

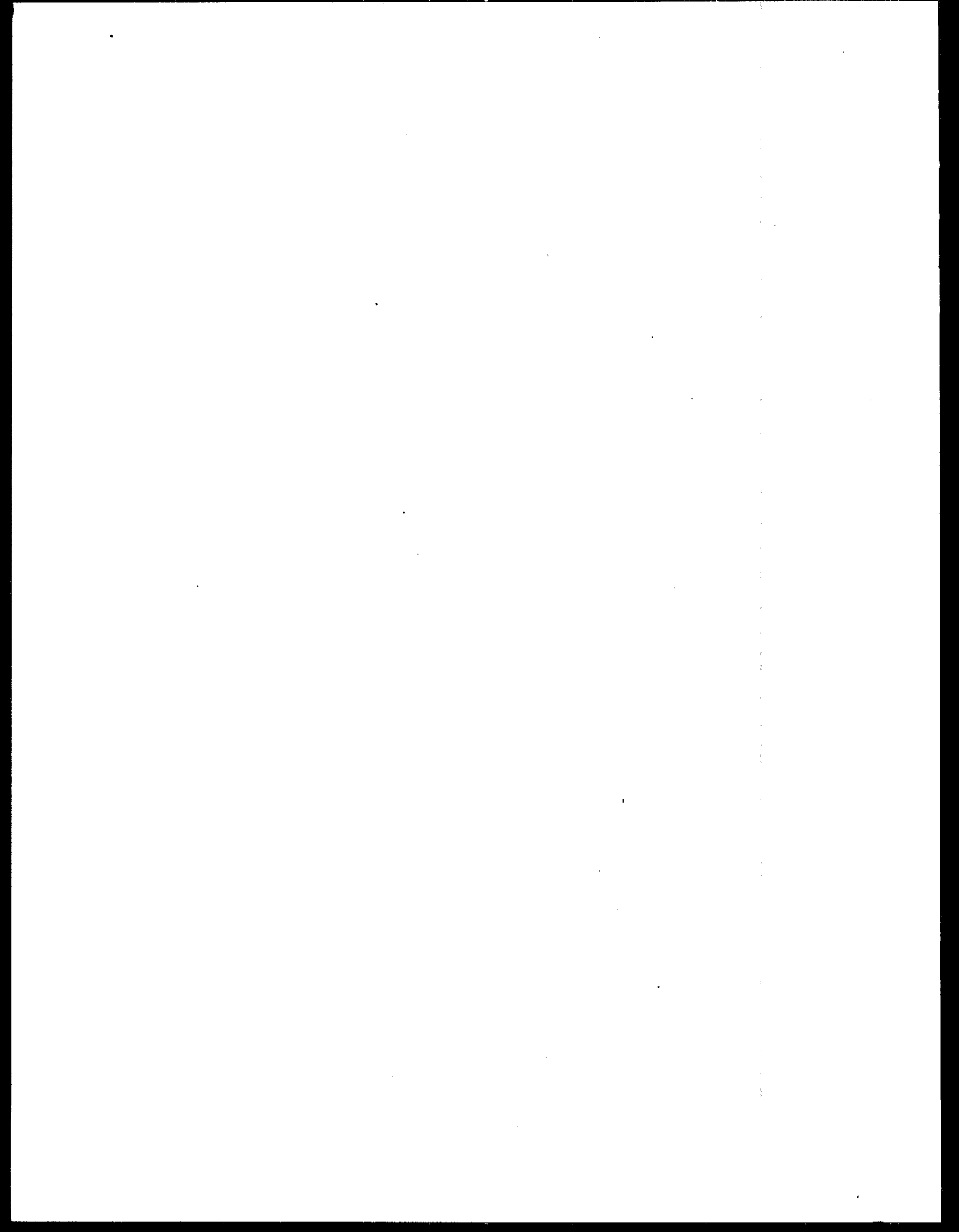


Sustainable Development And The Environmental Protection Agency

Report To Congress



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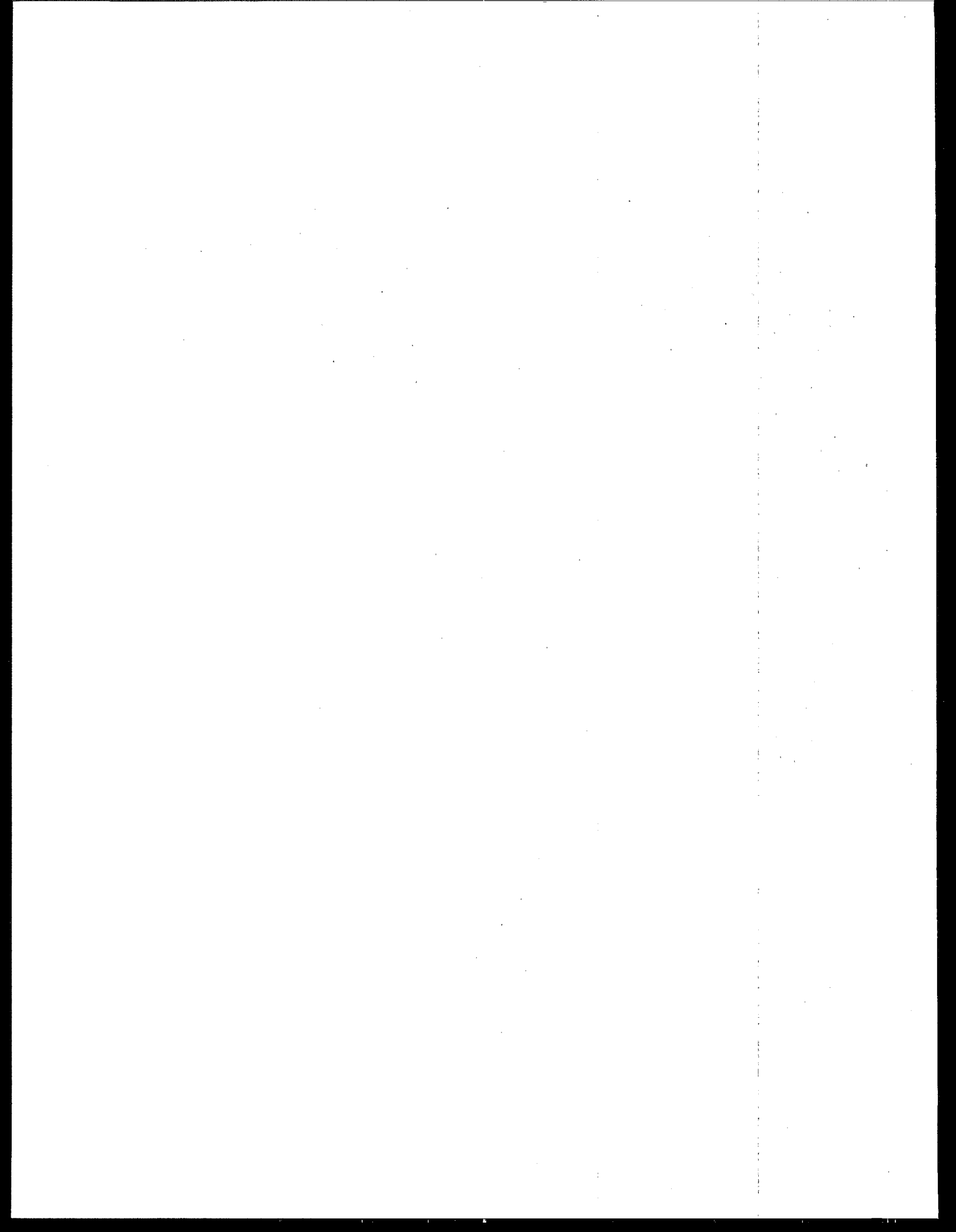
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EXECUTIVE SUMMARY

Sustainable development has emerged in the last decade as a focal point for research, discussion, and recommendations regarding the long-term economic and environmental outlook for the United States and the world. The level of global concern about sustainable development was evident, for example, at the 1992 United Nations Conference on Environment and Development, where representatives from 180 countries gathered "to promote sustainable and environmentally sound development." In view of the increasing interest in this topic, Congress has asked the Environmental Protection Agency to report on its efforts to incorporate the concepts of sustainable development into the Agency's operations.

Sustainable development, according to the United Nations World Commission on Environment and Development, "is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." While the operational meaning of sustainable development is still the subject of scientific and political discussion, consensus does exist on several of its fundamental tenets.

Sustainable development:

- requires a long-term perspective for planning and policy development;
- dictates actions that build on and reinforce the interdependence of our economy and our environment; and
- calls for new, integrative approaches to achieve economic, social, and environmental objectives.

EPA has a potentially important role in applying the tenets of sustainable development to protect the environment and promote environmentally sound economic development over the long term.

Many past and present Agency programs have utilized tenets of sustainable development, but the Agency has not employed this concept explicitly as an overall policy framework or programmatic objective. Several issues are particularly important in shaping the Agency's current and potential contributions to sustainable development. First, the

limited use of sustainable development concepts in EPA policies in part reflects the minor role these concepts have in the Agency's statutory mandates. Second, while the general concept and basic tenets of sustainable development are fairly straightforward, its applications and relevance to specific policy decisions are less certain. Third, an EPA sustainable development program is most likely to be successful if it builds upon the strengths of existing Agency programs that improve the quality of the environment we pass on to future generations. Fourth, the full scope of planning and implementation of sustainable development policies extends well beyond the purview of the Environmental Protection Agency. EPA seeks a dialogue with the public, Congress, and other government agencies to identify ways to integrate sustainable development into both the Agency's operations and National environmental and economic policy.

This report is meant to highlight Agency programs and projects that are particularly relevant to the basic tenets of sustainable development. It does not, however, review every EPA program that ultimately contributes to sustainable development, but rather focuses on newer approaches that complement the Agency's conventional activities.

Advancing Our Horizons. Addressing broad objectives like sustainable development requires anticipatory, integrated approaches to environmental problems. Consistent with this need, the Agency is strengthening its use of strategic planning and developing measurable environmental goals for the range of problems it addresses. Similarly, EPA is expanding its use of geographic approaches to facilitate integrated protection efforts for some of the Nation's key environmental resources, such as the Chesapeake Bay, the Gulf of Mexico, and the Great Lakes.

Several new approaches at EPA facilitate its strategic planning efforts. Comparative risk assessment allows the Agency to set priorities and assess strategic options more effectively, so that resources can be directed first to the environmental problems that pose the most significant risks. The development of a "future studies" function will allow

Agency planners to use longer time horizons in strategic plans.

The Agency is enhancing its work to promote environmental equity by considering the environmental needs of future generations and the broad spectrum of communities facing environmental risks today. The benefits of several EPA programs, such as efforts to protect stratospheric ozone, to mitigate or adapt to potential climate change, and to protect ecological resources, will accrue largely to future generations. EPA established an Environmental Equity Workgroup that has provided recommendations to improve the Agency's consideration of equity issues. The Agency is committed to ensuring that the consequences of environmental pollution should not be borne unequally by any segment of the population.

Developing a Knowledge Base. Progress toward sustainable development must build on knowledge about our environment and how development affects it. A variety of EPA programs are providing new and vital information about the links between environment and development.

Statistically and scientifically credible environmental data and information are needed to measure progress towards environmental goals and sustainable development. The Agency is developing a central staff within its Office of Policy, Planning and Evaluation to serve as a focal point for Agency compilation, analysis, and communication of statistical information on the environment.

EPA is also implementing a program to gather and provide statistically rigorous information about status and trends in the Nation's ecological systems. The Agency's Environmental Monitoring and Assessment Program (EMAP), the first statistically-based monitoring program to assess ecosystems on a national scale, should advance our scientific understanding of ecosystems and how they are changing and responding to human activities. EMAP will provide information about specific types of ecological resources, such as forests, agroecosystems, arid lands, wetlands, inland surface waters, estuaries, and the Great Lakes. EPA has worked extensively with other Federal agencies,

foreign governments, and the United Nations Environment Programme in developing, demonstrating, and applying EMAP and its methodologies.

EPA is developing a National Human Exposure Assessment Survey (NHEXAS) to document the status of and trends in human exposures to selected contaminants. NHEXAS will assist EPA in setting priorities for mitigating risks to human health.

EPA is sponsoring research to improve understanding of global environmental issues, such as global climate change, stratospheric ozone depletion, and loss of biodiversity, which have raised international concerns about the sustainability of human activities. The Agency's climate change research includes efforts to enhance our knowledge about the causes of global climate change, predict its potential impacts on economic sectors and ecosystems, and develop effective mitigation policies. EPA climate change research focuses on national issues specifically important in the U.S. and also on the particular concerns of scores of countries around the world. EPA-sponsored research on stratospheric ozone depletion addresses the effects of ultraviolet radiation exposure on human health and ecosystems, methods of reducing emissions of ozone depleting compounds, and the environmental impacts of possible substitutes for these compounds.

