute this focus. However, this matter could be addressed by making sure that the environmental component of these organizations concentrate on achieving pollution and waste reduction goals.

EVALUATION OF TECHNOLOGIES AND DISSEMINATION OF INFORMATION

Objective information about performance capabilities could make it easier to commercialize innovative American environmental technologies. Some users of environmental technologies are reluctant to try innovative technologies for fear that they will not meet requirements or will be more costly than anticipated. Rather than take the risk, they may stick with established technologies that could be less cost-effective for the enterprise and less effective from an environmental standpoint. Independent technology evaluations might help overcome some of the uncertainties accompanying new environmental technologies; hence, Congress might wish to encourage such evaluation activities (see Option 8 at the end of this section).

¹⁰s. 978 as reported by the Senate Environment and Public Works Committee would call on EPA and the commerce Department to enter into agreements so that EPA would provide technical assistance and support to the centers for this purpose.

¹¹ For example, many State pollution prevention programs have encouraged pollution prevention in sectors such as auto repair, electrical, and small print shops, and other local service firms. The environmental problems of these firms might get less attention in a program with more of an economic development or competitiveness focus.

Evaluation information also could aid U.S. environmental firms in marketing their products and services abroad by providing potential customers with a more solid basis for choosing among technologies. Often, such clients hold EPA in high regard as an unbiased source of environmental information. While EPA does not, and probably should not, endorse particular technologies or vendors, some U.S. companies say that lack of governmental endorsement can be an impediment in marketing abroad, and claim that foreign competitors sometimes obtain such blessings from their home governments.

Legislation proposed in the 103d Congress would authorize more extensive Federal support in evaluation of environmental technologies. Among its other evaluation programs, S. 978 (the proposed National Environmental Technology Act of 1993), would establish an EPA program to evaluate, verify, and disseminate performance and cost information on environmental technologies. One function of this program would be to develop protocols and testing procedures. A clearinghouse would disseminate information about technologies that meet or exceed evaluation guidelines. Another bill, the House passed version of H.R. 820, the proposed National Competitiveness Act, would authorize the Commerce Department's National Institute for Standards and Technology to serve as testbed for advanced technologies, including prototype clean manufacturing systems.

EPA already sponsors some evaluations of innovative technologies developed by U.S. vendors, with the vendor picking up most of the costs. Its Superfund Innovative Technology Evaluation (SITE) Program is the largest and best known example. Technology developers pay to design, install, and operate their technologies while EPA

pays for site preparation and evaluation. Smaller EPA efforts are the Municipal Innovative Technology (MITE) Program and the Clean Technology Demonstration Program.

Evaluations would not necessarily need to be federally administered; federally supported centers could perform this function. For example, the National Environmental Technologies Applications Corp. (NETAC), a nonprofit corporation founded by EPA in 1988 and associated with the University of Pittsburgh Trust, has provided independent laboratory evaluations on oil bioremediation agents. EPA apparently prefers an independent entity to oversee testing and review of technical data on environmental technologies.¹²

Evaluation programs have their drawbacks. The SITE program received early criticism for evaluating few truly innovative technologies.¹³ In addition, vendor demand for evaluations could exceed available resources; in such cases, evaluated technologies might receive a competitive advantage over comparable or even superior unevaluated technologies. Nonetheless, performance verification could be a useful step that would help domestic and foreign customers choose among alternatives. It could be a low cost way to promote U.S. exports in an environmentally desirable way. (See subsequent discussion of Option 23).

ENGINEERING AND BUSINESS EDUCATION

If U.S. industry is to better meld environmental with competitive demands, it will need engineers who are adept at integrating environmental considerations with other cost, quality, and technical performance criteria, and managers who understand how different environmental solutions impinge on cost, quality, and marketing. Environmental goods and services firms also will need such technical and managerial talent to offer

¹²"EPA Calls for Independent Environmental Technology Review Office," *Inside EPA*, Aug. 6, 1993,

¹³Office of Technology Assessment, *Coming Clean: Superfund Problems Can be Solved*, OTA-ITE-433 (Washington, DC: U.S. Government Printing Office, 1989), pp. 182-183.

customers a full range of environmentally and economically sound solutions. Yet such environmental matters are addressed on the periphery, if at all, in most engineering and business education programs.

In some engineering schools, environmental engineering programs train students to design and operate end-of-pipe pollution control and disposal systems. These students may have a limited understanding of the industrial production processes in which pollution prevention opportunities arise.

Students in traditional engineering disciplines (chemical, civil, electrical, and mechanical engineering) and related areas (e.g., architecture materials engineering, food science, and industrial engineering) usually do not receive much training on how to consider environmental factors in designing or modifying products, processes, and structures. *4 Environmental criteria, such as emissions standards, recyclability, and toxicity of materials, tend to be thought of as externally imposed constraints that are often treated as an afterthought in the design process. As a result, opportunities to improve the environmental performance of industrial processes and products while keeping costs low and quality high may lie unrecognized. Thus, integration of environmental issues and perspectives in the mainstream engineering curriculum could be useful.¹⁵

As is discussed in Option 9 below, Federal agencies, such as the National Science Foundation (NSF) and the Office of Environmental Education at EPA, might contribute to efforts to change engineering education. For instance, NSF could assemble and disseminate course materials for use in undergraduate curricula. It could help

professors and lecturers learn how to address environmental factors in their courses. NSF could support or complement some existing efforts. For instance, the Center for Waste Reduction Technologies of the American Institute of Chemical Engineers has developed a manual for incorporating pollution prevention design and homework problems in chemical engineering courses. Government, industry, professional associations, and universities can work together to produce and use these educational materials. Such materials could help in training undergraduate engineering students and in retraining practicing engineers, such as those leaving defense-related jobs or participating in continuing education.

Business schools tend to treat environmental issues as a peripheral matter. Their students are seldom taught to account for and properly assign all environmentally related costs. Without adequate environmental accounting and accountability, managers and engineers may not attack their environmental problems in the most cost-effective way. The costs of waste disposal may not be assigned to individual processes and product lines, for example. Regulatory costs, potential liability, or loss of community or customer goodwill also may not be fully taken into account. Finally, ways to mesh environmental performance with better quality and productivity are seldom studied. The analogy between environment and quality is discussed further in chapter 8.

