Environment Highlights

For at least two decades, USAID has operated with the conviction that fostering a healthy environment is essential to supporting sustainable development across the board. Economic growth, democracy, population and health, humanitarian assistance—all sectors are affected in some way by environmental health, or lack of it. Moreover, the Agency recognizes that environmental degradation outside U.S. borders ultimately threatens the economic and national security of the United States. USAID's goal of protecting the environment rests on five objectives:

Conserving the World's Biodiversity

Since 1987, USAID has worked in more than 100 protected areas in 60 countries to conserve globally significant habitat.

■ In Guatemala, USAID's work with 16,000 people living outside the Maya Biosphere Reserve, one of the Central America's most biologically rich areas, has saved 410,000 hectares of rain forest.

■ USAID helps nongovernmental organizations (NGOs) and local communities, which protect biodiversity throughout Africa, Asia, and Latin America. In Latin America alone, these NGOs contributed to more than 90 national and international environmental policy initiatives in 1995.

Mitigating Global Climate Change

USAID is reducing net emissions of greenhouse gases and, at the same time, promoting economic growth and environmental management in nine partner countries.

■ A rural electrification program in the Philippines reduced power-line losses by 3 percent, averting emission of 250,000 metric tons of greenhouse gases a year from a heavily polluting coal-powered plant.

■ In Mexico a high-efficiency lighting program reduced electricity costs while averting annual emissions of 118,000 metric tons of carbon dioxide.

Improving the Urban Environment

USAID assistance to 24 countries has helped improve the quality of life for millions of city dwellers.

■ Since 1980, 20 million Egyptians have benefited from USAID work to provide water and wastewater services to Alexandria, Cairo, and other cities.

■ With the help of a housing guaranty loan, a town in the Czech Republic was able to connect all of its homes to natual gas, thus allowing the town to have its first clean winter ever. The natural gas also helped bring back to productivity a brick factory that had been idle since 1934.

■ In the Philippines a demonstration program in cost-effective pollution prevention has reduced the country's emission of industrial organic pollution by almost 2 percent and yielded an estimated $30 million in annual savings to the private sector.

Encouraging Environmentally Sound Energy Services

The Agency is helping 16 countries shift to sustainable energy systems that yield economic and environmental benefits.

■ The Indonesian government purchased 30 wind turbines from an Oklahoma-based firm after an initial USAID investment of less that $25,000 for a wind power demonstration project. The Indonesian purchase has yielded $1 million in direct U.S. exports to date.

■ USAID advisers helped the Hungarian Energy Office develop the grid code and regulatory framework that attracted $1.3 billion in financing for six electricity distribution companies and two generation companies.

Sustainably Managing Natural Resources

USAID is helping communities and governments in 35 countries manage coasts, forests, fresh water, and agricultural lands more productively and with less environmental damage.

■ Throughout sub-Saharan Africa, the Agency is increasing the food security of millions of people. In food-insecure Niger, such techniques as planting trees for windbreaks and building water conservation ditches helped increase crop yields by as much as 50 percent,

■ In water-scarce Morocco, USAID assistance in passing a water law and introducing new irrigation technologies has led to a 20 percent water saving in agriculture.

Protecting the Environment

Since the 1970s, one principle has guided USAID's environmental programs: careful management of natural resources is essential if investments in development are to yield sustainable benefits. Unpolluted and productive lands and waters are essential for food security and long-term economic growth. Clean air and potable water are fundamental to the health of communities. Global environmental degradation ultimately threatens not only developing countries but also the economic and national security of the United States and the rest of the world. For this reason, USAID's environment program is vital to the achievement of its overall sustainable development goals.

USAID and its partners from more than 50 countries made significant inroads this year in addressing environmental problems that affect developing nations, countries in transition, and the global community (see map 4.1 for country programs with strategies contributing to the environmental goal). In countries as different as **Guatemala** and **Ukraine**, the Agency achieved measurable progress toward reducing two threats to the global environment—loss of biological diversity and global climate change.