The dependence of our economy and well-being on ecosystems gives ecological research an important role in refining our understanding of sustainable development. The Agency has developed a framework for ecological risk assessment to improve its ability to address risks to ecosystems consistently. EPA is also improving models that predict the ecological impacts of pollution. The Agency is conducting anticipatory research on the ecological impacts of promising new technologies and practices, including biotechnology products and innovative agricultural practices.

EPA is working to expand understanding of the contribution of ecosystems to human well-being and the economy. The Agency has sponsored an Ecosystem Valuation Forum, which outlined opportunities for ecological and economic research

to improve valuation of ecosystems. EPA is working with other Federal agencies and international organizations to develop and implement environmental accounting systems, which integrate environmental assets and service flows into conventional economic accounting systems.

The role of the social sciences is becoming increasingly important in anticipating and responding to new environmental challenges. EPA is developing a Social Sciences Research Agenda to direct research towards topics that are likely to be most important in its continuing efforts to protect the environment.

New Tools for Environmental Protection. As the Agency works to address new environmental challenges and to resolve persistent and intractable aspects of old problems, it is making greater use of innovative environmental protection tools. Pollution prevention eliminates environmental degradation before it occurs and, because it improves the efficiency of resource use, it can save money at the same time. EPA is working to promote use of pollution prevention techniques in government, business, and among consumers. The Agency is also developing pollution prevention strategies for the agricultural, energy and transportation, and Federal government sectors and for consumers.

EPA has also established some very successful voluntary pollution prevention programs. Over 700 businesses now participate in the "33/50 Program," which calls for a voluntary 33% reduction in emissions of seventeen high priority chemicals by 1992 and a 50% reduction by 1995. The "Green Lights Program" has signed up over 400 corporations to install energy-efficient, pollution-preventing lighting.

The Agency is making greater use of cost-effective economic incentives as an alternative to the more rigid command-and-control approaches used in the past. Properly designed incentives harness market-driven innovation to protect the environment more effectively at less cost. The Clean Air Act Amendments of 1990 (CAAA) make much use of economic incentives: the Title IV sulfur dioxide allowance-trading system alone is expected to save \$700 million to \$1 billion annually.

The Agency is working to expand the use of incentives in other program areas, such as the reduction of non-point source water pollution.

EPA is working to help state and local governments use public-private partnerships and other alternative financing mechanisms to finance the costs of environmental protection.

The Agency is also working to promote development of environmentally beneficial technologies. In accordance with the Federal Technology Transfer Act and in support of the President's National Technology Initiative, the Agency is collaborating with private researchers to develop new technologies and to stimulate U.S. competitiveness.

Focusing on Regions and Communities. Local and regional programs to promote sustainable development are integral parts of larger-scale efforts, and EPA is increasingly active in working to meet local and regional environmental needs and in protecting our most valuable environmental resources.

The Agency has expanded its use of geographic targeting, which focuses on the environmental problems and needs of a particular geographic area. EPA uses geographic targeting as an integrative approach to involve all local stakeholders and to address all significant regional environmental problems. EPA currently has about fifty geographic initiatives, ranging in size from the Great Lakes National Program to watershed-based approaches developed by the Office of Water.

EPA is also assisting regional, state, and local efforts to promote sustainable development. EPA's Region 10 has undertaken a Sustainable Development Initiative to examine new approaches to environmental protection through the use of sustainable development as an integrating objective. Several EPA Regions are working with state and local agencies to integrate environmental priorities into development activities. EPA also has supported several state and local sustainable development projects, such as the sustainable city projects in Portland, Oregon, and San Jose and San Francisco, California.

Enhancing Public Awareness and Participation. The Nation can only achieve and maintain sustainable development when its citizens understand this concept and embrace it as a national priority. As part of its efforts to educate the public about the environment and what can be done to protect it, the Agency administers an Environmental Education Grants Program and will fund a national Environmental Education and Training Program to train a force of environmental educators. These efforts are coordinated with the Department of Education's "America 2000" Initiative.

Complementing its educational efforts, the Agency is working to improve public access to information on environmental issues. Under the Emergency Planning and Community Right-to-Know Act of 1986, EPA administers the Toxic Release Inventory (TRI), an annual inventory of releases of over 300 toxic chemicals. The TRI provides information to the public about sources of pollution and has served as a basis for voluntary pollution prevention efforts, such as the 33/50 Program. EPA also administers a number of information clearinghouses, hotlines, and information centers to provide businesses and the public with environmental information.

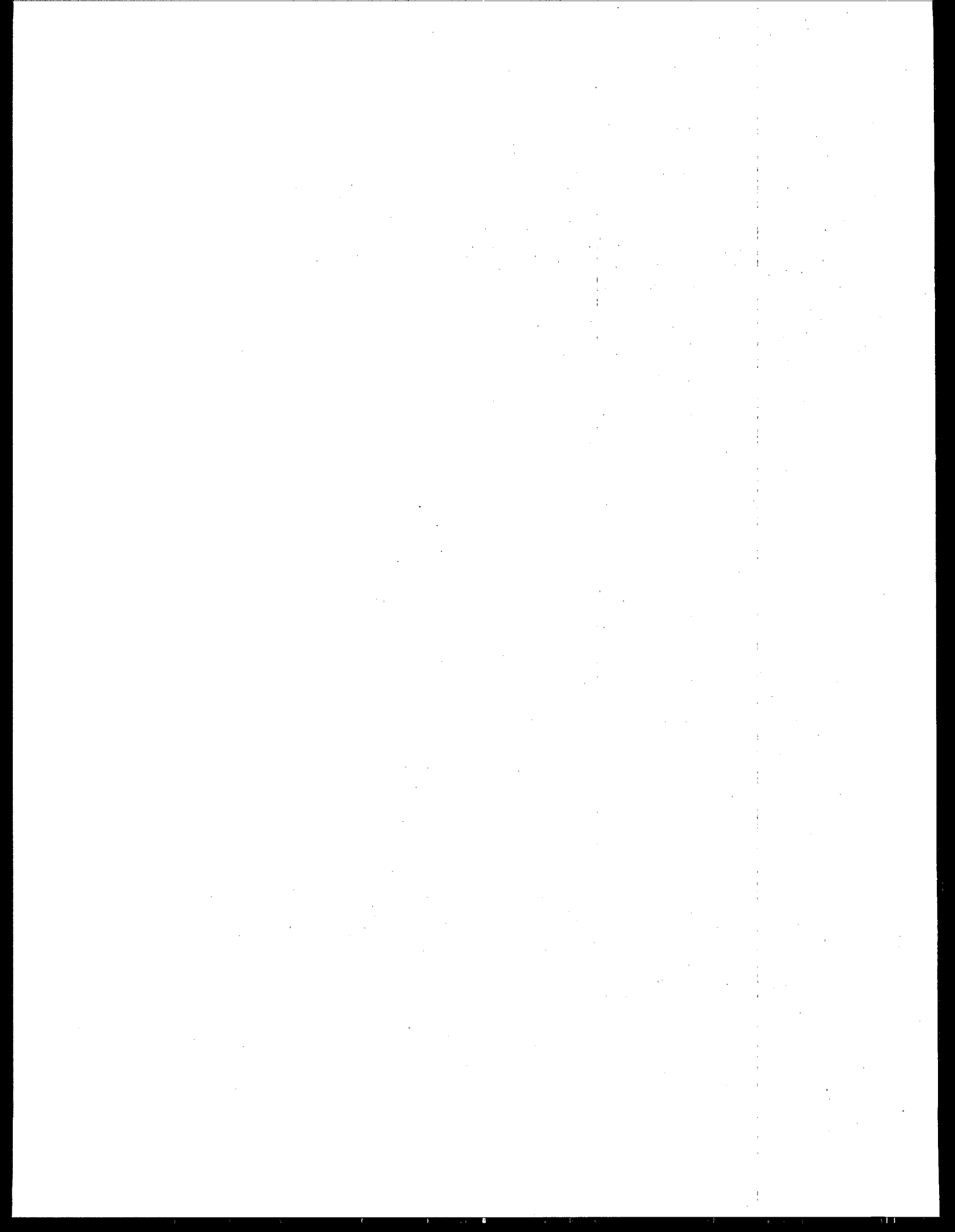
International Efforts. EPA's international programs support sustainable development, both domestically and abroad, by protecting ecosystems that we share with other countries. The 1991 Air Quality Agreement with Canada bolsters both U.S. and Canadian efforts to reduce acid rain. The Integrated Environmental Plan for the Mexican-U.S. Border Area, approved this year, strengthens cooperative enforcement, pollution prevention and reduction, and coordinated planning between the two countries. EPA also cooperated with other concerned parties to facilitate the establishment of the Caribbean Environment and Development Institute. The Institute will help reduce pollution of valuable coastal ecosystems in the Gulf of Mexico and Caribbean Sea.

EPA also works with other countries to protect the global environment. U.S. leadership in international efforts to protect stratospheric ozone helped bring about the Montreal Protocol, and

EPA now works with U.S. industry to develop substitutes for chlorofluorocarbons (CFCs). The Agency provides assistance to promote the use of CFC-substitutes and refrigerant recycling to reduce CFC emissions in developing countries. It works in particular with China, Mexico, and Ecuador to foster reductions in their use of ozone depleting chemicals. EPA is a leader in global efforts to reduce marine pollution, and will take an active role in the upcoming intergovernmental meeting on protection of the marine environment. The Agency also participates in international efforts to address potential climate change, and the U.S. has committed \$25 million to assist developing countries in preparing national climate change plans. These funds will be used to inventory greenhouse gas sources and sinks, analyze effects of potential climate change and assess scientific and technical options.

EPA has established cooperative agreements with more than twenty countries and participates in fifteen international organizations. EPA works with other Organization for Economic Cooperation and Development (OECD) countries on a program under which each member will receive a national environmental performance review. EPA also works closely with the Agency for International Development (AID) and the Peace Corps in providing environmental expertise in Central and Eastern Europe, the former Soviet Union, and in the developing world. EPA is working to share U.S. "lessons learned" in environmental protection, and has distributed sets of Technical Information Packages (TIPS) to 116 countries around the world. EPA participates in the U.S.-Asia Environmental Partnership to strengthen environmental management in target countries in that region of the world and to open new markets for U.S. suppliers of environmental goods and services. The Agency has engaged in international efforts to respond to environmental emergencies, such as those arising in the Persian Gulf War. EPA works closely with the Treasury Department, AID, and other agencies to support environmental improvement and sustainable development through the loan and grant programs of multilateral banks. The Agency also supports programs such as the

Environment for the Americas Program, which enables qualifying Latin American and Caribbean countries to use the interest on certain U.S. Government-held debt to support grass-roots environmental protection within their borders. EPA is making important contributions to resolving environmental issues associated with the North American Free Trade Agreement and is a leading player in trade and environment initiatives underway at the OECD and the General Agreement on Tariffs and Trade (GATT).



1 INTRODUCTION

Background and Purpose

Sustainable development has emerged in the last decade as a focal point for research, discussion, and recommendations regarding the long-term economic and environmental outlook for the United States and the world. In view of the increasing national and international interest in sustainable development, Congress has asked the Environmental Protection Agency (EPA) to report on its efforts to incorporate the concepts of sustainable development into the Agency's operations.¹

This report highlights EPA programs and activities that are most relevant to the basic tenets of sustainable development. Many past and present Agency programs have utilized the tenets of sustainable development, but the Agency has not employed this concept explicitly as an overall policy framework or programmatic objective. With this report, the Agency describes its current efforts and commitments to a dialogue with Congress, other government agencies, and the public on the best ways to define and understand sustainable development and to incorporate its tenets into EPA operations.

Sustainable Development

Although "sustainable development" is a relatively new term, it encompasses some familiar concepts. At the beginning of this century, for example, Theodore Roosevelt articulated a vision that seems remarkably similar to present-day ideas about sustainable development when he wrote, "the nation behaves well if it treats the natural resources as assets which it must turn over to the next generation, increased and not impaired in value."²

Principles now known as sustainable development concepts have previously been incorporated in many of the Nation's efforts to preserve, protect, and manage natural resources and

habitats. Conservation programs for resources such as soils, forests, and water and the creation of protected areas such as National Parks have served to promote responsible, long-term use of the Nation's natural endowment. The National Environmental Policy Act of 1969 codified and expanded the scope of these responsibilities as national policy, by requiring that the U.S. Government work to "fulfill the responsibilities of each generation as trustee of the environment for succeeding generations."³ The creation of EPA in 1970 and subsequent national environmental legislation further integrated and strengthened the Nation's ability to protect its environment for the betterment of current and future generations.