Some business schools are beginning to respond.¹⁶ However, only about 1 in 10 has or is developing environmental courses.¹⁷ The Federal Government, in cooperation with professional associations and universities, could support as-

¹⁴ For discussion of issues related to incorporation of environmental factors in the design of products, see U.S. Congress Office of Technology Assessment, *Green Products by Design: Choices for a Cleaner Environment*, OTA-E-541 (Washington, DC: U.S. Government Printing Office, October 1992).

¹⁵ Robert A. Frosch and Nicholas E. Gallopoulos, "S~te@es for Manufacturing," *Scientific American*, vol. 261, No. 3 (September 1989), pp. 144-152.

¹⁶ J.E. Post, "The Greening of Management," *Issues in Science and Technology*, vol. 6, No. 4 (summer), pp. 68-72.

¹⁷ Information provided by staff of the Management Institute for Environment and Business, August, 1992.

sembly and dissemination of relevant course materials to business schools (see Option 9 below). For example, the Management Institute for Environment and Business seeks to encourage business schools to integrate environmental concerns into their curricula. It has produced a book of case studies on environment and industrial competitiveness.

OPTION 6: Direct the administration to identify and evaluate that best choices among economic incentives (e.g., accelerated depreciation, loans, or fees) to speed diffusion of cleaner technologies to industry. EPA, the Department of Commerce, the Department of Energy, and the Treasury Department could examine the competitive, environmental, and fiscal impacts of such approaches. Congress also might direct the administration to provide initial evaluation of its use of Federal procurement to achieve environmental goals—an approach promulgated in several recent executive orders.

OPTION 7: Make pollution prevention and energy conservation specific mission objectives and services to be provided or facilitated by manufacturing extension services. (Expansion of these services is proposed in legislation before the 103d Congress.) Fund efforts at the State and local level, through existing industrial modernization organizations, to help promote pollution prevention. Use funding currently channeled through several existing Federal technical assistance programs to support full-service industrial extension, including manufacturing modernization, pollution prevention, energy conservation, worker training, and worker safety and health.

Alternatively, Congress could expand EPA's Pollution Prevention Incentives for the States (PPIS) program or the Waste Minimization Assessment Centers (WMAC), and direct that some grants be provided to State industrial extension services. PPIS provides \$3 million a year to State pollution prevention technical assistance programs. The three WMACs receive \$200,000 a year and are housed at universities where faculty

and staff perform free, in-depth waste minimization assessments for small and medium-sized business.

OPTION 8: Direct EPA (either itself or through a center) to undertake independent evaluations of the technical, environmental, and economic performance of innovative environmental technologies. As remediation evaluation programs already exist, this activity could be oriented to pollution prevention and control and cleaner technology options. Firms seeking to have their technologies evaluated would pick up most of the costs.

Provide resources to ensure timely dissemination of results, including possible translation into foreign languages.

OPTION 9: Provide seed funds through NSF or the EPA Office of Environmental Education for integration of environmental components into engineering school and business school curricula. The objective should not be to produce new courses labeled pollution prevention (in the case of engineering schools) or business and the environment (at business schools) but to incorporate environmental methodologies into basic curricula.

■ Issue Area C. Regulatory Reform and Innovation

It is difficult to generalize about the U.S. system of environmental regulations, even when the focus is just on manufacturing firms. However, there are some common characteristics. For example, there continues to be a focus on single media; there tends to be more emphasis on controlling or treating pollution after it has been generated; and there is relatively little direct encouragement for technology development or innovation.

As discussed in chapter 9, traditional approaches to regulation and enforcement sometimes make innovation difficult. Complying firms also can find it difficult to implement the lowest cost approaches.

For example, it has been difficult to integrate the mission of pollution prevention into EPA's operations. (Recent developments, such as the June 1993 pollution prevention policy statement from the EPA Administrator, may speed up the process.)¹⁸ Pollution prevention often has been carried out as a separate function, with projects peripheral to EPA's main regulatory and enforcement role. Many regulations and rules reinforce reliance on end-of-pipe technology. Even for performance based regulations, personnel responsible for permitting may not have adequate training to recognize appropriate opportunities for use of pollution prevention alternatives.

Strong environmental regulations and enforcement are essential to encourage firms to adopt pollution prevention and to encourage innovation. However, prescribing pollution prevention practices or techniques could make it difficult for manufacturers to develop pollution prevention solutions that make the most sense for their operations. Better results might be achieved by encouraging (or even mandating) pollution prevention planning, modifying regulations to allow more pollution prevention, and increasing technical assistance and support for technology development.

As long as strong regulation and enforcement are fully maintained, steps could be taken to explore approaches that allow firms to use more cost-effective approaches without jeopardizing environmental goals. Innovative experiments conducted in many places around the country are promising and could be attempted elsewhere. For example, full-facility studies examining all pollutants and waste generated by different types of industrial facilities can be useful for guiding company pollution prevention efforts and helping

regulators establish more effective but less costly environmental protection requirements. The Amoco Yorktown study, jointly managed by Amoco Co., EPA, and the Commonwealth of Virginia, identified many pollution prevention and control options that could achieve greater pollution reduction than now required by regulation. Such studies done for other types of facilities, such as pulp mills, or various classes of chemical plants, would be useful.

EPA has been assessing additional steps that might be taken to encourage innovation, such as setting up reinvention laboratories (or pilot projects) staffed by experienced EPA and state permit writers.¹⁹ Concern exists within EPA about its authority to undertake such efforts.²⁰ If Congress wishes to encourage more innovation, it could explicitly authorize and fund options such as those listed for Issue Area C in table 2-3 and discussed below.

OPTION 10: Congress could provide funds to EPA for a pilot project program with industry to demonstrate regulatory approaches that give firms that are first rate environmental performers more choice in the means they use to meet environmental requirements. Firms showing commitment to environmental excellence (e.g., significant pollution prevention efforts, participation in EPA voluntary programs, and willingness to conduct facility-wide environmental and pollution prevention audits) might be eligible for such benefits as:

- coordinated multimedia permitting and inspection (rather than single media permits with multiple inspections),
- facility-wide emission caps, rather than individual source limits,

¹⁸ Memorandum of Carol M. Browner, Administrator, to all EPA employees, June 5, 1993, titled "Pollution prevention Policy Statement: New Directions for Environmental Protection."

¹⁹ For discussion of this concept and several other steps to encourage innovations, see U.S. Environmental Protection Agency, "Report of EPA's Environmental Technology Team for the National Performance Review," August 1993, mimeo.

²⁰ *Ibid.*, p. 17.