USAID support for innovative environmental policies and technical approaches both promotes environmental sustainability and bolsters other sustainable development goals: promoting democracy, economic growth, improved public health, and natural disaster prevention.

For instance, Agency-supported sustainable agriculture activities helped farmers conserve soil and water resources while increasing their crop yields and incomes. USAID assistance also helped environmental NGOs and indigenous communities conserve **Indonesia's** world-renowned biological diversity and fostered a stronger civil society. USAID support to poor urban communities in Lima, **Peru**, encouraged simple solutions for solid-waste disposal and reduced the danger of cholera and other waterborne diseases. Assistance to farmers in **Senegal** helped them manage their fragile lands to increase their incomes and improve food security.

USAID's environmental initiatives have also led to larger multilateral programs with the World Bank, host country governments, and other international donors. Moreover, the Agency has brokered partnerships that helped U.S. businesses realize new opportunities in the growing international environmental management industry.

USAID helped countries improve the sustainability of their development efforts. Much work remains to be done, however, to arrest environmental degradation. For example, an estimated 10 million hectares of forest—an area the size of Virginia—were cut down in 1995 in Africa, Asia, Latin America, and Russia. Trees were felled to expand cropland, build cattle ranches, and extract timber. Profitable in the short run, ultimately most of these activities will fail because they are poorly suited to local ecological conditions. Negative trends persisted in other areas: loss of biological diversity, climate instabilities (which many attribute to greenhouse gas emissions) increase in air and water pollution, and degradation of natural resources.