In recent years, sustainable development has become an internationally recognized objective and the focus of international diplomacy at the highest levels. The United Nations World Commission on Environment and Development (WCED) reported in 1987 that "sustainable development should be seen as a global objective."⁴ The Group of Seven (G7) industrialized countries declared, at its Paris Economic Summit in 1989:

Protecting the environment calls for a determined and concerted international response and for the early adoption, worldwide, of policies based on sustainable development.⁵

Again in 1991, the G7 noted at its London Economic Summit:

Our economic policies should ensure that the use of this planet's resources is sustainable and safeguards the interests of both present and future generations.⁶

In June, 1992, sustainable development served as the central theme of the United Nations Conference on Environment and Development (UNCED), the largest diplomatic conference ever held. The UNCED brought leaders and representatives from 180 countries to Rio de Janeiro, Brazil

to elaborate strategies and measures to halt and reverse the effects of environmental degradation . . . to promote sustainable and environmentally sound development in all countries.⁷

President Clinton and Vice President Gore wrote in *Putting People First*, "We will renew America's commitment to leave our children a better nation--a nation whose air, water, and land are unspoiled, whose natural beauty is undimmed, and whose leadership for sustainable global growth is unsurpassed".⁸

Three Tenets of Sustainable Development

Sustainable development, according to a widely accepted definition offered by the WCED, "is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."⁹ While the general concept of sustainable development seems simple, the term draws its meaning from a rich variety of concepts in several disciplines, including ecology, development economics, and fisheries and forestry management, as well as from social and ethical concerns about the welfare of future generations.

In part because of its multidisciplinary heritage, a clear, operational definition of sustainable development has been difficult to establish. Its precise dimensions have been the subject of vigorous debate for over a decade. In fact, the literature on the subject now includes scores of different definitions. Each of these implies different goals, policies, and measures of progress. While the precise meaning of sustainable development is still the subject of scientific and political discussion, consensus does exist on several of its fundamental tenets.

First, sustainable development requires a long-term perspective for planning and policy development. The decisions we make today will affect the course of economic development and the quality of the environment for generations to come. With heightened awareness of how our activities impact others, both today and in the future, we are better equipped to choose patterns of development that are sustainable.

Second, sustainable development must build on and reinforce the interdependence of our economy and our environment. This tenet has two

corollaries. On the one hand, a strong economy is needed to provide for a high quality of life and to make effective environmental protection affordable. For example, the economic strength of the U.S. has provided most Americans with a high standard of living and allowed substantial investments in environmental protection. In 1990 alone, pollution control expenditures totalled approximately \$115 billion. This amount was just over 2% of U.S. Gross Domestic Product (GDP) for that year.¹⁰ It was also larger than the Gross Domestic Products of over 90 countries of the world.¹¹

On the other hand, economic-environmental interdependence means that a healthy environment makes continued economic development possible. Economic activity depends on the environment as a source of renewable and nonrenewable resources, a sink for wastes, and a life-support system for humans and other species. Technological innovations and other benefits of development have enabled us to improve the productivity of environmental resources. Yet the extent of our environment's carrying capacity--its ability to serve as both source and sink, and to support life--is finite.

The bounds of our environment's source and sink functions are not clear, but it is evident that when economic policies ignore environmental considerations, the economy eventually suffers. This has been the lesson in eastern Europe and in other parts of the world where central economic planning and scant attention to the environment have brought unprecedented environmental and economic catastrophes. Poland provides a dramatic example; that country's annual economic losses caused by environmental degradation were recently estimated at 15% of its GDP.¹² In the long run, the economy must build on and maintain an environment that provides for the welfare of people and the integrity and diversity of the ecological systems on which we depend.

Third, sustainable development calls for new, integrative approaches to achieve economic, social, and environmental objectives. In part, this follows from the second tenet: to reflect the interdependence of the economy and environment, environmental policies must increasingly be set in

the same context as development policies, such as those affecting natural resource management, agriculture, transportation, and energy. When environmental priorities are not adequately addressed up-front in development policies, society's economic resources may later be drained by costly damages to natural resources and cleanups of resulting problems.

Yet the need for more comprehensive approaches extends beyond the environment-economy link. Environmental policies themselves must be better integrated so that pollution cleaned up in one place is not simply moved to another, and so that our resources may be allocated to address the highest priority environmental problems effectively. Development of environmental programs and policies must also incorporate the long-term needs of as many of our communities as possible, so that regulatory and other actions have desired, equitable results and do not cause unforeseen economic dislocations.

In summary, a concern for sustainable development counsels long-term time horizons consistent with our responsibilities to others, recognition of the interdependence of the economy and the environment, and more comprehensive, integrated approaches to economic development and environmental protection.

Sustainable Development and the Environmental Protection Agency: Past and Present Issues

EPA has a potentially important role in applying the tenets of sustainable development to protect the environment and promote economic prosperity over the long term. Many past and present Agency programs have utilized the tenets of sustainable development, but the Agency has not employed this concept explicitly as an overall policy framework or programmatic objective. EPA seeks a dialogue with the public, Congress, and other government agencies to define sustainable development more clearly and identify ways to integrate it into the Agency's operations. This

report highlights past and current EPA activities most relevant to the tenets of sustainable development and is intended to provide context for such a dialogue.

Several issues are particularly important in shaping the Agency's current and potential contributions to sustainable development. First, the limited use of sustainable development concepts in EPA policies in part reflects the minor role these concepts have in the Agency's statutory mandates. EPA has developed its programs and projects primarily to fulfill statutory mandates that do not specify sustainability as an objective.

Second, while the general concept and basic tenets of sustainable development are fairly straightforward, its applications and relevance to specific policy decisions are less certain. EPA has sponsored some policy research on sustainable development concepts and their relevance to the Agency's mission.¹³ At present, however, EPA has not conducted a systematic investigation of the opportunities for incorporating sustainable development concepts more fully into its operations.

Third, an EPA sustainable development program is most likely to be successful if it builds upon the strengths of existing Agency programs. Many of these programs make important contributions to sustainable development by improving the quality of the environment that we pass on to future generations. Several of EPA's newer environmental protection approaches, such as pollution prevention and the use of economic instruments, are especially well-suited to provide both environmental and economic benefits to the Nation. A sustainable development program should integrate, rather than duplicate, the contributions of current programs.

Fourth, the full scope of planning and implementation of sustainable development policies extends well beyond the purview of EPA. Objectives often associated with sustainable development, such as sustainable management of natural resources, sustainable agricultural practices, improved energy efficiency, improved economic and environmental equity, and a competitive U.S. economy, can only be addressed through the cooperative efforts of multiple Federal agencies, the

Congress, state and local governments, businesses, and nongovernment organizations. Similarly, cooperation among many government agencies will be needed to develop useful measures of sustainability and to assess the sustainability of environmental and economic trends on a variety of temporal and geographic scales. As the lead national agency for environmental protection, EPA can exercise an important role in developing intergovernmental and public-private coalitions to accelerate progress toward sustainability, but progress will depend on the contributions of many institutions.

Sustainable Development and the Environmental Protection Agency: New Opportunities

The issues outlined here should be important in shaping a dialogue on the Agency's role in promoting sustainable development. Such a dialogue clearly should address EPA's statutory authorities and how they influence the Agency's role, the links between sustainable development tenets and the Agency's mission and existing programs, the practical meaning of sustainable development for specific policy decisions, and mechanisms to facilitate coordinated action among all relevant Federal agencies. This report makes no specific recommendations on what the outcome of such a dialogue should be, nor does it outline a program to incorporate sustainable development concepts into Agency operations. Instead, the report provides information that can facilitate discussions of the actions that EPA and other agencies might take to promote sustainable development.

The Agency has undertaken other activities to foster dialogue on its potential contributions to sustainable development. EPA hopes to initiate a cooperative effort with Congress and the public to establish long-term, measurable environmental goals. These goals will be used at first to guide the Agency's multi-year strategic planning. Goals also can be useful in a broader context to engender the

cooperation needed to address sustainable development effectively. Eventually, goals should embody national consensus on a practical meaning for sustainable development--development that best meets our needs and those of generations to come.

Organization of the Report

EPA activities that are most relevant to the tenets of sustainable development fall into several broad categories. *Section 2* of this report highlights Agency efforts to expand its planning time horizons and build anticipatory capabilities that will facilitate protection of the environment for living and future generations. This section discusses the importance of EPA's enhanced focus on goal-oriented strategic planning and the usefulness of establishing priorities using comparative risk assessments. It also describes EPA's efforts to strengthen its consideration of environmental equity by taking into account the environmental needs of future generations and of populations facing special risks today. *Section 3* describes EPA's work to develop a knowledge base that can be used by government officials and the public to set the goals and policies needed to foster sustainable development. This knowledge base will include basic research to improve our understanding of the natural systems on which we depend; data collection, analysis, and interpretation to provide statistical information on environmental status and trends; social science research to examine human behavior and its impacts on the environment; and economic research to understand the significance of the environment's contributions to human welfare. Further development of this knowledge base is essential to making sustainable development a practical policy tool. *Section 4* discusses new tools and approaches that the Agency is employing to help harmonize economic development and environmental priorities. These include pollution prevention, economic incentives, public private partnerships, and efforts to spur environmentally beneficial technological innovation. *Section 5* describes the Agency's heightened focus on the particular needs associated

with specific environmental resources, communities, and regions. *Section 6* examines EPA efforts to expand public awareness of environmental issues through education and improved access to environmental information. *Section 7* describes some of the Agency's international activities that foster sustainable development, or advance its basic tenets, both within the United States because of cooperative international efforts and at a global level. Finally, EPA activities undertaken in cooperation with other agencies are discussed throughout these sections. The examples provided demonstrate the importance of interagency coordination and integrative approaches in promoting sustainable development, and underscore the fact that EPA is only one of many potential contributors to policies and actions supporting sustainable development.

2 EXPANDING OUR HORIZONS

Strategic Planning

Since its creation in 1970, EPA has achieved many successes as the primary Federal regulatory agency responsible for preserving and improving environmental quality. Under environmental legislation enacted by Congress, EPA has developed programs to control air pollution, water pollution, hazardous and other wastes, toxic substances, and other threats to the environment. Much progress has been made in these two decades. Yet many environmental problems remain. Moreover, scientific research and technological developments have revealed the fragility, complexity, and interrelatedness of global ecosystems, as well as the pace and scale of human modifications to the natural environment.

As our understanding of environmental problems grows, EPA is committed to strengthening its leadership role in anticipating and addressing current and future environmental challenges. These include such intractable problems as indoor air pollution, water pollution from agricultural and urban runoff, global climate change, stratospheric ozone depletion, and loss of biological diversity. The Agency must serve as an effective agent for change and develop innovative approaches to anticipate and solve environmental problems.

To foster a more anticipatory, integrated approach to environmental problems, the Agency has strengthened its use of strategic planning. While EPA's planning has historically focused on year-to-year statutory implementation activities and emergency responses to crises, strategic planning will increasingly use goal-oriented approaches to address longer-term priorities. The Agency is now working to define and make greater use of environmental goals in its strategic plans by setting measurable environmental goals for the range of media-specific and multi-media problems it addresses. While the Agency has not established sustainable development as an environmental goal, many of these measurable goals support the tenets

discussed in Section 1. By developing goal-oriented policies and using environmental indicators as measures of progress towards the goals, the Agency can enhance its ability to address environmental problems and to assess its effectiveness in solving these problems. Environmental goals will supplement the more conventional administrative goals used by the Agency.

Strategic planning has also provided EPA with the opportunity to employ more holistic approaches to environmental problems. EPA's organizational structure, which divides the Agency into offices that address specific media and types of pollution (i.e. air, water, solid waste, pesticides and toxic substances), has at times resulted in inconsistent responses to environmental challenges. The longer-term perspective provided by strategic planning fosters development of "cross-media" initiatives, which utilize Agency resources and tools more consistently. Geographic initiatives, for example, allow the Agency to focus all its legal authorities and programs in an integrated response to threats to specific environmental resources, such as the Chesapeake Bay, the Gulf of Mexico, and the Great Lakes. These whole-watershed protection approaches will provide more effective means of protecting both environmental quality and natural resources. Cross-media initiatives are not isolated from EPA's media-specific work; instead, they exploit opportunities to improve existing Agency programs to obtain better environmental results.

Several new directions at the Agency serve to support the Agency's enhanced use of strategic planning. One is use of risk assessment and risk reduction concepts for setting priorities and assessing strategic options. Because environmental protection may be costly and public funds are scarce, EPA is working to identify and to devote resources first to the environmental problems that pose the highest risks to human health and the environment. Following internal EPA efforts to prioritize environmental concerns, the Agency's Science Advisory Board (SAB) in 1990 published *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. This report provided a comparative risk analysis of the environmental problems facing EPA. Among the highest-priority

problems identified by the SAB were global climate change, stratospheric ozone depletion, habitat alteration, and loss of biological diversity.¹⁴

To facilitate implementation of the SAB recommendations, EPA in 1992 established ten strategies that set an Agency-wide framework for policy decisions. These are described in *Strategies and Framework for the Future*,¹⁵ published in July 1992. The strategies include: (1) strategic implementation of statutory mandates; (2) improving science and the knowledge base; (3) pollution prevention: EPA's preferred choice; (4) geographic targeting for ecological protection; (5) greater reliance on economic incentives and technological innovation; (6) improving cross-media program integration and multi-media enforcement; (7) building state/local/tribal capacity; (8) enhancing international cooperation; (9) strengthening environmental education and public outreach; and (10) better management and infrastructure. Many of these strategies are directly relevant to sustainable development and its basic tenets, and several will be discussed in detail later in this report.