Table 2-3--Issue Area C. Regulatory Reform and Innovation

| | | Policy goals promoted ^d | | | | |
|----|--|---|---|--|--|--|
| | | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| 10 | Set up an EPA pilot project to experiment with innovative permits for firms that are first rate environmental performers | M | N | Y | ? | 7 |
| 11 | Give incentive grants for regulatory reform and innovation projects to States and firms | M | N | Y | ? | ? |
| 12 | Upgrade training of permit and regulation writers | M | N | Y | ? | ? |
| 13 | Set up industry sector Consortia/cluster groups | s | Y | Y | ? | ? |
| 14 | Modify R&D permitting to better accommodate R&D, such as fixed site permits for R&D centers | s | Y | Y | Y | 7 |
| 15 | Set up an environmental cooperation institute and sector cooperation councils | s | Y | Y | ? | ? |

a S=small (\$10 million or less); M=moderate (\$10 to \$100 million); L=large (\$100 million plus); a range indicates that it depends on how the option is implemented.

b Y=yes; P=potentially yes; N=no; ?=effect is unclear

SOURCE: Office of Technology Assessment, 1993.

- use by participating firms of any technical approach that meets environmental standards, and
- accelerated permitting in some circumstances.

OPTION 11: Congress could give EPA funds to make incentive grants for innovative regulatory reform projects, and funds for innovations by State environmental agencies. For example, grants could be used to conduct full-facility studies examining all sources of pollution and pollution prevention options, provide training to implement new approaches, integrate information management technologies into compliance monitoring, and conduct multimedia inspections. In addition, EPA could actively work to encourage coordination, and disseminate information about the States experiences.

* * *

While experience with such approaches as those in Options 10 and 11 is growing, a number

of barriers and concerns would need to be addressed before these techniques could be put into widespread use. Assurance would be needed that health and environmental standards would be maintained. Safeguards to guard against, and quickly detect, abuses would be needed. (Hence, new techniques allowing continuous monitoring of emissions would help.) It also would be difficult to develop criteria to use in determining what constitutes a good environmental record for qualifying firms. Concerns exist that flexibility could lead to favoritism or foreclose enforcement options.

For all these reasons, evaluation of the activities undertaken under Options 10 and 11 would be essential to identify the most effective approaches and needed areas for improvement. EPA could be directed to provide for such evaluations, and to provide technical assistance to states seeking to implement these approaches on a wider basis.

Widespread use of these approaches could stress regulatory agencies now organized along media lines for end-of-pipe compliance. The skills needed by permit writers would change from narrow and specialized to broad based, yet the permit writers would need strong technical backgrounds to deal with a more complicated permitting process and to judge whether alternative approaches are appropriate. Provision would need to be made for training.

OPTION 12: Congress might increase EPA's resources to hire or train inspectors and permit writers to recognize and evaluate a variety of technical approaches for meeting environmental standards.

* * *

Regulations and permitting procedures can sometimes impede technology innovation and diffusion. Best available technology (BAT) or similar standards can assure successful environmental technology developers of a market, but can make acceptance of alternative environmental technologies harder. Complying firms may install technologies used as benchmarks by regulatory agencies on the assumption that it is better to stick with proven technologies that seem to be endorsed by the regulations. While BAT standards are favorable for suppliers of approved technology, they may inhibit development of new and innovative technology by other vendors and developers.

Some of the impediments might be overcome if there were closer links between technology developers and regulators, EPA could work with industry-sector technology organizations (e.g., the organizations discussed in Option 5) on environmental issues facing the industry, including the implications of foreseeable regulations for technology priorities, development, and diffusion. This task could be assigned to industry-sector groups at EPA with expertise on a given industry. Better training of permit writers, so that they might more confidently judge innovative alternatives, would also help.

OPTION 13: Congress could direct EPA to expand its industry sector-based activities. EPA could be given resources to develop more sectoral specific expertise at EPA and within the States. With more industry sector expertise, efforts to develop regulations that realistically anticipate compliance problems could be enhanced.

* * *

Firms complain about the complexity, uncertainty, cost, and time required to obtain an innovative environmental technology R&D permit under RCRA or under ad hoc procedures under the Clean Air Act (CAA) and Clean Water Act (CWA). Some technology developers have moved technologies abroad for development and testing. Adjusting procedures to meet the needs of innovators, provide permits for freed R&D and testing facilities, and develop quicker and more predictable permitting might help U.S. innovators, but would need to be done in ways that avoid the potential for abuses.

OPTION 14: Modify permitting in RCRA, CAA, and CWA to better accommodate research, development, demonstration, and testing. R&D permits lack the flexibility required to encourage research; ad hoc administration of innovative technology testing lacks predictability. Congress might therefore institute streamlined and flexible permitting for innovative technology, including permitting of testing centers.

* * *

The options discussed above are intended to help stimulate innovation. However, they would still be controversial. While experimentation with such procedures is already underway, even some demonstrably successful approaches might not win acceptance with industry, environmental organizations, or regulators. Over years of debate about regulations, regulated industries often have concentrated more on reducing levels of regulation than on improving the efficiency of the regulatory system. Many in industry fear that new approaches to regulation, such as pollution prevention, could lead to more burdensome requirements. For their part, many environmental groups

have been more concerned with defending existing gains than in making the system deliver equal or even greater environmental benefits at lower costs. Within regulatory agencies, many are reluctant to embrace a new system that departs from accustomed ways of doing things. Also, managers may resist efforts to break down organizational walls, particularly when resources are scarce.

Without a sense of trust and commitment among these key parties, the cooperative basis for developing more effective and efficient regulatory approaches will be limited. Thus Congress might consider ways to build more cooperative relationships between government, industry, and environmental organizations, as in Option 15.

OPTION 15: Congress could fund an Institute for Environmental Cooperation to promote innovative cooperative efforts between industry, environmental groups or other nongovernmental organizations, and government. The institute could be a forum for collaboration, bringing various parties together to explore new approaches and to craft new solutions. Moreover, the institute could study innovative cooperative efforts and disseminate lessons learned from these approaches.

Universities could also serve as forums for consensus building and collaboration. One example is an effort at the Massachusetts Institute of Technology in which industry, nongovernmental organizations, regulators, and academics are examining issues related to industrial chlorine use. Such efforts could be supported as part of an Institute for Environmental Cooperation.

Congress might also want to explore creating sectoral industry councils within EPA. A small number of councils might be formed for those industries with the greatest environmental impacts, with membership from industry and environmental organizations. If EPA moves toward sectorally based, multimedia rulemaking, these councils could support these efforts.