Map 4.1. Programs With Strategies Contributing to the Environment

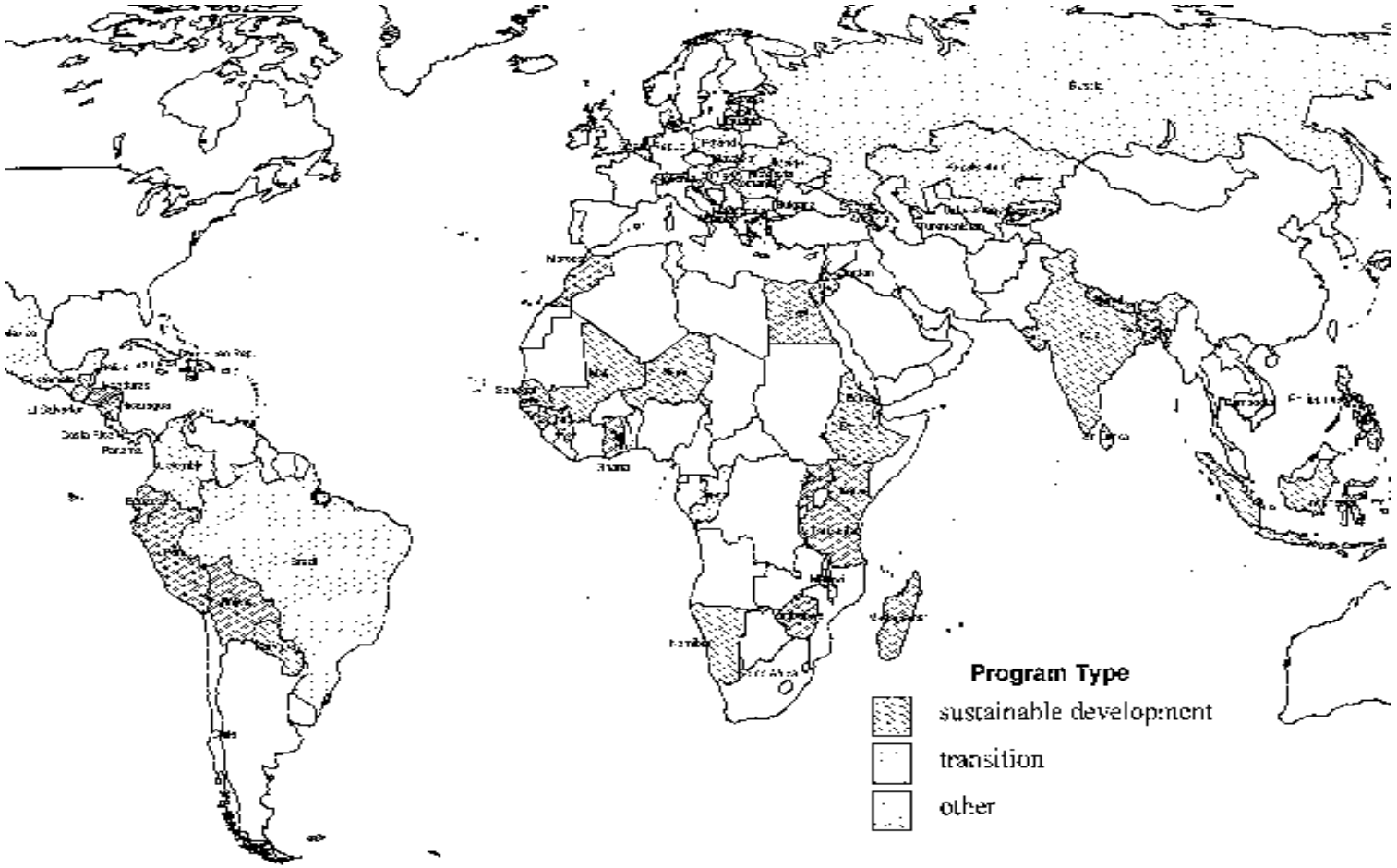
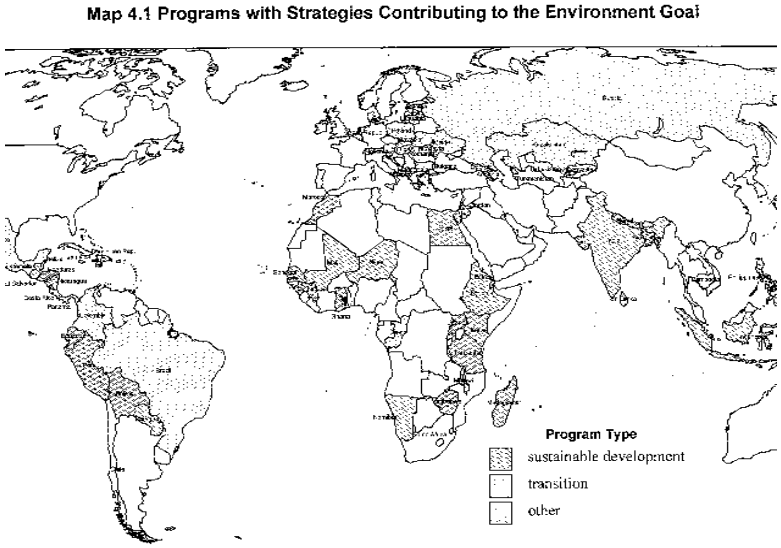


Figure 4.1. USAID Environment Obligations By Region, 1994–96



Budget cuts jeopardize USAID's ability to achieve results in environmental protection in the face of negative trends. The Agency's 1995 environmental obligations total $678.5 million, nearly a 10 percent drop in funding from last year's $753.0 million (see figure 4.1). The 1996 environment budget is expected to be cut by another 20 percent, to $544 million.

Already, the Agency's environmental funding to central and Eastern Europe and the former Soviet Union has been halved, although the region is among the world's most polluted. Should these trends continue, the United States risks losing its leadership role in the environment among international donors. It may also lose its effectiveness in helping countries adopt solutions that protect the environment and meet their economic and social needs.