A second new Agency direction that supports a greater role for strategic planning is the use of "future studies." The Agency has recently established a future studies function within its strategic planning office to support anticipatory approaches to environmental challenges. The results of this work will give EPA a better vision of the environmental problems of tomorrow, so that we can begin development of cost-effective solutions today.¹⁶

Scenario development requires a greater understanding of the economic, demographic, institutional, and social forces which will drive change in the future. Technological and social trends which may have significant environmental consequences will be monitored and analyzed. In particular, EPA is examining the relationships between current and anticipated activities in various sectors of the economy and environmental quality. The Agency's future studies serve to improve our understanding of the long-term interdependence of the environment and the economy.

In addition to these new directions supporting an enhanced role for internal strategic planning, EPA is also involved in broader efforts to set long-term environmental priorities. For example, EPA is an active participant in a joint effort by several government agencies, industry, academia, and citizen groups to identify key issues relating to long-term planning of water resource management. The initiative, *Water Quality 2000*, is a three-phase study to identify long-term problems and solutions regarding loss of water quality and quantity in the United States.¹⁷ Over 80 organizations have participated, including many Federal agencies in addition to EPA, such as the Army Corps of Engineers, the Department of the Interior (Bureau of Land Management, Fish and Wildlife Service, and U.S. Geological Survey), the Department of Transportation, and the Department of Agriculture (Agricultural Research Service, U.S. Forest Service, and Soil Conservation Service).

The evolving strategic planning process is beginning to change the way the Agency approaches environmental challenges. Anticipatory approaches guided by environmental goals can help us address long-term environmental issues more effectively.

Equity

Our ethical responsibility to bestow a healthy environment upon future generations is an important tenet of sustainable development. Because future generations are not able to express preferences in the marketplace or in the political process, fulfillment of intergenerational responsibilities will require that we adopt a long-term perspective and work to protect the environment for future generations.

Our ability to ensure sustained environmental quality for future generations depends on our ability to estimate the long-term impacts of today's patterns of development. The need for the strategic planning and future studies efforts described above is therefore critical, and recent Agency efforts to strengthen these functions will provide mechanisms for greater consideration of future needs.

Several EPA programs are directed primarily at achieving results over the long term. For example, the benefits of Agency efforts to protect stratospheric ozone, to mitigate or adapt to potential climate change, to eliminate persistent pesticides that contaminate soil, water, and sediments, and to protect ecological resources will accrue largely to future generations.

Equity issues encompassed by sustainable development include not only concerns about future generations but also the needs of the disadvantaged of today. Substantial linkages exist between alleviating poverty and protecting the environment. For example, since the poor have fewer resources to avoid, prevent, or remedy environmental problems, they will often face disproportionate exposures to environmental hazards but will benefit most from environmental improvements if these are implemented equitably.

In response to growing concerns about environmental equity, EPA established an Environmental Equity Workgroup in July 1990 to examine the issue. The Workgroup released its final report, *Environmental Equity: Reducing Risk for All Communities*, in June, 1992.¹⁸ The Report recommends improved consideration of equity issues in such EPA functions as risk assessments, permitting actions, grants, monitoring activities, enforcement actions, and outreach efforts. It calls for more attention to the variations in exposure to environmental hazards, and to the associated health effects, faced by different racial, ethnic, and socioeconomic groups. Other recommendations include improved communication of information about environmental risks to racial minorities and low-income populations and development of information that will allow identification of populations that may be subjected to special environmental risks. The Report also suggests ways the Agency can incorporate environmental equity into strategic planning, management, and other activities, as well as the activities of state environmental agencies.

EPA has also undertaken a number of initiatives to address the equity issue. In one regional project, the Agency is analyzing the locations of certain environmentally hazardous

industries relative to low-income and minority communities. Another project focuses on the exposure of certain inner-city residents to lead. The Agency is currently engaged in a cooperative agreement with the Columbia River Intertribal Fish Commission (CRITFC) to investigate the levels of potential exposure to dioxins from fish. Because Native Americans from the Commission's Tribes rely heavily on fish in their diet, they may be at higher risk from dietary exposure to dioxins.

Low-income and minority populations may also benefit substantially from EPA's overall environmental programs. The new Clean Air Act will improve air quality for more than 15 million African-Americans and more than eight million Hispanics living in areas with relatively poor air quality.¹⁹

3 DEVELOPING A KNOWLEDGE BASE

Progress toward sustainable development must build on knowledge about the ecosystems in which we live and work and how our activities and patterns of development affect these ecosystems. EPA is actively working to improve the information available to government officials and the public on the environment and its linkages to development and human welfare. This information is needed to shape programs and policies that will be most conducive to sustainable development and the values it suggests.

A variety of Agency programs and initiatives support efforts to build this knowledge base. Some of these programs are designed to collect and interpret environmental data. Others monitor long-term environmental trends. EPA is also conducting research on global environmental problems that may be especially relevant to sustainable development, since these problems call into question the sustainability of current patterns of development at an unprecedented scale. The Agency is conducting research on many aspects of ecosystems and the valuable services they provide to people; better information about ecological systems will enable us to identify activities and policies that prevent degradation of the ecosystem processes on which all life depends. Other research activities are intended to enhance our knowledge of the interdependence of the economy and the environment, and to improve our ability to utilize the social sciences more effectively to understand and protect our environment.

Environmental Statistics and Information

To measure progress towards environmental objectives, we need statistically and scientifically credible environmental indicators. These will provide the baseline and measures of environmental trends and conditions necessary to assess both national and world progress towards sustainable development.

In the United States a variety of Federal, state, local, and nongovernmental organizations collect environmental data; we have plentiful environmental data, but our ability to obtain useful information from those data has been impeded by the lack of an overall structure for organizing and acquiring data. EPA has recognized the need for an active, centralized focus for environmental statistics and the need to establish a statistically and scientifically rigorous multi-media information base. The Office of Policy, Planning, and Evaluation recently has taken steps to develop a centralized statistical function for the Agency. This will provide Agency decision-makers and the public with scientifically credible data and information on status and trends in the environment and, in conjunction with other Agency monitoring and data management activities, will provide assessments of the relative significance of the factors associated with environmental changes. This new function will provide the Agency and the Nation with information for the assessment of progress towards environmental and programmatic goals compatible with sustainable development.

EPA is also contributing to North American, Organization for Economic Cooperation and Development (OECD), and global efforts on environmental statistics. As part of a long-term effort, the Agency is developing and implementing joint activities with Canadian and Mexican counterparts on environmental statistics and state-of-environment reporting.

Long-Term Monitoring

The ability to evaluate environmental status and trends to assess long-term progress towards sustainable development goals is critical to designing and managing programs compatible with sustainable development. EPA has initiated programs to provide statistically rigorous information about status and trends in the Nation's ecological systems and in the exposure of Americans to toxic environmental contaminants.

EPA is implementing a statistically-based Environmental Monitoring and Assessment

Program (EMAP) to further our scientific understanding of ecosystems in the United States and the status of and long-term trends in these systems. This program is EPA's first major effort to provide a large-scale, multi-media assessment of ecological status and trends.²⁹

EMAP will use a nationwide sampling grid and a statistically-based survey design to monitor the condition of the Nation's ecological resources, including forests, agroecosystems, arid lands, wetlands, estuaries, inland surface waters and the Great Lakes. An important contribution of EMAP is research to develop a variety of appropriate indicators of ecological condition for each of these different types of ecosystems. The Program will use these indicators as measures in monitoring the ecosystems, and the results will allow detection of environmental trends in ecosystems at risk from multiple environmental stressors.

EMAP selects indicators that relate to environmental processes ranging from the causes to the effects of human impacts on ecosystems. For example, some indicators relate to aspects of the environment with immediate value to the public, such as forest productivity, wildlife biodiversity, flood protection and water purification functions of wetlands, recreational value, or other ecosystem "services" provided by the environment. EMAP "response" indicators also may identify ecosystem disturbances that are less readily perceived as significant by the public but that nonetheless could portend damage to economically important resources. Examples include shifts in nutrient processing rates in forest soils that presage damage to trees, or shifts in zooplankton species that lead to shifts in the composition of fish communities.

EMAP is a comprehensive program that builds on the expertise of many U.S. agencies, including the U.S. Department of Agriculture, the U.S. Geological Survey, the National Park Service, the Fish and Wildlife Service, and National Oceanic and Atmospheric Administration. Currently EPA is cooperating with seventeen governmental agencies and national laboratories in conducting pilot and demonstration studies.

EMAP can also serve as a model for international development of a global ecological

monitoring network that would allow assessment of world-wide environmental status and trends. U.S. scientists are working with universities and governments around the world to develop and apply relevant mapping and remote sensing techniques for indicator selection and to help adapt EMAP sampling design to the spatial scales of other nations. EMAP staff are working with the United Nations Environmental Programme (UNEP) to extend EMAP technology transfer capabilities and to help catalogue and integrate existing monitoring activities on a global scale. Some of the projects the U.S. has provided assistance for include a study on the decline of Brazil's rain forests using EMAP design, characterization of Australia's arid lands using EMAP characterization methodology, and a comparative study of EMAP and Czechoslovakian forest soil indicators. EMAP scientists have also consulted with Canada, Finland, France, Nepal, New Zealand, Romania, and the former Soviet Union.

EPA is also extending its monitoring and assessment activities to the area of human exposure and health. The National Human Exposure Assessment Survey (NHEXAS) is being planned to provide an extensive assessment of exposure of Americans to toxic substances. The data collected through NHEXAS will be used to document the current status of exposure, historical trends in exposure levels, and the potential for future exposures to selected contaminants. The statistically-based survey will be a critical link in the assessment of human exposure, and the Agency's approach to more effective control of toxic releases. NHEXAS is being designed to assist managers in identifying priorities for exposure mitigation based upon relative risks to human health.

Research on Global Environmental Issues

The discovery of environmental problems of global dimensions has heightened international concerns about the sustainability of human activities. Problems such as global climate change, stratospheric ozone depletion, and loss of biodiversity are now central to discussions of what

will be necessary to promote sustainable development. The worldwide participation at the recent United Nations Conference on Environment and Development in Brazil, which served as a forum for international debate and agreements on global environmental issues, reflects the breadth of concern about these challenges.

The Environmental Protection Agency sponsors research to improve understanding of global environmental issues and to develop effective policies to address them. These research efforts are coordinated with those of other federal agencies through EPA's partnership in the U.S. Global Change Research Program (USGCRP). The Agency more than doubled its budget for research on global change between 1989 and 1992.²¹

The Agency is conducting a number of research efforts to further understanding of the potential causes of global climate change. EPA is working to quantify the relative warming potential of the various greenhouse gases, such as carbon dioxide (CO₂) and methane. This information will be necessary for formulation of a comprehensive greenhouse gas policy. The Agency is also working with the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS) to monitor the rates of global deforestation and burning of biomass. The results will be used to assess the extent of the contributions of these activities to increased atmospheric concentrations of greenhouse gases in the atmosphere. Other EPA research seeks to reduce uncertainty about the fate of atmospheric carbon emissions in order to facilitate more precise predictions of the consequences of changing emissions. The Agency has also been developing and testing, in conjunction with the Department of Energy, more advanced models of the impacts of carbon dioxide and other greenhouse gas emissions.

EPA is sponsoring research on the potential impacts of climate change within the United States and around the globe. Using an integrated approach that incorporates models of climate change, models of its potential effects on agriculture, forests, water use, and ecosystems, and economic models, the Agency is developing

estimates of the societal and economic losses that climate change could cause in the United States. This effort builds on other Agency research efforts. For example, in cooperation with NASA, the Agency is studying the responses of key crops to increased temperature and CO₂ concentrations, and examining how these responses may vary by region. EPA is also assessing the vulnerability to potential climate change of selected animal species and their critical habitats. The results will be used in modelling agricultural and ecological impacts of potential climate change.

EPA is conducting research to support development of effective climate change mitigation policies. For example, in cooperation with the Lawrence Berkeley Laboratory, the Agency in 1992 published a guidebook on the use of tree planting and surface coloring to reduce urban heat island effects and conserve energy.²² Seven municipalities are now working with EPA to implement the recommendations in the guidebook. The Agency is examining the potential use of managed forests and agricultural soils in the U.S. for reducing concentrations of carbon in the atmosphere. EPA has also worked with the private sector to demonstrate innovative approaches to reduce anthropogenic methane emissions. In cooperation with the Department of Energy and private industry, EPA is studying ways to enhance the use of renewable energy sources, such as biomass combustion to fuel electric power generation and solar photovoltaics to produce electricity in small end-user applications. These uses can reduce fossil fuel consumption and greenhouse gas emissions.