■ Issue Area D. Export Promotion, Development Assistance, and Environmental Firms

Compared to several competitors, the U.S. Government provides relatively little support for U.S. manufacturing firms for exporting. Recent U.S. laws give new legislative priority to Federal export promotion programs; someplace emphasis on environmental technologies and services specifically. Several bills pertaining to promoting exports of U.S. environmental technologies and services also have been proposed in the 103d Congress.

Responding to a congressional directive, the Clinton administration issued a proposed export promotion strategy with over 60 recommended actions in September, 1993. While many of the proposed steps do not require congressional action, debate about level of funding and support for these new programs will continue. The administration also issued an environmental export strategy in November 1993 just before this report went to press.

While most of the environmental market is in advanced industrial countries, markets in newly industrialized countries are growing rapidly. Most developing countries have limited experience in addressing environmental matters. However, developing country environmental problems are great, and some are beginning to invest in environmental protection. They thus have become a focal point in debate about policies and programs to promote exports of environmental technologies, not only in this country but in other countries with large environmental industries. In this case, alternative governmental roles in promoting exports need to be evaluated in the broader context of encouraging international cooperation to improve the environment, which is the shared heritage of all countries, and in

Table 2-4—issue Area D. Export Promotion, Development Assistance, and Environmental Firms

| | | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Policy goals promoted ^c | | |
|---|---|---|---|--|--|--|
| | | | | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| <i>Multilateral cooperation for technical assistance:</i> | | | | | | |
| 16 | Work to setup a program to help developing countries identify needed environmental technologies | S | N | ? | Y | Y |
| 17 | Make cleaner production/pollution prevention a priority in multilateral aid | M | N | ? | Y | Y |
| <i>Bilateral Foreign Assistance/Export Promotion:</i> | | | | | | |
| 18 | Fund EPACT programs for USAID- DOE transfer of innovative energy and environmental technologies to developing countries | L | N | ? | Y | Y |
| 19 | Increase Trade and Development Agency funding for feasibility studies | M-L | N | ? | Y | Y |
| 20 | Encourage U.S. firms to emphasize training of developing country personnel in equipment and services contracts | M | N | ? | Y | Y |
| <i>Export Promotion</i> | | | | | | |
| 21 | Conduct early oversight on the Trade Promotion Coordinating Committee's environmental working group strategy and proposed budget | S | N | ? | Y | Y |
| 22 | Encourage U.S. foreign commercial interactions through: | | | | | |
| | •increasing overseas commercial officers or contractors | M | N | Y | Y | P |
| | •increasing outreach to environmental industry associations | M | Y | ? | Y | P |
| | •operating through environmental business centers here and American Business centers overseas. | M | N | ? | Y | Y |
| 23 | Disseminate information about U.S. technologies abroad | S | N | ? | Y | Y |
| 24 | Provide resources for one-stop shopping and regional centers to help smaller firms access and make use of available export assistance | M | Y ^c | ? | Y | P |
| 25 | Consider ways to expand export financing while keeping environmental safeguards | L ^c | Y ^c | ? | Y | P |

a S=small (\$10 million or less); M=moderate (\$10 to \$100 million); L-large (\$100 million plus); a range indicates that it depends on how the option is implemented.

b Y=yes; P=potentially yes; N=no; ?-effect is unclear

c assumes action is taken after review or evaluation

SOURCE: Office of Technology Assessment, 1993.

furthering developmentally sound progress in the developing world.

Discussed below are three matters that bear on where to draw the line between competition for markets and environmental cooperation: the role of multilateral aid to developing countries; links between development assistance and export promotion; and the Federal export promotion role

more generally. A number of options, summarized in table 2-4, are discussed.

This ordering is deliberate: this report finds that efforts by developed countries to promote environmental exports need to take place within a context of bilateral and multilateral actions to improve the environmental capabilities of developing countries.

There is a potential for tensions between development assistance objectives aimed at meeting the needs of developing countries (e.g., for environmentally sound, sustainable development) and the desire of many donor countries to realize commercial benefit from their aid (e.g., encouraging exports of environmental technologies whether or not the particular technology is best suited for the developing country). A background paper prepared for this assessment, *Development Assistance, Export Promotion, and Environmental Technology*, discusses this issue in some detail.²¹

MULTILATERAL COOPERATION FOR TECHNICAL ASSISTANCE

Developing countries have a great need for appropriate environmental technologies and services. Yet few developing countries have the necessary information or technical resources to make the best selections; nor can they be sure of the objectivity of other nations in providing technical help when commercial transactions are involved. These concerns might be addressed through multilateral and bilateral efforts to provide developing countries with technical information and assistance about environmental technologies and services.

As discussed in Option 8, U.S. agency support for independent evaluations of environmental technology could be expanded. Expansion to include more emphasis on evaluation of prevention and control technologies as well as remediation could benefit U.S. firms seeking foreign clients. However, even with independent information, officials in developing countries often do not have enough information about available options. In some cases, relatively simple technologies may suffice. Information and technical assistance provided by national governments or by firms could be suspect. Hence, a multilateral approach could be helpful.

One possibility (see Option 16 at end of section) would be for the U.S. Government (acting through the Department of State, USAID, or another agency) to work with other countries to expand the ability of international agencies like the United Nations Environment Program to provide objective information and technical advice about environmental technologies (including cleaner technology choices).

The costs of needed environmental improvements in developing countries could be great. With end-of-pipe solutions, developing countries might easily need to invest over \$50 billion per year (1 percent of their projected gross domestic products in the year 2000) to factor environmental matters into their development plans.

Most of the costs of environmental protection in developing countries will need to be paid for by the developing countries themselves or through resources made available through increased trade and investment. However, bilateral and multilateral aid might serve a catalytic function in prompting action. As discussed in OTA's *Development Assistance, Export Promotion, and Environmental Technology*, industrial countries provided about \$5 billion in bilateral and multilateral environmental aid in 1991.²² This aid has probably increased; Japan claims its 1992 environmental aid was more than twice that in 1991—over \$2 billion.

Cleaner technologies and pollution prevention are promising options to keep life cycle costs for environmental infrastructure manageable. Some pollution prevention approaches are very inexpensive, although requiring technical assistance and training of personnel. In other cases, cleaner technologies entail higher front end costs than conventional equipment; however, they can be more attractive than conventional options when operating and maintenance costs are considered. Technical assistance to provide reliable informa-

²¹ U.S. Congress Office of Technology Assessment, *Development Assistance, Export Promotion, and Environmental Technology*, OTA-BP-ITE-107 (Washington, DC: U.S. Government Printing Office, August 1993).