Repercussions from budget cuts include

- Impairing USAID's ability to identify potential pilot investments in central and Eastern Europe through the Environmental Action Program, a multidonor effort to address environmental degradation in the region
- Diminishing the ability of Indonesian municipalities to reduce pollution though provision of environmental infrastructure and by reducing participation of local NGOs and communities in urban environmental issues
- Shrinking the number and scope of existing environmental investments.

USAID's 1995 Environment Objectives

The environmental strategic framework (see figure 4.2) developed last year established the following objectives for USAID's goal, "environment managed for long-term sustainability":

- Conserving biological diversity
- Reducing the threat of global climate change
- Promoting sustainable urbanization and improving pollution management

■ Increasing the provision of environmentally sound energy services

■ Sustainably managing natural resources

In 1995, 52 Missions, or 60 percent of USAID's field-based programs, pursued at least one of these objectives (see table 4.1). Washington-based regional and global bureaus also supported environment objectives.

To achieve the greatest impact from the Agency's environmental programs, each region concentrated its efforts on particular Agency objectives. USAID programs in **Africa** reflected "green" priorities—biodiversity conservation and natural resource management. Programs targeted sustainable agriculture, community-based natural resource management, and wildlife conservation. Environmental objectives in **central and Eastern Europe** and the **new independent states** were directed to "brown" environmental problems—air and water pollution and inefficient energy generation. However, because of budget cuts, only 12 Missions pursued environmental objectives in 1995, down from 20 in 1994.

In **Latin America and the Caribbean,** the Agency maintained strong biodiversity and natural resource management programs. In 1995, following the establishment of the Environmental Initiative for the Americas (see box 4.1), Missions in Latin America assumed objectives to address the region's growing urban and industrial pollution. In **Asia and the Near East,** the most geographically and ecologically diverse region in the portfolio, strategic objectives encompassed both green and brown issues.