The Agency will continue to aid other nations, particularly Eastern European and developing nations, in preparing the national implementation plans required by the Framework Convention on Climate Change signed at the UNCED in Rio and ratified by the United States this October. EPA is designing methodologies that other countries may use to prepare these plans. The Agency is also developing country studies that include emissions inventories, projections of future emissions based on current policies, and assessments of the effectiveness of various climate change policy

options. EPA has already assessed the potential climate change impacts on sixty different countries, focusing on implications for human health, agriculture, forests, rivers, and coastal areas that may be affected by sea level rise.

The Agency's stratospheric ozone program sponsors research on the effects of increased ultraviolet (UV-B) radiation on human health and terrestrial and aquatic ecosystems. This research will continue to examine the relationships between UV-B dose and damage to humans and sensitive ecosystems. Research also continues on ways to reduce emissions of chlorofluorocarbons (CFCs), Halons, hydrochlorofluorocarbons (HCFCs), and other ozone depleting compounds (ODCs). As private industry and EPA's research programs identify compounds that may be used as substitutes for ODCs, the Agency is evaluating these potential substitutes to determine if they can replace ODCs without causing other environmental problems. EPA research is also supporting development of environmentally safe recovery, reuse, and disposal techniques to minimize emissions of the existing inventory of ODCs.

Ecological Research

EPA is enhancing its ecological research efforts and is extending the perspective of this research beyond small scale efforts with local environments. The Agency is looking at regional, continental, and even global scales for the effects of continuing, persistent, and cumulative pollution. EPA is also focusing on multiple stresses to ecosystems, such as the simultaneous effects of habitat destruction and chemical contamination. Better scientific understanding of the ways in which multiple stressors impact ecosystems at various scales is needed to predict the effects of our activities on the resources that we need to sustain over generations, such as the planet's diversity of ecosystems and species. EPA's research supports the Agency's implementation of statutes such as the Clean Water Act, in which biodiversity is a key indicator in assessing impacts from factors including non-point-source pollution.

The Agency is also conducting anticipatory research on the ecological impacts of promising new technologies and practices. For example, biotechnology products have numerous potential applications, ranging from production of alternative fuels and new industrial materials to improvements in agricultural productivity and food quality. EPA's research will help identify risks that these products may pose to ecosystems or to human health and find ways to reduce or control these potential risks.

Similarly, innovative agricultural practices hold great promise for reducing the ecological impacts of farming. EPA is working in cooperation with the Department of Agriculture to study the ecological benefits of implementing innovative agricultural techniques on midwest farms. This joint effort, known as the Integrated Farm Management System initiative, is designed to assess the economic advantages of these techniques as well as their impacts on habitat, species diversity, and water quality.

In keeping with the Agency's heightened emphasis on protection of ecological systems, the EPA has developed a Framework for Ecological Risk Assessment.²³ This framework will provide the basis for evaluation of ecological risk posed by environmental stressors. It provides an approach conceptually similar to that used for assessment of human health risk, although ecological risk assessments can consider effects beyond those on individuals of a single species and may examine populations, communities or ecosystems. The Agency has prioritized the improvement of its ecological risk assessment techniques and their application to regulatory initiatives.

EPA is currently conducting research on many aspects of ecological risk. Objectives of this research include improved characterization of fate and transport of pesticides and other toxic substances; identification of ecological endpoints, such as increased mortality, reproductive failures, and behavioral changes in animal populations; and development of models to integrate data and depict risk. Another aim of Agency research is reduction of uncertainty in ecological risk assessments through, for example, identification of the contributions to assessment uncertainty made by

temporal variability in ecosystems. This work is conducted in conjunction with EMAP and NOAA.

The Values of Ecosystems and Other Economic Research

Ecosystems provide a variety of benefits to humans and other species. Some of the goods and services supplied by ecosystems include food and natural resources; habitat for species that are important for economic, scientific, aesthetic, spiritual, and other reasons; recreational opportunities for people; creation of soils; decomposition and detoxification of pollutants and wastes; protection from erosion, siltation of rivers, and flooding; and regulation of regional temperatures and precipitation. Together, these and other ecosystem services provide the economy with inputs of natural resources, sinks for the outputs of our activities, and the life-support system that makes possible human society and the biological diversity of the planet.

The importance of some of these ecosystem services to society can be effectively quantified, using scientific assessment methods, and valued, using economic valuation techniques. But neither science nor economics provides techniques that are well-suited to assessment of the full value of many ecosystem services, such as the capacity of large ecosystems to moderate regional climates. Better scientific understanding of ecosystems and their importance is needed to provide economists with the information they need to value ecosystem services. Some of EPA's efforts to improve our ecological knowledge base are described in the previous section. At the same time, new economic tools are needed to improve valuation of the full range of services provided by ecosystems, and to assess the significance of changes in ecosystem service flows when ecosystems are affected by human activities.

EPA's Science Advisory Board (SAB), in *Reducing Risk*, emphasized the importance of improving economic techniques for valuing ecosystems and the services they provide.²⁴ Following the SAB's report, the Agency in 1990

established the Ecosystem Valuation Forum, a group of prominent economists, ecologists, and other natural and social scientists, to explore opportunities for improving our ability to value ecosystem services. In its initial report, the Forum identified ecosystem valuation concepts and problems suitable for research by both economists and ecologists, and thus began to bridge the interdisciplinary gaps that have hindered progress.²⁵ Following up on Forum's findings, the Agency will be undertaking case studies of ecosystem valuation. One such case study, focusing on the wetlands of the Chesapeake Bay, will examine potential linkages between ecological value and economic value. EPA will continue research to improve methods for measuring the economic benefits of environmental resources.

At a larger scale, ecosystems and the environment make important contributions to the Nation's economy. Like conventional economic assets which provide flows of income to their owners, the environment provides flows of benefits to its users and to society at large. Yet, measures of macroeconomic health and prosperity, such as the Gross Domestic Product (GDP), generally do not account for the contributions provided by the environment. For example, when environmental quality is improved, Americans may enjoy the benefits of cleaner, healthier air and water for years to come, but no change is registered in our national economic accounts. Similarly, an economic and environmental catastrophe, such as the Exxon Valdez oil spill, may substantially impair the value of the environment as an asset by reducing its capacity to provide valuable fisheries, recreational opportunities, and natural beauty that many Americans enjoy for its own sake. But the disaster may show up as a *gain* in GDP, because of all the goods and services expended in the cleanup.²⁶

Environmental accounts attempt to resolve these problems by integrating environmental assets and service flows into conventional economic accounting systems. EPA recently completed a pilot project to develop and apply a system of environmental accounts to the Chesapeake Bay area. EPA is also working with other federal agencies and international organizations to develop

and implement environmental accounting systems. The Agency's work to improve valuation of ecosystem services will also serve to strengthen environmental accounting capabilities, since these depend in part on accurate assessments of the economic value of environmental assets.

Environmental accounting offers a framework for identifying and measuring the linkages between the economy and the environment, and it thus has the potential to operationalize sustainable development concepts. The economic and environmental data used in the accounting framework allows us to assess the sustainability of our current patterns of development, and it will be an important tool in measuring progress toward sustainable development.

Social Science Research

As EPA faces new types of environmental challenges and begins to employ new tools to address these (see Section 4), the issues addressed by the social sciences are becoming increasingly important in the Agency's work. Disciplines such as economics, psychology, social psychology, political science, and sociology can contribute to our understanding of how individuals and society make decisions affecting the environment, and how these decisions might collectively foster a transition to sustainable development. Social science research thus complements the contributions of research in the natural sciences by analyzing individual and societal responses to scientific knowledge about the environment.

EPA has conducted, within its various programs, research on social science issues since its creation, but these efforts have not previously been coordinated across the Agency. EPA's Science Advisory Board (SAB), in its 1988 report, *Future Risk: Research Strategies for the 1990s*, and in its 1990 report, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, recommended that EPA give higher priority to social science research. In response to these and similar recommendations from outside the Agency,

the Agency has initiated development of a Social Science Research Agenda.²⁷

A draft of the agenda identifies over 200 potential social science research topics addressing two types of issues: those covered by specific EPA programs and those affecting many different programs. The former include indoor air pollution and radon, global climate change, stratospheric ozone depletion, and wetlands protection, while the latter include such issues as pollution prevention, international trade and its relationship to environmental protection, the anticipation of future environmental problems, economic incentives, and risk communication and the role of information in influencing private behavior. Recommended research ranges from applied research on tools for addressing specific environmental issues to research designed to assess the overall effectiveness of environmental programs.

One example illustrates how the Social Science Research Agenda addresses the heightened importance of social science issues for the Agency's programs. EPA is making greater use of both economic incentives and voluntary programs. Neither approach mandates specific actions or pollution limitations, but instead, each relies on individuals and private businesses to make their own environmentally sound decisions. Our ability to design effective programs using these approaches will depend on our understanding of the factors that shape private decisions affecting the environment. The Social Science Research Agenda recommends research to expand our understanding of how private decisions reflect such factors as economic and non-economic incentives, information about environmental risks and other issues, and the economic status and educational background of a decision-maker.

The course of our Nation's development will ultimately depend upon the multitude of choices we make daily as businesspeople, public officials, and citizens. The draft Social Science Research Agenda, by focusing on these choices and their impacts, represents an expanded EPA emphasis on issues that will ultimately be crucial in the promotion of sustainable development.

4 NEW TOOLS FOR ENVIRONMENTAL PROTECTION

Pollution Prevention

Most of EPA's efforts in the last twenty years have focused on treatment and cleanup of pollution and existing environmental problems. As the Agency seeks to adopt more anticipatory approaches to these problems, it has identified economically efficient pollution prevention as the preferred method of achieving environmental results. Prevention eliminates environmental degradation before it occurs, can obviate costly cleanups of wastes and restorations of degraded resources, avoids the possibility that pollutant emissions may have unanticipated, deleterious consequences in the future, can conserve natural resources, and can cut costs immediately by improving efficiency in the use of natural resources, energy, and water. The long-run benefits of prevention and its combination of economic and environmental advantages makes pollution prevention a particularly useful tool in pursuing sustainable development.

In accordance with the national policy set forth by the Pollution Prevention Act of 1990, EPA is working to promote pollution prevention by government agencies and institutions, businesses, and consumers. In particular, the Agency encourages "source reduction": increased efficiency in the use of raw materials, energy, water, and other resources; protection of natural resources by conservation; and modifications of equipment, processes, products, or materials that reduce creation of pollutants. Taking advantage of the links between pollution prevention and cost-saving efficiency, the Agency is also promoting voluntary programs that help businesses prevent pollution *and* save money.

Sector Strategies. In 1990, Congress requested the Agency to develop pollution prevention strategies for the agriculture, energy and transportation, Federal government, and consumer sectors. Some

of the Agency's sector strategies are described below.

Agriculture. The Agency has worked jointly with the Department of Agriculture to develop an agricultural pollution prevention strategy. In April 1992, the two agencies signed an agreement to develop an overall pollution prevention plan that contains strategic objectives for incorporating environmental goals; programmatic approaches; institutional roles; financial, human, and technological resources; geographic targets; and a specific schedule for achieving objectives.²⁸ This agreement and the initiatives that flow from it will enhance the focus on stewardship in the Nation's agricultural policies. At the same time, the agreement will accommodate efficient production of the food and the fiber upon which our economy and welfare depends. The agreement stresses the use of a variety of tools to reach these ends, including voluntary and cooperative efforts in the farm and commodity area, such as the use of integrated pest management techniques (IPM), low input sustainable agriculture (LISA) methods, market incentives, technical assistance, education, research and development, and--when necessary and appropriate--regulatory and enforcement approaches. This agreement is also supported by EPA's activities to reduce non-point-source pollution, including pollution from agricultural lands, under the Clean Water Act (§319). EPA is also working in cooperation with the USDA to support the Wetland Reserve Program, which was established under the 1990 Farm Bill to encourage farmers to restore valuable wetlands. EPA research suggests that these reforested wetlands substantially reduce the loss of nitrogen and sediment from agricultural lands, expanding the lifetime of agricultural land while restoring diverse land uses including forestry and recreation.

To stimulate the innovation and to demonstrate the technologies which will help make these objectives a reality, EPA's Pollution Prevention Division has developed, in cooperation with USDA's Cooperative State Research Service, a grants program designed to promote the adoption of sustainable agricultural practices and

demonstrate their viability on the farm. Called "Agriculture in Concert with the Environment" (ACE), the program funds innovative approaches to reduce the use of chemical inputs and protect the ecological capital of our agricultural lands.