²² *Ibid.*

tion about alternatives could be useful to developing country decisionmakers. U.S. firms and consultants are among the leaders in providing such services.

The United States offers substantial assistance to developing countries to enhance their environmental management capabilities.²³ If Congress wished to pursue more multilateral activities to help develop information needed for environmentally and economically sound choices, the following options might be considered:

OPTION 16: Support establishment of a technical information program by an international agency such as the United Nations Environment Program, the United Nations Development Program, or the Global Environment Facility to provide objective information and technical advice about environmental technologies to developing countries.

OPTION 17: Through multilateral channels, support cleaner technology and pollution prevention services to developing countries in addition to the existing USAID bilateral environmental pollution prevention project.

BILATERAL ASSISTANCE AND EXPORT PROMOTION

The United States Government now spends about \$650 million per year on environmental and related energy aid to developing countries. U.S. aid programs are not as overtly commercial as some other countries' programs are perceived to be. Use of aid to support commercial transfer of U.S. environmental technologies has been limited. However, some forms of assistance can benefit a donor country's commercial goals in ways that are compatible with the development aspirations of developing countries.

Some recently initiated public-private partnerships aim to involve U.S. industry in efforts by

developing countries to address environmental problems. The United States-Asia Environmental Partnership (US-AEP), launched in 1992, works with U.S. agencies and firms to encourage use of U.S. technologies and expertise in Asian country environmental efforts. It is too soon to evaluate US-AEP. If it succeeds, US-AEP's regional emphasis might be attempted in other promising market areas. The U.S. Environmental Training Institute (USETI), another recently launched public-private partnership, brings business and governmental decisionmakers to the United States for training through which U.S. firms can showcase their technologies.

Newly authorized programs, such as major new environment and energy technology transfer programs called for in the 1992 Energy Policy Act, emphasize an USAID role with the Department of Energy in transferring technologies to developing countries, in part because of the potential benefits to U.S. firms and the U.S. economy. As indicated in Option 18, Congress might consider fuller funding for these programs.

Helping developing countries with capacity building also can bring commercial benefits to donors. Support for the development of central laboratory facilities—equipment and training—for the environment agencies of developing countries could create preferences for U.S. standards, protocols, instruments, and other equipment. Such laboratories may set nationwide standards for environmental monitoring that may produce further orders for U.S. equipment from private sector and State/provincial/municipal laboratories.²⁴

Technical training is another area where a donor's commercial interests and the recipient's developmental and environmental interests may coincide. The United States has an advantage in that many engineers in developing countries have

²³ *Ibid.*, pp. 58-61.

²⁴ Japan, for instance, has funded the Environmental Management Center for the Indonesian environmental agency. The Center includes a central reference laboratory that will be outfitted with Japanese instruments. Some expect that provincial and private laboratories might adopt similar Japanese instruments so that they will be compatible with the central government laboratory.

received university education here. programs like USETI offer a way to expose developing country officials in both the public and private sectors to U.S. technology. However, there is also a need to train developing country personnel who will operate and maintain equipment and plants once facilities are constructed. Support for operations training could be an effective way to meet both development assistance and export promotion goals.

Grants to developing countries for project feasibility studies conducted by U.S. firms is another form of support; often, these studies lead to subsequent purchase of technologies or products made in the United States. The U.S. Trade and Development Agency (TDA) contends that its feasibility study grant program generates over \$20 in *U.S. sales* for every Federal dollar spent. Compared to some other countries, such as Japan (over \$200 million per year), funding for TDA is low—about \$40 million in fiscal year 1993; an increase to \$60 million has been proposed. Since many TDA feasibility studies contain environmental components, such an increase would likely encourage more environmental exports. In its recent export promotion strategy, the Clinton administration proposed consolidation of all Federal feasibility studies for major projects primarily intended to promote U.S. exports.²⁵

Compared to some donors, the United States provides little aid for capital projects—projects that often involve internationally traded goods and services. If undertaken in a developmentally and environmentally sound way, funding capital projects could create many commercial opportunities for U.S. firms. Some would contend that such a change would ruin months to years of U.S. efforts to encourage other donors to reduce their use of mixed credits and other tied aid loans.

If Congress wishes to place more emphasis on links between foreign aid and environmental export promoting, it might consider several options:

OPTION 18: Fund provisions in the Energy Policy Act of 1992 (Public Law 102-486) that call on the Secretary of Energy, acting through USAID or other Federal agencies, to encourage transfer of environmentally preferable energy technologies to developing countries. Three new programs were authorized: an innovative environmental technology transfer program, a clean coal technology transfer program, and a renewable energy technology transfer program. (The authorized funding level for each of these programs is \$100 million per year through fiscal year 1998.) Also fund the developing country training program on renewable energy authorized by the law.

OPTION 19: Increase funding for the Trade and Development Agency for project feasibility studies.

OPTION 20: Encourage U.S. firms to provide training of developing country personnel for use of U.S. equipment and services. This might be accomplished through TDA funds.

EXPORT PROMOTION POLICY AND STRATEGY

The Export Enhancement Act of 1992 gave new emphasis to the need for better coordinated Federal export promotion efforts, including those pertinent to environmental exports. In addition, several environmental export promotion bills had been proposed in the 103d Congress.²⁶

The Clinton administration's initial export promotion strategy, prepared in response to the Export Enhancement Act by the Trade Promotion Coordinating Committee (TPCC), was issued in

²⁵ Trade Promotion Coordinating Committee, *Toward a National Export Strategy* (Washington, DC: U.S. Government Printing Office, Sept. 30, 1993), p. x.

²⁶ See, for example, H.R. 2112, the proposed National Environmental Trade Development Act of 1993, as reported by the House Merchant Marine and Fisheries Committee on June 30, 1992; H.R. 2096, to promote exports of environmental technology, goods, and services; S. 979 the proposed Greentech Jobs Initiative Act of 1993; and S. 1074, the proposed National Environmental Trade Development Act of 1993.

September 1993.²⁷ The Act also gave statutory direction for an environmental trade working group as part of the TPCC. The Department of Commerce, the Department of Energy, EPA and some other Federal agencies had just issued an environmental export strategy when this report went to press.²⁸ Congress could monitor its priorities and implementation plans, including mechanisms for private sector involvement and priorities for the export potential of cleaner technologies (Option 21).