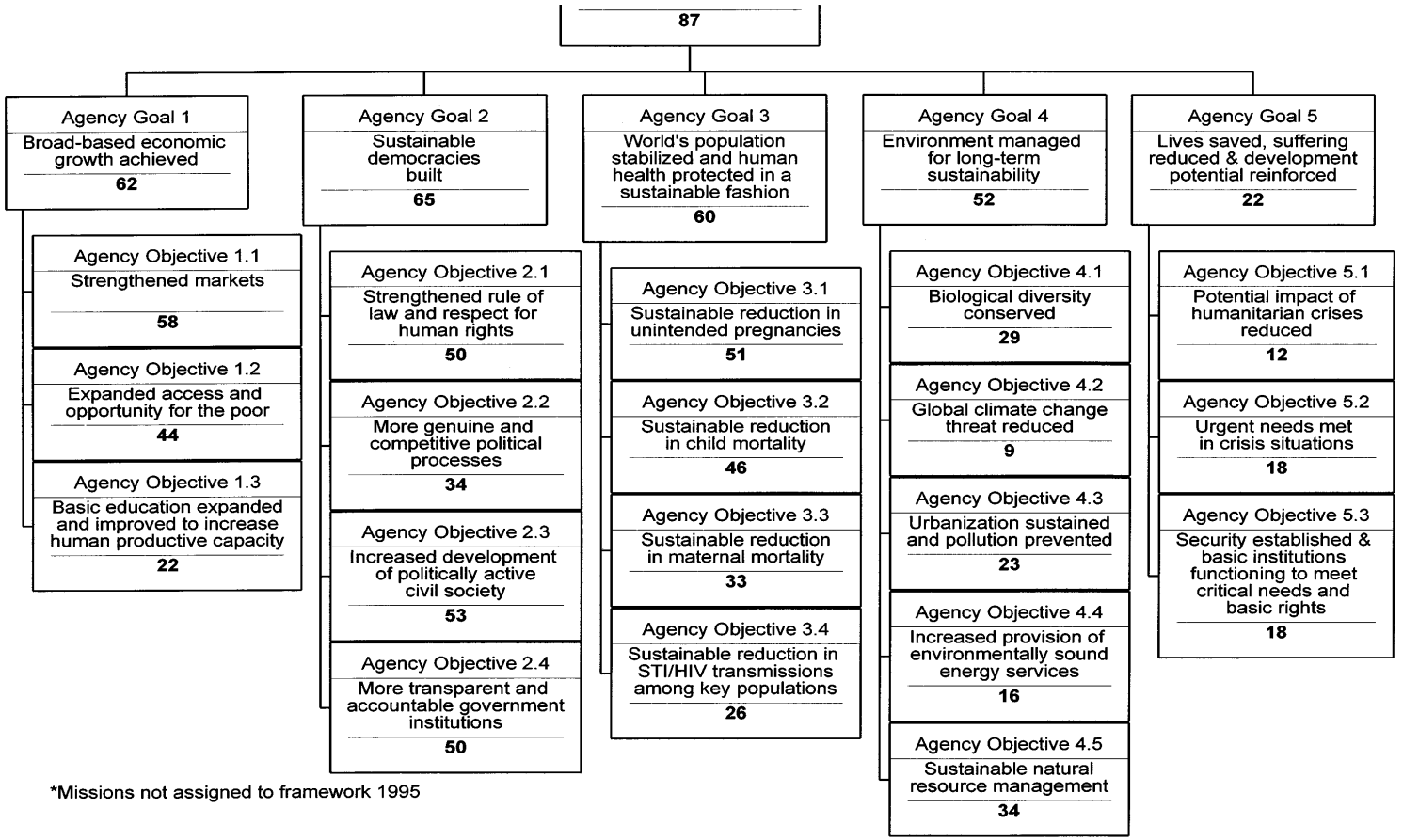
Measuring Environmental Performance

Field Missions and Washington bureaus took several steps this year to measure environmental performance. The Global Bureau's Environment Center adopted a new strategic plan with performance indicators for its three environment offices. A team of environmental and performance measurement experts helped USAID/**Philippines** in a pilot effort to develop indicators that capture that Mission's full range of environmental impacts.

These developments highlighted several inherent challenges and lessons in measuring environmental performance. Since environmental trends often take a long time to emerge and change, USAID's results may not be immediately apparent. Monitoring environmental change can be expensive and complex when the full spectrum of ecological systems is taken into account. Finally, many environmental problems are cross-sectoral. Measuring program outcomes requires monitoring systems that take into account economics, governance, health, and benefits that are difficult to quantify, such as the benefits of breathing unpolluted air.

Despite these challenges, the Agency has made significant progress over the last few years in identifying and documenting its environmental performance and results. Through procedures adopted under reengineering in 1995, Missions actively monitored their environmental performance, and they used this information to manage their programs. Four Missions—**Brazil, El Salvador, Honduras**, and **Jamaica**—sorted their results data by gender.

Figure 4.2. Environmental Strategic Framework, 1996: Number of Country Programs Contributing to Each Objective