Energy and Transportation. The Agency is developing a pollution prevention strategy for the energy and transportation sector aimed at stimulating demand side reduction activities in key areas, encouraging cleaner supplies, and providing for more accurate accounting of the true social costs of generating and using energy.²⁹

EPA has established a joint program with the Departments of Energy and Commerce to fund industrial sector demonstration projects that capitalize on the linkages between economic competitiveness, energy conservation, and pollution prevention. The program has a secondary objective of forging links between the regional and state agencies responsible for energy, commerce, and environment. EPA is also conducting research on alternative fuels to determine their emissions characteristics and suitability for use as replacements for gasoline in urban areas.

The Agency is also supporting the development and use of innovative technologies for managing storm-water runoff to enhance surface water quality. Runoff from roads and paved surfaces is a significant source of hydrocarbons and heavy metals in the Nation's waters. Improvement of water quality in lakes, rivers, and coastal areas will require better management of runoff water. The Agency is working to assist state and local governments in establishing demonstration projects to manage runoff. One major effort focuses on retrofitting older treatment devices by adding oil and grease separators to runoff drains and collectors.

Federal Sector. EPA is working with the Federal community to take advantage of pollution prevention opportunities in three key areas: the Federal Government's generation of wastes; its procurement and consumption of goods, energy, and resources; and its development and implementation of policies and regulations. Initial

efforts have focused on the first two areas of opportunity. For example, the Department of Defense has taken a lead in reviewing Federal military procurement standards to identify opportunities to replace or reduce the use of the seventeen priority chemicals identified in the EPA Industrial Toxics Project (see below). In general, as a large-scale consumer, the U.S. Government can help create demand that stimulates development of markets for goods ranging from recycled paper to safer substitutes for potentially hazardous materials.

EPA regional offices are also working to take advantage of pollution prevention opportunities in Federal Government operations. For example, EPA Region 2 is working with the U.S. Postal Service (USPS) to complete an assessment of vehicle pollution prevention opportunities at the USPS General Mail and Vehicle Maintenance facilities in Buffalo. The results of the study should be more broadly applicable to other USPS facilities, fleet operators, and the package handling industry.

Voluntary and Collaborative Efforts. In January, 1991, EPA issued a Pollution Prevention Strategy that serves as the blueprint for a national, cross-media program.³⁰ The strategy provided the framework for the Industrial Toxics Project ("33/50 Program"), which calls for voluntary reductions in industrial emissions of seventeen high priority chemicals included in the Toxics Release Inventory. Targets are a 33% reduction in releases by the end of 1992 and a 50% reduction by 1995. Seven hundred of the largest businesses in the United States have joined this program, and their commitments will result in an estimated 300 million pound reduction in toxic emissions by 1995. Similarly, the Green Lights Program seeks private and public "partners" to commit, on a voluntary basis, to reduce power consumption through the installation of more efficient lighting in work areas. Over 400 corporations, nine states, the government of the U.S. Virgin Islands, as well as cities, counties, schools, and environmental groups have signed on. EPA estimates that full implementation of Green Lights commitments to date will save \$700 million a year in electricity costs and reduce emissions of

carbon dioxide, sulfur dioxide, and nitrogen oxides by more than seven million metric tons annually.³¹

A New Regulatory Focus on Prevention. EPA's 1991 Pollution Prevention Strategy provided guidance and direction for efforts to incorporate pollution prevention within EPA's existing regulatory and non-regulatory programs. The strategy also set forth a schedule for achievement of specific, near-term objectives in pollution prevention. The Agency's pollution prevention program has established the source reduction review project to examine potential reductions in releases to all environmental media through adoption of alternative manufacturing or handling processes. This project supports regulatory and non-regulatory EPA activities and focuses on source control and source reduction.

Economic Incentives

In the market economy of the United States, the collective actions of private businesses and consumers will play the key role in determining the path of development that our country follows. One of the most important steps we can take to ensure that development proceeds in sustainable directions is to provide economic incentives that encourage environmentally beneficial private choices. Such incentives help harmonize private interests and the broader social need to maintain a quality environment.

Economic incentives share three key advantages over command-and-control systems. First, if properly designed, economic incentives programs can effect environmental protection at lower cost than command-and-control systems; they therefore allow more of society's resources to be directed to other sustainable development priorities. Second, because they make pollution more costly, well-designed economic incentives encourage continuous movement toward less expensive and more effective pollution prevention and control techniques. Third, because economic incentives establish a direct link between environmental protection and market decisions, they can help set the economy onto a

sustainable course. Since markets will in large part determine the development path that the United States will take, incorporation of environmental protection priorities in private economic decisions will be a prerequisite for sustainable development.

The Clean Air Act Amendments of 1990 contain many provisions for the use of economic incentives, and implementation of this statute will help EPA advance both theory and practice regarding these tools. For example, Title IV mandates the establishment of a system of tradable "allowances" for electric utilities' emissions of sulfur dioxide. After 1994, utilities covered under the law must have or purchase allowances to emit sulfur dioxide. This system creates an incentive to reduce sulfur emissions, since reduced emissions allow utilities to sell more (or buy fewer) allowances.

The program has both economic and environmental advantages over the conventional command-and-control approach, which might simply set a legally binding standard to be achieved by each utility. The allowance system allows the utilities flexibility in reducing emissions, so that the cost of the emissions reductions to the industry and consumers is minimized. In fact, the system is expected to be \$700 million to \$1 billion less expensive than a more rigid command-and-control approach.³²

Even more important in the long run, the allowance system should spur research and development of new, cost-effective pollution prevention technologies, since the allowances create a continuous financial incentive for lowered emissions. While a command-and-control approach gives utilities the incentive to reduce emissions down to the level specified by a standard (to avoid prosecution), tradeable allowances create an incentive to lower emissions below levels mandated by regulation.

The Clean Air Act Amendments contain other provisions for the use of economic incentives. For example, the statute sets fees for certain sources of volatile organic compounds in ozone non-attainment areas (areas where ozone concentrations exceed National Ambient Air Quality Standards). Title VI establishes a system of tradable allowances for reduction of chlorofluorocarbons.

In addition to these opportunities to use economic incentives in its air program, the Agency is investigating the use of incentives in its water and solid waste programs and promoting the use of incentives by state and local environmental agencies. For example, a system of trading could be introduced to reduce water pollution from "non-point sources." These sources, which include the runoff from agricultural and urban areas, have proven difficult to control with conventional water pollution control tools. In general, economic incentives may be very useful for preventing or reducing forms of environmental degradation that EPA previously has been less successful in addressing.

Public-Private Partnerships

Because private businesses are forced by competitive pressures to keep costs down, they may be able to provide certain services more cost-effectively than can government agencies. Public-private partnerships take advantage of these cost savings by involving private firms in activities that have historically been public-sector functions. These partnerships offer an innovative approach for financing environmental protection--saving public funds while expanding private sector interest and expertise in environmental issues. In the long run, involvement of private firms in environmental protection activities also puts the dynamic marketplace to work in finding new technologies and methods suitable for protecting the environment.

Through its Environmental Finance Program, EPA is working to help state and local governments use public-private partnerships and other alternative financing mechanisms to fund environmental protection activities. A particularly important application of the partnership approach is in small and economically disadvantaged communities, where government financing of operations such as wastewater treatment can be prohibitively expensive. Privatization of these operations may significantly reduce costs to these communities. One initiative that will help showcase partnerships

is EPA's demonstration project program. The Agency has established over forty demonstration partnerships with state and local governments, universities, and private firms to increase awareness of partnership opportunities. These demonstrations provide seed money to communities to explore alternative financing techniques when planning environmental projects. The projects provide useful case studies for other communities while enabling small communities to meet increasingly stringent environmental protection standards. Moreover, the demonstrations provide an opportunity for the Agency to promote pollution prevention as a preferred and cost-effective option for achieving environmental progress at the state and local levels. EPA also works with regional organizations to promote partnerships; for example, the Agency has formed an alliance with the Appalachian Regional Commission to make joint awards for demonstration projects in the Appalachian region.

EPA will be establishing Environmental Finance Centers at land grant universities to provide training, advisory services, publications, and analysis to states and communities on options for funding of environmental programs and services. Two potential pilot Centers are the University of Maryland and the University of New Mexico. The Centers will also serve to coordinate programs like the Revitalizing Environmental Infrastructure through Volunteerism (REV) Program, which is currently under development as a source of pro bono engineering advice for disadvantaged communities of all sizes.

Technological Innovation

A concern voiced by some economists and industry groups is that environmental regulation can stifle innovation and lessen America's competitiveness. The 1990 Clean Air Act Amendments address this concern through extensive use of performance standards and market-based incentives that promote, rather than hinder, innovation. EPA is also addressing concerns about regulatory barriers and economic disincentives that may impede the development of innovative

environmental technologies. Some of these barriers include unresolved questions about technology-based regulatory standards and regulatory reliance on "available" technology; public concern over risk; inadequate data on the potential market for various technologies; and the regulatory difficulties in obtaining permits or field trials for research, testing, or marketing.

EPA is taking steps to improve its role in promoting the development and transfer of environmentally beneficial technologies. In a 1991 report, EPA's National Advisory Council for Environmental Policy and Technology recommended that the Agency establish a technology advocate function.³³ In response to this recommendation, EPA created the Innovative Technology Council to coordinate Agency efforts to foster new environmental technologies and to leverage private and Federal investments in these technologies. EPA is also working with the Departments of Defense and Energy to facilitate the use of Federal facilities for testing and demonstration of innovative environmentally beneficial technologies.

The Federal Technology Transfer Act (FTTA) has set up a framework that government and private-sector researchers can use to collaborate on promising environmental technologies. A key provision of the law establishes the authority for government and industry to enter into Cooperative Research and Development Agreements on specific technologies that will cost-effectively reduce environmental pollution. In addition, the Agency is actively supporting the National Technology Initiative, designed to bring together officials in the Federal government, industry, and academia to promote U.S. competitiveness through technology development. To stimulate commercial use of environmental technologies developed by EPA laboratories, the Agency is sponsoring a series of workshops for business leaders to showcase these products.

5 FOCUSING ON REGIONS AND COMMUNITIES

Sustainable development objectives may be pursued at many levels, from the global-scale efforts at international conferences, such as the UNCED in Brazil, to individual efforts to conserve natural resources and prevent pollution. Local and regional programs and policies supporting sustainable development will be integral parts of larger-scale efforts, just as programs designed to protect regionally important ecological resources will play an important role in preserving the Nation's ecosystems. EPA is increasingly active in working to meet local and regional environmental needs and in protecting special environmental resources.

Geographic Targeting

In its two decades of work to protect the environment, EPA has generally employed nationwide strategies to control specific pollutants and pollution sources. Though this national pollutant-by-pollutant, source-by-source approach has yielded much progress in the restoration and preservation of our air, land, and water resources, its effectiveness may be limited in some areas where unique environmental characteristics or conditions call for more tailored, integrated approaches. Geographic targeting is such an approach. It focuses on the environmental problems and needs of a particular geographic area, such as a watershed, and seeks to involve the full array of local stakeholders to address the broad range of local--often interrelated--environmental problems. Thus, geographic targeting is an important step in advancing the integrative approaches that will be necessary to achieve sustainable development. The Agency currently has geographic initiatives ranging in scale from programs with very large focuses, such as the Great Lakes and Gulf of Mexico programs, to efforts covering mid-size areas, including Puget Sound and the Chesapeake Bay, and finally to the smaller-scale

watershed-based approaches being developed by the Office of Water.

EPA's Region 9 has developed a geographic initiative that illustrates the value of geographic targeting in pursuing sustainable development. The initiative focuses on the Central Valley of California, where many areas are experiencing rapid urban growth and associated environmental problems. In addition, intensive agricultural activities have created major water quality and quantity conflicts. A stronger emphasis on sustainable agricultural practices will be a key element in any long-term solutions to problems in the area. The Region is currently developing an inventory of public and private sustainable agriculture programs and initiatives in the Valley and will use this as a basis to target future EPA work on this issue.

Most of the geographic initiatives, however, do not currently focus explicitly on sustainable development. They are nonetheless developing many components of the infrastructure that will be needed to make lasting progress toward sustainability. These include improved knowledge of ecological relationships and stresses within an area, programs for risk-based priority setting, and institutions to bring parties with widely disparate interests together to facilitate coordination and planning. Geographic initiatives can serve as models for application, on a manageable scale, of sustainable development concepts.

Regional, State, and Local Programs

Throughout the United States, regional, state, and local initiatives are incorporating concepts of sustainability into development plans and government programs. The Agency is working to support and assist these efforts, many of which are associated with the geographic initiatives discussed above. A few examples are described here to provide a sense of the scope of these activities.