Federal Agency Export Promotion Budget—

Several U.S. agencies and programs work to promote U.S. exports. Five agencies, the Commerce Department, Eximbank, the Agriculture Department, USAID, and the Small Business Administration (SBA), account for 90 percent of Federal outlays and most Federal field operations.²⁹ Other agencies with important roles include TDA and the Overseas Private Investment Corp. (OPIC). Numerous other agencies, including DOE and EPA, may have some involvement.

The Export Enhancement Act charged the TPCC with proposing an “annual unified” Federal export promotion budget. In its initial year under the new Act, the TPCC was unable to accomplish this—deferring development of the budget proposal to the fiscal year 1995 budget process. A particularly thorny issue concerns agriculture’s budget share: according to the U.S. General Accounting Office, agriculture, in fiscal year 1991, accounted for 10 percent of U.S. exports, but 75 percent of the Federal export promotion budget.

Private Sector Role—A key question in export promotion generally, and in environmental exports specifically concerns the nature and degree

of private sector involvement strategy development and priority setting. Some contend that there needs to be more private sector involvement in developing an environmental export strategy, and have proposed creation of a public private council to prepare an action plan to implement the strategy after it is accepted. The danger is, of course, that such a plan would become a form of special pleading by its private sector members. However, some precedents already exist for industry involvement in priority setting. One example is the Committee on Renewable Energy Commerce and Trade (CORECT) which could become a model for other subsectors.

Financing—Inability to put together an acceptable financing package often limits U.S. firms’ ability to secure overseas projects. Moreover, the U.S. Government has few funds available for capital project financing in its aid program. Some other exporting countries offer more accessible and lower cost financial help to their firms in exporting (see ch. 6). The U.S. Eximbank does maintain a War Chest, but it is used defensively to counter unfair financing packages put together with support from other countries. Increased funding for the War Chest was authorized by Congress in 1992; it could be used to help U.S. environmental firms with financing when faced by a competitor with an unfair package. The War Chest also might be used proactively, to help U.S. firms finance projects that are more favorable from an environmental standpoint that might not otherwise be able to compete with lower cost, environmentally less favorable projects.

Another approach would be to give special priority to environmental projects by opening a special window for environmental loans at close-to-market rates at the Eximbank or other financ-

¹⁷ *Toward a National Export Strategy*, *op cit.*, footnote 25.

²⁸ **Ronald H. Brown, Hazel O’Leary, Carol Browner**, *Environmental Technologies Exports: Strategic Framework for U.S. Leadership*, November 1993.

²⁹ Statement of **Allan L. Mendelowitz**, ‘Export Promotion: Initial Assessment of Governmentwide Strategic Plan,’ testimony before the **House Committee on Foreign Affairs Subcommittee on Economic Policy, Trade and Environment**, September 29, 1993, U.S. General Accounting Office, GAO/T-GGD-93-48, p. 9.

ing institutions. These institutions are now expected to give special attention to projects that are environmentally preferable.

Foreign Commercial Service Representation—The United States & Foreign Commercial Service (US&FCS), part of the Commerce Department, maintains offices in this country and overseas. It is understaffed relative to the commercial offices of several competing countries. (See table 6-6 in ch. 6.) Congress could consider increasing the number of commercial officers. It also could provide resources to improve the timeliness and quality of commercial information from overseas offices to U.S. firms. Such steps might help increase U.S. exports of goods and services generally, not just in the environmental arena.

In some countries, the few US&FCS officers that are available must help sell a great range of American products, from textiles to nuclear power plants. It might help if some commercial officers could specialize in specific industries, such as environmental products where a potentially large market exists—a step authorized by the Export Enhancement Act.³⁰ While more officers could be assigned overseas, it might be cheaper to employ local nationals or Americans living overseas. While increasing environmental officers would be useful in this sector, the more general issue of staffing and resources for US&FCS remains.

A more far-reaching approach would be to set up American business centers in key market areas to facilitate interactions between U.S. firms and potential clients. An environmental trade measure under consideration in the 103d Congress, H.R. 2112, proposes such an approach.

Information Clearinghouses and One-Stop Shopping—Many U.S. companies (including small and medium-sized enterprises) find it difficult to make use of government export assistance programs. They may not know how to obtain

information about environmental opportunities in other countries. An information clearinghouse and a one-stop shopping process might help. Such a process would allow a business to tap into all U.S. export promotion and financing programs at a single source. Small companies have special difficulties financing market research in other countries, especially when they are inexperienced with exports.

Many potential exporters are unaware of existing Federal export support services. Better marketing of these services, such as the 1-800-USA-TRADE DOC Trade Information Center, US&FCS regional offices, and the National Trade Data Bank, through advertising in business and industry publications could heighten export awareness.

If Congress wishes to provide more emphasis on environmental export promotion, it could consider several steps:

OPTION 21: Conduct early oversight of the administration's environmental export strategy, including mechanisms for private sector involvement in implementation, and the priority given to export opportunities associated with cleaner technologies.

OPTION 22: Provide resources for US&FCS to hire industry sector specialists, including environmental industry specialists in key countries.

OPTION 23: Call for dissemination of evaluations of U.S. environmental technologies to potential foreign customers (see also Option 8).

OPTION 24: Call for demonstration of one-stop shopping approaches for export promotion, using environmental technologies and services as one area of emphasis. This activity would go beyond the initial efforts by United States-Asia Environmental Partnership and the Committee on Renewable Energy Commerce and Trade to consolidate application forms by providing a range of services to small businesses with limited export experience.

³⁰ The US-Asia Environmental Partnership has recently opened business offices in a number of Asian capitals as a complement to US&FCS in promoting U.S. environmental business opportunities.

Congress also might direct Federal export promotion programs to take steps to make U.S. firms more aware of available services by advertising in business and industry publications, increasing outreach to industry associations, chambers of commerce, and industry conferences, and increasing support and collaboration with State and local export promotion programs and World Trade Center institutes.

A more far-reaching approach, proposed in H.R. 2112 in the 103d Congress, would be to encourage exports through a network of environmental business centers in the United States and American business centers in countries with promising environmental markets.

OPTION 25: Consider ways to expand export financing while maintaining environmental safeguards. One possibility would be to offset extra costs borne by U.S. firms in designing environmentally preferable projects when going up against a project proposed by a foreign firm with inadequate safeguards.