*Missions not assigned to framework 1995

Table 4.1. USAID Missions with Environmental Objectives in 1995

	Africa	Asia and the Near East	Europe and the New Independent States	Latin America and the Caribbean	Total
Number of countries	27	15	29	16	87
Number with environmental objectives	14 (52%)	11 (73%)	12 (41%)	15 (94%)	52 (60%)
Objective 4.1: Biological diversity conserved	Congo, Ghana, Kenya, Madagascar, Malawi, Mali, Namibia, Tanzania, Uganda, Zimbabwe (9)	Egypt, India, Indonesia, Nepal, Philippines, Sri Lanka (6)	Bulgaria (1)	Bolivia, Brazil, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru (13)	29 (33%)
Objective 4.2: Global climate change threat reduced	None	India, Indonesia, Philippines (3)	Kazakstan, Poland, Russia, Ukraine (4)	Brazil, Mexico (2)	9 (10%)
Objective 4.3: Sustainable urbanization promoted and pollution management improved	None	Egypt, India, Indonesia, Jordan, Morocco, Philippines, Sri Lanka, West Bank–Gaza (8)	Bulgaria, Kazakstan, Lithuania, Romania, Russia, Slovakia, Ukraine (7)	Dominican Republic, Ecuador, Haiti, Jamaica, Mexico, Panama, Paraguay, Peru (8)	23 (26%)
Objective 4.4: Increased provision of environmentally sound energy services	None	Egypt, India, Indonesia, Philippines (4)	Armenia, Georgia, Hungary, Lithuania, Moldova, Poland, Romania, Russia, Ukraine (9)	Brazil, Dominican Republic, Mexico (3)	16 (18%)
Objective 4.5: Sustainable natural resource management	Ethiopia, Guinea, Madagascar, Malawi, Mali, Namibia, Niger, Senegal, Tanzania, Uganda (10)	Bangladesh, Egypt, Indonesia, Jordan, Morocco, Nepal, Philippines, Sri Lanka, West Bank–Gaza (9)	Kazakstan, Ukraine (2)	Bolivia, Brazil, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru (13)	34 (39%)
Other: National institutional and policy strengthening	Guinea, Madagascar, Malawi, Namibia, Tanzania, Uganda (6)	Cambodia, Indonesia, Morocco, Sri Lanka (4)	Russia (1)	Bolivia, Ecuador, El Salvador, Guatemala, Haiti, Peru (6)	17 (20%)

[1] Environmental objectives are based on 1995 field mission submissions of approved strategic and performance monitoring plans. This table excludes all regional and global bureaus, such as the Latin American and Caribbean Regional Program (G–CAP), the Asia Environment Partnership, and the Global Bureau's Environment Center.
[2] The Africa Bureau has launched CARPE, a major global climate change program.
[3] National environmental institutional and policy strengthening is a major component of USAID's portfolio that currently falls outside the environmental strategic framework's five objectives.

Box 4.1. New Beginnings: Regional Energy Initiatives

In the past year, USAID has launched several initiatives that integrate activities in energy efficiency, renewable energy, and cleaner technology to benefit entire regions. Asia's Sustainable Energy Initiative (ASEI) capitalizes on the expertise of various Agency energy programs to address Asian energy needs. For example, USAID–ASEI has created a Utility Partnership Program through the U.S. Energy Association. The program establishes cooperative relationships between U.S. and Asian utilities to improve the environmentally sound use and supply of electric power. U.S. partnerships have been established with utilities in **India**, **Indonesia**, and the **Philippines**. They will address such issues as identifying technical losses in transmission and distribution lines, and building the appropriate level of management skills to manage plants more efficiently.

USAID created another regional program, the Environmental Initiative for the Americas (EIA), in response to an agreement reached at the Summit of the Americas in 1994. The North and South American countries agreed to form partnerships to "guarantee sustainable development and conserve our natural environment for future generations." The EIA is designed to complement existing bilateral environmental cooperation. Its special emphasis is on industrial and urban pollution, sustainable energy production, and coastal zone management. The energy component of EIA promotes three strategies for sustainable energy production and use: developing low-cost, reliable, clean systems; utilizing conservation principles and renewable energy resources; and improving the management of power use and consumption in the urban, industrial, rural, and transportation sectors. Several EIA-supported activities are described in this chapter.

The following sections provide an overview of the environmental results that USAID and its partners achieved in 1995. These accomplishments illustrate the need to continue support for the environment to achieve the Agency's goal of helping nations move toward sustainable development.

Conserving Biological Diversity

This year more than 1,500 leading scientists from around the world, working under the auspices of the UN Environment Program, reached a consensus: the destruction of natural habitat has accelerated species extinctions from 50 to 100 times above natural levels. Evidence shows this rate will only increase if habitat loss continues at the present rate. The disappearance of biological diversity has serious implications for humans. Maintaining biological diversity is crucial for economic sectors including agriculture, pharmaceuticals, and tourism. The bulk of the world's food supply depends on genetic variability to maintain resistance to pests, droughts, and other natural disasters. The 20 best-selling drugs in this country—representing $6 billion in sales—were derived from plants, animals, and microbes. Plants and animals are also a source of food, medicine, clothing, and labor for people in developing countries.