EPA's Region 10 has undertaken a sustainable development initiative to examine new approaches for achieving long-term improvements in environmental quality by using sustainable

development as an integrating objective. In its initial stage, this work centers on finding new opportunities for cooperation with government agencies, non-governmental organizations, businesses, and universities that are working to foster or promote sustainable development. The Region is also exploring opportunities to assist other sustainability initiatives in the Northwest, such as "sustainable city" programs, sustainable agriculture projects, and private-public forums focusing on sustainability. In the next phase of this program, Region 10 will select areas in which it can be most effective in enabling or initiating progress toward sustainable development. The lessons we learn in these northwestern states will help the Agency to employ successful sustainable development approaches elsewhere.

Over the last several years, each EPA Region has worked to identify the environmental problems that pose the highest risks to humans and to ecosystems. These regional "comparative risk" efforts complement the Agency's efforts to identify high-priority environmental problems on a national basis (see Section 2), and allow it to devote resources to the greatest regional and local threats to sustainable development.

Similarly, a number of states and cities have worked to identify and prioritize environmental problems. Several EPA Regions are working with their state and local counterparts to integrate environmental priorities into state and local economic development and growth management activities. The Agency provides technical assistance for these efforts. For example, Washington Environment 2010, a joint project of the State of Washington and EPA, developed *Toward 2010: An Environmental Action Agenda*, which identified major environmental challenges facing Washington and set forth recommendations for "creating a sustainable future."³⁴ Similar approaches are also being utilized by some cities. EPA has provided resources that were used to help fund the Sustainable City Project in Portland, Oregon, and San Jose and San Francisco, California.

Region 10 has also initiated, through grants to states, cities, and counties, a program to develop long-term wetland conservation plans. The

development of these plans will bring disparate interests together to foster an understanding of what must be sustained to protect the role of wetlands in providing habitat and other economically important services. This program will provide a model for long-term efforts to sustain important ecological resources. Such efforts will be essential components of any comprehensive sustainable development policy.

In Region 2, the development of a Special Area Management Plan Environmental Impact Statement (SAMP/EIS) for the Hackensack Meadowlands of New Jersey provides an example of integrated management approaches for environmental quality and economic development. The SAMP is to be included as part of New Jersey's Coastal Zone Management Plan for the management of an environmentally sensitive tidal wetland. The project involves balancing the intense development pressures in the area with wetlands wildlife protection, water quality, air quality, waste management, and other environmental considerations. It will provide the basis for the development and management of the 32-square-mile area over the next thirty years. Implementation of the SAMP should offer substantial environmental and economic benefits over the current project-by-project approach to environmental decisions in the area.

6 ENHANCING PUBLIC AWARENESS AND PARTICIPATION

While governments, international organizations, and non-government organizations can take leadership roles in promoting sustainable development, achievement of sustainable development will ultimately require the full participation and support of the public. It is in our everyday decisions as consumers, investors, employers and employees, parents, neighbors, and citizens that we decide the course of development our Nation will take. Through educational programs designed to improve public understanding of the environment, EPA seeks to foster private decisions that support environmental protection and sustainable development.

Education

In the long run, the Nation can only achieve and maintain sustainable development when its citizens understand this concept and embrace it as a national priority. Since sustainable development encompasses a multitude of issues--scientific concerns, ethical principles, economic interactions on a broad scale, and others--many institutions will share the responsibility both to study the practical meaning of the concept and to educate the public about the results of such study. EPA's educational responsibilities stem both from its general mission to protect the environment and from specific legislative mandates of Congress. EPA has a particularly important role in ensuring that the public is informed about our environment and about what can be done by private citizens to protect and enhance environmental quality.

EPA has undertaken a number of education programs that will improve environmental education in the United States. Under the authorities of the National Environmental Education Act, for example, EPA administers an Environmental Education Grants Program. Grants are awarded to

support state, local, and non-profit environmental education efforts. Interest in the program has been enormous; over 3,000 grant applications have been received for the fiscal year 1992 program, and proposals exceed the available monies by nearly \$100 million. The Agency will also be funding a national Environmental Education and Training Program. This "train the trainer" program, to be headed by the University of Michigan, will create a rapidly expanding network of environmental educators by training both in-service teachers and informal educators, who will in turn train others in the field. By training people to train others, the program obtains maximum leverage from public funds.

EPA's education program is also utilizing cooperative approaches that will be necessary to promote useful understanding of a concept as broad as sustainable development. EPA participates in the efforts of the Federal Coordinating Council for Science, Engineering, and Technology to identify and assist U.S. Government programs that will help train a work force ready for the challenges--including the environmental challenges--that will face the country in the year 2000. The Agency is actively pursuing public-private partnerships, such as a recent cooperative effort with General Motors to produce an award-winning video on the environment for schoolchildren. The video, which required no public funding, has been requested by over 100,000 schools. The Agency also sponsors a variety of other programs to fund hands-on research by students, to honor students for outstanding environmental projects, and to facilitate teacher access to environmental education materials.

Other EPA education efforts focus on specific sectoral activities. For example, EPA, in a cooperative effort with the American Institute of Architects (AIA), is sponsoring the development of an Environmental Resources Guide to provide architects and builders with guidance on how to select more environmentally friendly materials for construction.³⁵

EPA is also seeking to advance environmental education internationally. In September 1992, EPA, the Canadian Department of the Environment, and the Mexican Secretariat of Social Development

signed a Memorandum of Understanding (MOU) on Environmental Education. The purposes of the MOU include increasing public awareness and fostering attitudinal change contributing to the achievement of sustainable development.³⁶

Improving Public Access to Environmental Information

The Agency is working to improve public access to information on environmental issues. The Emergency Planning and Community Right-to-Know Act of 1986, commonly known as Title III (of the Superfund Reauthorization and Amendments Act of 1986), provided communities with unprecedented access to information about toxic chemicals in their communities and created mechanisms to minimize the threats posed by these substances. One of the most important features of Title III is its creation of the EPA-administered Toxics Release Inventory (TRI), an annual inventory of releases and transfers from over 20,000 manufacturing sources. The TRI contains extensive data on 320 listed toxic chemicals, waste management practices, and releases to the environment, and is designed to improve public access to information for community decision making.³⁷ Public awareness and involvement are viewed as key forces in spurring voluntary pollution prevention actions by industry. The TRI has already been instrumental in serving as a basis for voluntary efforts to reduce the use and release of hazardous materials to the environment. Over 700 private firms will use the TRI as a baseline for reductions in emissions as participants in the 33/50 program (see Section 4). EPA will continue to work with all interested parties to develop techniques and incentives for preventing chemical risks to human health and the environment.

To foster exchange of information that can be used to protect the environment, EPA continues to operate information clearinghouses that facilitate public information access. The Pollution Prevention Information Clearinghouse and the International Cleaner Production Information

Clearinghouse publicize industry initiatives to make environmentally friendly product modifications or to minimize wastes. Other clearinghouses such as the Resource Conservation and Recovery Act (RCRA) and Wetlands Hotlines, as well as the Alternative Treatment Technology Information Center (ATTIC), provide public access to information on environmental restoration and protection efforts.

7 INTERNATIONAL EFFORTS

EPA's international programs support sustainable development, both domestically and abroad, and the integration of economic and environmental policies, an important prerequisite for sustainable development. These programs fall into three general categories: protecting shared ecosystems; protecting the global environment; and cooperation with other countries and international organizations on scientific, economic and technological aspects of environmental protection that are of mutual concern.

Protecting Shared Ecosystems

Concern about the effects of transboundary pollution goes back to 1909, when the U.S. and Great Britain signed the Boundary Waters Treaty, which included provisions to protect water quality in the rivers that form or cross the U.S.-Canada border, the Great Lakes, and other shared inland water resources. The treaty was intended to prevent pollution in shared water resources from causing injury to health or property in either country. The 1978 U.S.-Canada Great Lakes Water Quality Agreement, amended in 1987, furthered long-term cooperation by establishing a comprehensive framework to protect and improve water quality in this large region.

More recently, in March 1991, the U.S. and Canada signed a historic Air Quality Agreement that requires both nations to reduce emissions of sulfur dioxide and nitrogen oxides, the damaging ingredients of acid rain. The agreement also sets up an institutional framework to address other transboundary air pollution issues. Another bilateral agreement with Canada establishes notice and consent procedures for hazardous waste crossing the border in both directions.

In the Northwest, there is a growing discussion of the need for more integrated planning and information exchange between the U.S. and Canada in the urbanized corridor stretching from Portland,

Oregon to Vancouver, British Columbia. The EPA Region 10 Office is an active participant in these discussions, which focus on sustaining high quality natural resources and marine ecosystems in the face of rapid population and economic growth in the area. Participants include a wide variety of public and private interests from both sides of the border.

EPA's Region 10, the environmental agencies of the Northwest States and British Columbia, and the Canadian Department of Environment Regional Office established in 1991 a regional Memorandum of Understanding (MOU) on hazardous waste. This MOU serves as a framework for addressing issues such as generation of hazardous wastes in the region and the region's capacity to treat and dispose of these wastes.

In the Northeast, EPA is contributing to U.S.-Canadian cooperation through a State-Provincial agreement to protect and conserve the Gulf of Maine marine region. This effort includes long-term sustainable development objectives for the Gulf.

U.S. environmental cooperation with Mexico began more than 50 years ago with the formation of the International Boundary and Water Commission to develop bilateral water and sanitation projects along the border. This cooperation was significantly expanded with the signing of the 1983 Border Environment Agreement covering sanitation in Tijuana, transboundary movement of hazardous wastes, air pollution, and emergency response. This year, the first stage of a formal Integrated Environmental Plan for the Mexican-U.S. Border Area was approved. It provides for strengthening cooperative strategies for the enforcement of existing laws, reducing pollution through new investment initiatives, and increasing cooperative planning, training and education.

The proposed North America Free Trade Agreement (NAFTA) has served as a catalyst for trilateral cooperation on environmental protection of the continent. In September 1992, former Administrator William Reilly hosted a meeting with his counterparts from Canada and Mexico that addressed NAFTA, related environmental issues, and possible approaches to enhancing cooperation

among the three countries on critical sustainable development issues.

This year, EPA furthered cooperation with concerned parties to facilitate the establishment of the Caribbean Environment and Development Institute.³⁸ The Institute is a non-profit organization that is designed to develop public-private partnerships in support of regional environmental protection efforts. It initially will support activities to reduce pollution from land-based sources that contribute to the degradation of coastal ecosystems, which are critical to tourism and other economic activities in the Caribbean.

EPA plays a leading role in the development and operation of the Arctic Monitoring and Assessment Program (AMAP), a component of the Arctic Environmental Protection Strategy agreed to by the U.S. and the seven other Arctic countries in June 1991. EPA also is extensively involved in the work of the Convention on Long-Range Transboundary Air Pollution (LRTAP) of the U.N. Economic Commission for Europe (ECE).

Protecting the Global Environment

Since the U.S. banned the production of aerosols containing chlorofluorocarbons (CFCs) in 1978, this country has been a leader in international efforts to protect the ozone layer. These efforts led to the Vienna Convention for the protection of the ozone layer and the Montreal Protocol on substances that deplete the ozone layer. EPA has worked closely with U.S. industry to develop substitutes for CFCs and with developing countries to encourage the use of these substitutes. EPA provides assistance to developing countries in meeting their reduction targets for ozone-depleting substances under the Montreal Protocol.

EPA and China have launched a multi-faceted program aimed at curtailing growth of the CFC market in that country. EPA is working with Chinese ministries and industries to convert refrigerator factories to enable them to use CFC-substitutes, with additional benefits in energy efficiency. Production of household refrigerators in China, expected to reach 10 million units in this

decade, would otherwise require approximately 10,000 metric tons of CFCs for initial operation. Another EPA project will establish a plan to replace halons used in fire-fighting, which accounted for almost 40% of Chinese consumption of ozone-depleting chemicals in 1989. Through these and other activities, the bilateral ozone program with China will promote sustainable development by fostering economically sound projects which protect the global environment.

EPA has been a leading player in international efforts to prevent damage to the marine environment from dumping wastes at sea. EPA also is strongly promoting international cooperation to control land-based sources of marine pollution, both at the regional level and through UNCED and the United Nations Environment Programme (UNEP). UNCED's Agenda 21 calls upon UNEP to convene an intergovernmental meeting on protection of the marine environment from land-based sources of pollution.³⁹ EPA will take an active role in this conference. EPA is also participating in and leading initiatives to control long range transboundary air pollution and in efforts to protect environmental quality in the Arctic and Antarctic regions.

EPA also plays an important role in international programs related to mitigation of and adaptation to potential global climate change. The U.S. has committed to provide \$25 million over two years to help fund climate studies for selected developing countries. These countries are expected to account for the largest growth in greenhouse gas emissions during the coming decades, so efforts to encourage energy efficiency and reduce deforestation in these countries are an important adjunct to domestic actions.

Other International Environmental Cooperation

EPA has established cooperative agreements with more than 20 developed and developing countries, and takes part in the environmental programs and initiatives of some 15 international

organizations. EPA receives more than 2000 foreign visitors per year, who are eager to consult with our experts at headquarters, the regional offices and laboratories.