■ Issue Area E: International Trade and Environmental Policy

The potential for conflict between environment and trade objectives seems to be increasing. Environmentalists contend that the environmental implications of the Uruguay Round trade discussions at the General Agreement on Tariffs and Trade (GATT) were overlooked by trade negotiators. Trade officials, for their part, are wary that some measures ostensibly taken to protect the environment could be used as means for trade protection.

U.S. positions on trade and environment issues will need to be developed for international discussions over the next few years. Since 1990, the Organization for Economic Cooperation and Development (OECD) has been sponsoring member country discussions about possible trade and

environment guidelines. Both trade agencies and the environmental agencies of member countries (mostly, advanced industrial nations) are involved so that the discussions could lead to greater integration. However, some disputes involve developing countries, which are not members of OECD.

GATT, long inactive on trade and environment matters, has begun to review these questions from the trade perspective. A working group is examining trade measures in international environmental agreements, the trade transparency of national environmental regulations, and the trade effects of environmentally oriented packaging and labeling requirements. GATT groups have begun to discuss possible ways to follow up on a recommendation from the United Nations Conference on Environment and Development (UNCED) that multilateral agencies work to make environment and trade mutually supportable in the service of sustainable development. While environmental matters have not been addressed in the Uruguay GATT Round, the possibility of addressing trade and environment questions in a subsequent GATT round has been raised by some trade officials.

An OTA background paper, *Trade and Environment: Conflicts and Opportunities*, discusses some of the difficulties entailed in developing U.S. positions during the initial period of the OECD discussions.³¹ The complexity and difficulty of the subject matter, and the number of agencies involved (the United States Trade Representative, the State Department, the Environmental Protection Agency, and several other mission agencies) partly explained the slow progress. More importantly, it was difficult to articulate goals for U.S. negotiating positions, since trade, economic, and environmental perspectives all need to be taken into account in defining U.S. positions. Such differences in perspective continue even when administrations change. To assure adequate formulation of U.S.

³¹U.S. Congress, Office of Technology Assessment, *Trade and Environment: Conflicts and Opportunities*, OTA-BP-ITE-94 (Washington, DC: U.S. Government Printing Office, May 1992).

Table 2-5-issue Area E. International Trade and Environmental Policy

| | | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Policy goals promoted ^d | | |
|----|---|---|---|--|--|--|
| | | | | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| 26 | Conduct oversight on U.S. policy development for GATT and OECD trade/environment discussions | S | N | P | P | P |
| 27 | Expand efforts to develop multilateral or bilateral agreement on environmental standards to address competitive impacts | S | Y | Y | Y | Y |
| 28 | Combine technical assistance with efforts to upgrade developing country environmental standards in advance of trade discussions | M | Y | Y | Y | Y |
| 29 | Work for more effective monitoring and enforcement of multilateral environmental agreements | S | N | Y | Y | Y |
| 30 | Work to establish a global business charter on environmental standards | S | Y | Y | Y | Y |
| 31 | Encourage other countries to require firms to report toxic release inventories | S | Y | Y | Y | Y |

a S=small (\$10 million or less); M=moderate (\$10 to \$100 million); L=large (\$100 million plus); a range indicates that it depends on how the option is implemented.

b Y=yes; P=potentially yes; N=no; ?-effect is unclear

SOURCE: Office of Technology Assessment, 1993.

policy in this area, Congress may wish to conduct oversight or provide guidance to the administration (Option 26 discussed at end of this section and discussed in table 2-5).

NEGOTIATING ENVIRONMENTAL STANDARDS

Compared to many other countries, the United States imposes relatively strong environmental standards on industry. While there has long been concern about possible competitive impacts of such standards, much of the research conducted in the 1970s and 1980s found only minor impacts. However, recent efforts to liberalize trade and investment rules, and the emergence of several newly industrialized and advanced developing countries as strong competitors, have again brought attention to possible competitive impacts.

Environmental issues were central in the debate about the North American Free Trade Agreement for Mexico, the United States and Canada. Aside from the NAFTA itself, a side agreement addressing environmental matters has been negotiated. (Congress had just approved NAFTA when this report went to press).

Environmental matters will almost certainly arise if other efforts to liberalize trade are undertaken in Latin America, the Asian Pacific region, or elsewhere. With or without trade liberalization, there is special concern about the potential for competitive and investment impacts for the United States when firms in other countries have lower labor costs as well as less strict health, safety, and environmental standards or enforcement.

Given this context, some have suggested that the U.S. Government should do much more to

encourage other countries to upgrade their environmental standards as part of a strategy to improve the environment, expand opportunities for U.S. environmental firms, and avoid negative competitive impacts for U.S. firms and workers. (Option 27). Legislation to that effect has been introduced in the 103d Congress.³²

An aggressive effort to negotiate bilateral and multilateral environmental agreements would be a departure from policies in the 1980s, and would require high level guidance and coordination.³³

Such an effort would be controversial with developing countries, and is not likely to succeed unless accompanied by help for capacity building and technical assistance. It might also be opposed by those who see such efforts as steps toward global bureaucracy. The strategy would be difficult to carry out without continuing, high level commitment.

As discussed in Options 29-31, the potential for adverse competitive impacts also might be reduced if there were more effective monitoring and enforcement of agreements, if businesses were encouraged to adhere to developed country standards throughout the world, and if other countries took steps such as calling on business to report their releases of toxic substances, as they are required to do in this country.

The approaches set forth in Options 26-31 would be controversial, both here and in other countries. Moreover, past efforts to adopt such policies have had little success. Yet there could be long-term benefits for the environment and quite possibly, a more positive climate in this country

for trade liberalization with countries that now have weaker environmental standards.

To some extent, officials in developing nations may believe they are in a prisoners dilemma with regard to environmental regulations. If one country raises standards, it risks losing out on investments by multinational corporations to neighbors with lower standards. As a result, standards may stay lower than they might be otherwise. If companies applied high standards in their facilities around the world, concerns about competitive disadvantage from strict regulation would be eased. While some multinational companies (including a number of U.S. firms) say they do this already, they may well be the exceptions.