USAID's commitment to conserving biological diversity centers on working with countries to stem habitat loss. Since 1987 the Agency has supported the largest biodiversity program of any bilateral donor. It has helped more than 60 countries maintain the integrity of biologically diverse ecosystems of national and global value. To guide the direction of the Agency's biodiversity portfolio,

USAID completed an Agency-wide strategy and policy in 1996 that systematically targets assistance to the world's most biodiverse and unique habitats.

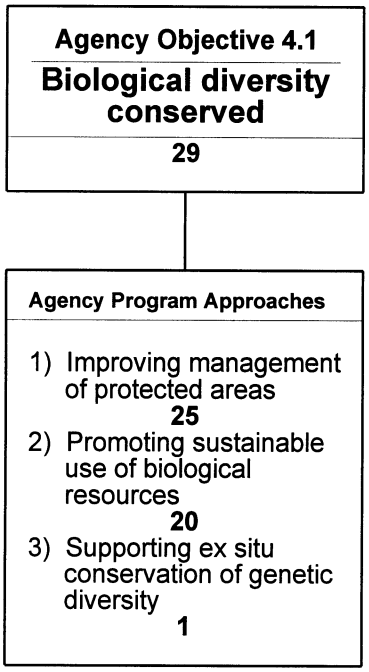
This year 29 USAID country programs, the regional bureaus, and the Global Bureau's Environment Center pursued at least one of three approaches in the Agency environmental strategic framework (see figure 4.3):

■ Conserving biodiversity inside protected areas

■ Encouraging sustainable use of biological resources in protected and critical unprotected habitats

■ Promoting *ex situ* conservation (conservation of animals and plants outside their natural habitats) to preserve species and their genes in managed environments such as seed banks

Figure 4.3. Number of Country Programs Contributing to Agency Objective 4.1



Improving Management Of Protected Areas

USAID's primary approach is to work with countries to strengthen protected areas, safeguarding a wide range of ecosystems—deserts, wetlands, savannas, rain forests, and coral reefs. The Agency has pursued a multipronged strategy in more than 100 protected areas that cover more than 40 million hectares worldwide, an area nearly the size of California. This approach encompasses four basic strategies:

■ Designating species-rich and unique habitats and ecosystems for legal protection

■ Building in-country institutional capacity to manage these areas

■ Linking the benefits of promoting parks to the people who live in and around them

■ Securing long-term financing to ensure the viability of conservation initiatives beyond USAID assistance

Globally, countries have made impressive strides in incorporating additional habitat into their protected areas. The total land area under legal protection over the last decade has doubled (see figure 4.4).

USAID played a role in ensuring that critical habitat is protected in several countries with exceptional biological wealth, including **Bolivia, Ecuador, Guatemala, Madagascar**, and **Uganda**. The Agency helped add more than 405,000 hectares to **Mexico**'s protected-area system since 1990. As a result, 45 percent more forested land is now under protection. Although countries made headway in protecting their land, more work is needed. The area set aside for protection in tropical developing countries, the storehouse of most biologi-

cal diversity, falls far short of the global average and is insufficient. Left unprotected or poorly managed, vital terrestrial and marine ecosystems remain vulnerable to many threats.