In the area of chemical safety, EPA is working with the World Health Organization (WHO), UNEP, and OECD to develop toxicological standards which provide more uniform health and safety information, reduce duplicative testing, and avoid unnecessary barriers to trade in chemicals. This work is strongly supported by the chemicals industry and by environmental groups. Additionally, EPA has been promoting the use of community right-to-know programs internationally based on the success of such programs in the U.S. (see Section 6).

EPA is engaged with other OECD countries in implementing a major new program of national environmental performance reviews, under which the environmental performance of each OECD country will be assessed by "peer" countries every four years. Promotion of sustainable development is an explicit aim of the program. It is based on OECD's "Environmental Strategy for the 1990s" that contains three principal goals: reducing the pollution burden in OECD countries, integrating economic and environmental policies, and strengthening international cooperation.⁴⁰ EPA staff recently took part in a pilot environmental performance review of Germany. In addition, EPA plans to support the decision of the U.N. ECE to extend the OECD environmental performance review program to the entire ECE region: the U.S., Canada, all of Europe, the former Soviet Union and Israel.

EPA has formal agreements with a number of international organizations to facilitate the exchange of information and personnel, joint research activities and training. At the UNCED, EPA signed agreements with the United Nations Development Programme (UNDP), the United Nations Industrial Development Organization (UNIDO), and the World Health Organization.

EPA works closely with the Agency for International Development (AID) and the Peace Corps in providing environmental expertise in Central and Eastern Europe, the former Soviet

Union, and the developing world. Under the Support for East European Democracy (SEED) Act of 1989, EPA has provided technical assistance in monitoring and controlling air and water pollution in Krakow, Poland, and helped establish the Regional Environmental Center in Budapest, Hungary. More recently, EPA has been working with local officials in Central and Eastern Europe to develop and test environmental management training modules and to implement several comparative risk assessments in the Czech and Slovak Federal Republics and Bulgaria with assistance from resident Peace Corps volunteers.

EPA is providing technical assistance, information, and training materials to other countries in an effort to share U.S. "lessons learned" in environmental protection, both successes and failures. This year, EPA distributed sets of Technical Information Packages (TIPS) to 116 countries around the world. These packages organize some of the Agency's best technical information into compact resource libraries on fourteen environmental issues. TIPS provide an explanation of the threats posed by various environmental problems, options for dealing with these problems, sources of technical advice and ways to access key EPA publications and databases.⁴¹ EPA has also developed, in cooperation with Purdue University, a set of environmental education software packages that are being distributed throughout the world.

EPA is a leading member of the U.S.-Asia Environmental Partnership, which is providing assistance to strengthen environmental management in target Asian countries and to open new markets for U.S. suppliers of environmental goods and services. The U.S. Environmental Training Institute (USETI), a public-private initiative launched by EPA, is a key feature of the Partnership. Through USETI, key officials from developing countries receive technical training from leading U.S. environmental industries. One result of USETI activities has been the formation of regional networks for sharing information on environmental and developmental issues.

EPA is active in a number of international programs to respond to and prevent environmental

emergencies. EPA worked closely with Kuwait and Saudi Arabia to address environmental and human health threats posed by oil fires and spills which occurred during the Persian Gulf War. Working through the United Nations Environment Programme, the International Maritime Organization, and the OECD, EPA has been a leader in developing and implementing programs throughout the world to respond to chemical accidents. To complement and build on these efforts, EPA recently played a major role in negotiating and concluding a new U.N. ECE convention on transboundary effects of industrial accidents.

EPA has actively encouraged increased funding for international environmental programs oriented towards sustainable development, such as establishment of debt-for-nature programs and the Environment for the Americas initiative, which permits qualifying Latin American and Caribbean countries to use the interest that would have otherwise been paid on certain U.S. Government-held debt for the support of grass-roots environmental protection programs in their own countries. EPA works in close cooperation with the Treasury Department, AID and other agencies to support environmental improvement and sustainable development through the loan and grant programs of multilateral banks. Examples of EPA's activities with the World Bank and the four regional development banks include reviewing the environmental implications of development loans and grants; encouraging the transition to environmentally sustainable portfolios; supporting the development of environmentally appropriate bank policies on natural resources, emission controls and environmental assessment; sharing technical information on good environmental management practices; and helping shape the policies and programs of the new Global Environment Facility.

EPA believes that trade and environmental policies can be mutually supportive in the pursuit of sustainable development and that trade liberalization is an important tool in achieving economic growth and efficiency. EPA is making important contributions to resolving environmental

issues associated with NAFTA and is a leading player in trade and environment initiatives underway at the OECD and the General Agreement on Tariffs and Trade (GATT). The OECD's work program includes, among other things, developing guidelines for design and implementation of "trade policies and agreements which reflect environmental considerations and accommodate and assist the achievement of sustainable development" as well as "effective environmental policies and agreements that minimize trade distortions."

EPA's National Advisory Council for Environmental Policy and Technology (NACEPT) is examining a range of trade and environment policy issues, and sustainable development is a central and explicit reference point for this work. NACEPT is preparing a report on trade and environment issues that may be useful in GATT and NAFTA negotiations.

EPA understands the importance of public participation and access to information, and is promoting these values at the GATT, the OECD and elsewhere. EPA also recognizes the special concerns of developing countries in regard to trade, environment and sustainable development, such as gaining access to industrialized country markets, strengthening environmental protection policies and institutions, and acquiring more environmentally benign technologies.

- 16 See, for example: U.S. Environmental Protection Agency, Office of Strategic Planning and Environmental Data. "Futures." (quarterly publication) (Washington, D.C.).
- 17 Water Pollution Control Federation. *Water Quality 2000: A Cooperative Effort to Improve the Nation's Water Quality Program. Phase II Report.* (Alexandria, Virginia: 1990).
- 18 U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. *Environmental Equity: Reducing Risk For All Communities.* EPA/230-R-92-008 (2 vols.) (Washington, D.C.: June 1992).
- 19 William K. Reilly, "Environmental Equity: EPA's Position," *EPA Journal* (175N-92-001) vol. 18, no. 1 (March/April 1992): p. 22.
- 20 Hunsaker, C.T., and D.E. Carpenter, eds. *Ecological Indicators for the Environmental Monitoring and Assessment Program.* EPA 600/3-90/060. (Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Research and Development, September 1990).
- 21 U.S. Environmental Protection Agency, Office of Communications and Public Affairs, *Securing Our Legacy: An EPA Progress Report 1989-1991*, EPA/175 R 92-001 (Washington, D.C.: April 1992), p. 36.
- 22 U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation. *Cooling Our Communities: A Guidebook on Tree Planting and Light-Colored Surfacing.* EPA/22P-2001. (Washington, D.C.: January 1992).
- 23 U.S. Environmental Protection Agency, Risk Assessment Forum. *Framework For Ecological Risk Assessment.* EPA/630/R-92/001. (Washington, D.C.: February 1992).
- 24 U.S. Environmental Protection Agency, Science Advisory Board, p. 25.
- 25 *Issues in Ecosystem Valuation: Improving Information for Decision Making. Phase I Report of the Ecosystem Valuation Forum to the U.S. Environmental Protection Agency.* Draft. (Washington, D.C.: Resolve, 14 January 1992).
- 26 William K. Reilly. "The Green Thumb of Capitalism."
- 27 U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation and Office of Research and Development. *Stimulating Environmental Progress: A Social Science Research Agenda.* Draft. (Washington, D.C.: 30 December 1991).
- 28 U.S. Environmental Protection Agency and the U.S. Department of Agriculture. *Agriculture Pollution Prevention Strategy.* Draft. (Washington, D.C.: 1 July 1992).
- 29 U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. *Pollution Prevention Strategy for the Energy Sector.* Draft. (Washington, D.C.: 14 August 1991).
- 30 U.S. Environmental Protection Agency. *U.S. Environmental Protection Agency Pollution Prevention Strategy.* (Washington, D.C.: January 1991).
- 31 U.S. Environmental Protection Agency, Office of Communications and Public Affairs, *Securing Our Legacy: An EPA Progress Report 1989-1991*, pp. 20-22.
- 32 *Federal Register*, vol. 56, no. 232 (3 December 1991): p. 63097.

- 33 U.S. Environmental Protection Agency, Office of the Administrator, Office of Cooperative Environmental Management. *Permitting and Compliance Policy: Barriers to U.S. Environmental Technology Innovation*. EPA101/N-91/001. (Washington, D.C.: January 1991).
- 34 Washington Environment 2010. *Towards 2010: An Environmental Action Agenda*. (Olympia, WA: Washington Department of Ecology, July 1990).
- 35 American Institute of Architects. *Environmental Resources Guide*. (Serial publication) (Washington, D.C.).
- 36 *Memorandum of Understanding on Environmental Education Among the Department of the Environment, Canada, and the Secretariat of Social Development, Republic of Mexico, and the Environmental Protection Agency, United States of America*. (Washington, D.C.: 17 September 1992).
- 37 U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. *Toxics in the Community: National and Local Perspectives. The 1989 Toxic Release Inventory National Report*. EPA 560/4-91-014. (Washington, D.C.: September 1991).
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- 39 United Nations Conference on Environment and Development. *Agenda 21*. (Unpublished draft). (United Nations: 1992).
- 40 Organization for Economic Cooperation and Development, Environment Directorate, Environment Committee. *Environmental Performance Reviews: Detailed Plan and Implementation Strategy*. Document ENV/EC (91)21/REV1. Paris: 27 March 1992.
- 41 Packages include fourteen issue summaries together with EPA documents referenced in each summary. An example of a summary document is: U.S. Environmental Protection Agency, Office of Research and Development, Office of International Activities, and Office of Policy, Planning and Evaluation. *Pollution Prevention*. EPA/600/M-91/036 (Washington, D.C.: November 1991).

8 CONCLUSION

Sustainable development tenets offer promise for shaping new and more successful environmental policies that promote economic well-being, public health, and the integrity of ecological systems. At present, the concepts of sustainable development provide a useful framework for discussion of the Nation's long-term environmental and economic priorities, although these concepts have not been developed yet to the extent that they provide a basis for EPA's operational planning. EPA is committed to promoting public dialogue on sustainable development and on its practical meaning at local, national, and international levels. To this end, we invite comment on this report and on the applications of sustainable development in public policy. Please direct any comment to

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ENDNOTES

- 1 *Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 1992* (Senate Report 102-107), p. 90. The request reads:

In keeping with the Committee's support of long-term strategic planning efforts, the Committee is interested in EPA's efforts to explore the concept of sustainable development. In particular, the Committee is interested in how environmental concerns can best be incorporated in national, State, and local development and economic planning and decisionmaking processes. The Committee directs EPA to provide a report by July 15, 1992, which describes in detail how EPA has incorporated, or plans to incorporate, the concept of sustainable development into the Agency's operations.
- 2 Quoted by William K. Reilly in "A Perspective from EPA," *EPA Journal* (20K-9004) vol. 16, no. 4 (July/August 1990): pp. 12-14.
- 3 National Environmental Policy Act of 1969 (NEPA), Section 101(b)(1).
- 4 World Commission on Environment and Development, *Our Common Future* (New York: Oxford University Press, 1987), p. 40.
- 5 Group of Seven. *Summit of the Arch: Economic Declaration*. (Paris: 16 July 1989).
- 6 Group of Seven. *London Economic Summit 1991: Economic Declaration*. (London: 17 July).
- 7 United Nations General Assembly. *United Nations Conference on Environment and Development*. Resolution 44/228. (New York: 22 December 1989).
- 8 Governor Bill Clinton and Senator Al Gore. *Putting People First: How We Can All Change America*. (New York: Times Books, 1992), pp. 94-5.
- 9 World Commission on Environment and Development, p. 43.
- 10 U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation. *Environmental Investments: The Cost of a Clean Environment*. Report to Congress. EPA-230-11-90-083. (Washington, D.C.: 1990).
- 11 International Bank for Reconstruction and Development, *World Development Report 1992* (New York: Oxford University Press, 1992), pp. 222-23.
- 12 F. Henry Habicht II. "U.S. Environmental Policy and Economic Growth: How Do We Fare?" Address to the Center for Policy Research, American Council for Capital Formation, 12 September 1991. 175-K-92-003. (Washington, D.C.: U.S. Environmental Protection Agency, Office of Communications and Public Affairs).
- 13 U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. *Sustainable Development: Concepts, Implications, and Recommended Actions*. (Unpublished report). (Washington, D.C.: July 1990).
- 14 U.S. Environmental Protection Agency, Science Advisory Board. *Reducing Risk: Setting Priorities and Strategies For Environmental Protection*. EPA/SAB-EC-90-021. (Washington, D.C.: September 1990).
- 15 U.S. Environmental Protection Agency. *Strategies and Framework for the Future*. (Washington, D.C.: 16 July 1992).