Some might argue that there is no competitive reason for such negotiations, because, they claim, strict environmental regulations can lead to increased competitive advantage. Firms within countries having strong regulatory demands on industrial processes can find that aggressive environmental actions, particularly pollution prevention, make them more competitive relative to other domestic competitors. However, as a group, firms within countries with strict regulations will face higher compliance costs relative to foreign competitors in countries with more lax standards and enforcement. When waste disposal costs and requirements are high, firms can sometimes save money by controlling pollution and reducing wastes. However, these actions are usually not justified from an economic perspective alone when waste disposal costs and requirements are zero or minimal. Still, as has been mentioned,

³² See for example, H.R. 1830 the proposed Global **Environmental Cleanup Act**, and H.R. 1446, the proposed **Western Hemisphere Environmental, Labor, and Agricultural Standards Act of 1993**. Other approaches, such as treating the absence of strict standards as an unfair trade practice for which countervailing duties might be imposed, have also been proposed. For discussion on how such approaches might be viewed in the context of the GATT, see *Trade and Environment: Conflicts and Opportunities*, *op. cit.*, pp. 66-68.

³³ It should be noted that Congress has required strategies in the past. Section 811 of the 1990 Clean Air Act Amendments (P.L. 101-549) required the President to provide Congress with a strategy for addressing competitive impacts arising from differences in national standards through "trade consultations and negotiations." Although due in May 1992, the strategy had yet to be submitted in September, 1993. Section 6 of the 1972 Federal Water Pollution Control Amendments (P.L. 92-500) directed the President to negotiate international agreements to apply uniform performance standards or uniform controls for some categories of pollutants in order to head off possible competitive impacts. Efforts by the Carter administration in 1978 to raise pollution and workplace health standards in Tokyo Round GATT talks encountered strong opposition from business and foreign countries. See H. Jeffrey Leonard, *Are Environmental Regulations Driving U.S. Industry Overseas?* (Washington, DC: The Conservation Foundation, 1984), pp. 8, 13.

strong domestic regulations are often a key factor in competitiveness of environmental goods and services industries.

Steps Congress could consider include:

OPTION 26: Conduct oversight on development of U.S. positions on trade and environment matters. Several agencies (USTR, State, EPA, etc.) have missions that relate to trade and environment questions; efforts to use interagency discussions to develop positions have been ineffective. Without high level guidance, informed by other high level strategy documents (e.g., a possible administration policy on international environment, trade policy, etc.), it will be difficult for the United States to present appropriate positions at OECD, GAIT, and other forums.

OPTION 27: Call on the administration to expand efforts to develop multilateral or bilateral agreements on environmental standards, not just for environmental reasons but also to offset competitive impacts arising from different levels of regulation. The U.S. Government could encourage other countries to strengthen their domestic environmental standards, and provide technical assistance on how to implement and enforce standards. Such discussions and activities could be carried out in advance of any formal discussions about trade liberalization. This approach would require close coordination among agencies with roles to play in foreign assistance, the environment, international trade, and export financing and promotion.

OPTION 28: Increase emphasis in U.S. development assistance on technical assistance to developing countries for implementing and enforcing environmental standards. (See additional discussion under Issue Area D.)

OPTION 29: Work to develop more effective monitoring and enforcement provisions for multilateral environmental agreements.

OPTION 30: Encourage establishment of a global business charter under which participating multinational companies agree to use home country standards when investing in other nations.

OPTION 31: Encourage other countries to make use of reporting requirements (such as that required for U.S. firms by the toxic release inventory).

■ Issue Area F: Data and Information Needs for Policymaking

Data on commerce in environmental products and services, and on costs borne by industry to meet environmental standards are often poor, often inconsistent, and frequently not available. The economic consequences of pollution are even less well-documented, though they are real nonetheless.

Trade and production figures collected by the Department of Commerce and foreign equivalents often do not correspond closely to many categories of environmental products. In many cases the distinction between an environmental and nonenvironmental good is difficult to discern—a blower, pump, or measuring instrument may be used in environmental equipment or not—and discriminating between the two types of goods is likely to become more difficult as pollution prevention approaches become more widely used. However, better data gathering is possible. For instance, since 1971 the U.S. Bureau of Census has been collecting yearly data on orders and shipments of selected industrial air pollution control equipment—yet such data series seem not to have been collected for industrial wastewater and waste treatment equipment. Another example comes from the Japan Society of Industrial Machinery Manufacturers, which publishes data on orders for environmental equipment categorized by media (air, water, waste, noise, and vibration) and by user (manufacturing, nonmanufacturing industry, government, and export).

OPTION 32: Improve the collection and analysis of commercially relevant environmental data including production and trade of environmental goods and services, environmental compliance costs for businesses, and economic costs of pollution and environmental degradation. Such

Table 2-6--issue Area F. Data Needs for Policy Making

| | | Policy goals promoted ^b | | | | |
|----|--|---|---|--|--|--|
| | | Impact on Federal expenditures ^a | Does option require major changes in Federal role? ^b | Enhance overall manufacturing industry competitiveness | Expand markets for U.S. environmental goods and services | Further global or developing country environmental goals |
| 32 | Direct pertinent agencies to: | | | | | |
| | • collect and analyze more commercially relevant data on trade and environmental goods and services | S | N | ? | Y | Y |
| | • facilitate flow of commercial information to companies | M | P | Y | Y | Y |
| | • verify and assess ways to improve pollution abatement cost data | S | N | P | N | N |
| 33 | • identify and quantify benefits of regulations through study | M | N | ? | ? | ? |
| | Call for periodic assessment of competitive effects of differing levels of environmental regulations among countries, and for development of strategies to address any adverse effects | S | N | Y | P | P |

^a S=small (\$10 million or less); M=moderate (\$10 to \$100 million); L=large (\$100 million plus); a range indicates that it depends on how the option is implemented.

^b Y=yes; P=potentially yes; N=no; ?-effect is unclear

SOURCE: Office of Technology Assessment, 1993.

efforts could be coordinated with the OECD and perhaps the UN Statistical Office. As part of this, Congress would:

- Support a small effort at the Census Bureau to verify accuracy of the Pollution Abatement and Control Expenditure Data and to determine ways to improve the data. Support a small effort at the International Trade Commission or the Department of Commerce to improve data and reporting of environmental products and services trade.
- Fund a reasonably large scale study to more carefully identify and quantify the benefits of

environmental regulations. Ensure that the findings can be readily incorporated into economic models measuring the impact of regulations on the economy.

OPTION 33: Call for periodic reassessment of the competitive impacts of different levels of environmental standards among different countries. The research could focus on comparison of relative strictness of pollution control and waste treatment actions required of industries in other countries, and identification of competitive effects for business operations in the United States.

These options are listed in table 2-6.