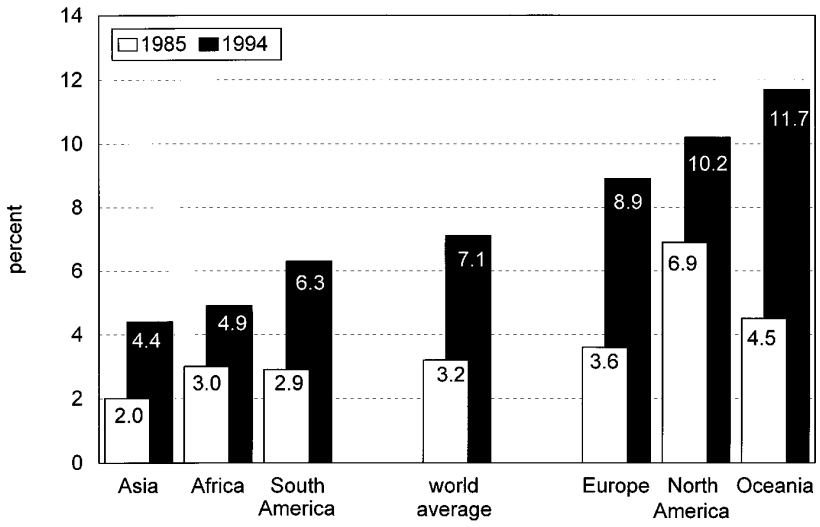
USAID has achieved notable success in building local and national capacity in protected areas management, as documented in a USAID evaluation released in 1995. Parks in Peril, the Agency's largest regional program devoted to strengthening protected areas, has improved on-site management in 28 parks in **Latin America** covering 7.8 million hectares. USAID support included training park guards, building basic infrastructure, and demarcating borders. In five countries, seven parks covering an area the size of Vermont have progressed to the point where USAID funding is no longer required. Parks in Peril also has strengthened 19 Latin American NGOs, several of which have become highly influential in their own countries and internationally. In 1995 these NGOs helped build a stronger civil society in Latin America through their active involvement in more than 90 national, regional, and international environmental policy initiatives.

Encouraging communities living in and around parks to benefit from biodiversity conservation is another area showing promising results. In **Madagascar**, USAID helped women from seven villages near Ranomafana National Park realize a direct link between conservation and income generation. The women had sold flowerpots made of forest ferns. Because of overharvesting, they lost their earnings.

USAID helped them establish an artisan group and kiosk near the park entrance and taught them how to make crafts from sustainably harvested natural materials. The women report they are now able to buy basic food staples that once were too expensive, and the ferns are growing undisturbed in the park. The USAID-supported national park service has begun coordinating environmental management activities in and around protected areas.

These kinds of community-based initiatives play an indispensable role in reducing serious threats to biodiversity. In Madagascar's Mantadia National Park, for example, *tavy*, or slash-and-burn agriculture, had been a major problem before USAID entered the area in 1991. The Agency introduced alternative agricultural systems, agroforestry, environmental

Figure 4.4. Percent of Land Area Under Protection, 1985–94



Source: World Resources Institute.

Table 4.2. USAID-Supported Environmental Endowment Funds

Endowment	Year Established	USAID Funding ($US millions)	Amount Leveraged ($US millions)
Costa Rica Cordillera Development Foundation	1990	10.0	N/A
Jamaica National Parks Trust Fund	1990	0.2[a]	0.8
Foundation for the Philippine Environment	1992	18.0	0.2
Honduras Environmental Trust Fund	1993	10.0	6.2
Indonesia Biodiversity Foundation	1995	16.5	4.7
Panama Ecological Trust	1995	8.0	17.0
Madagascar National Environmental Endowment Fund[b]	1996	12.0	12.0
Mexico Nature Conservation Fund	1996	19.5	10.0
Total		**94.2**	**50.9**

[a]USAID purchased $0.4 million in debt through an initial $0.19 million investment.

[b]USAID's nonproject assistance contribution led to a Madagascar contribution of $12 million in local currency for that country's environment fund.

education, and measures to strengthen park management and enforcement. By 1994, tavy was reduced 65 percent inside the park. It was arrested completely in 1995. Tavy ceased in Ranomafana National Park following USAID assistance as well.

Another Agency priority is to secure financing to ensure the long-term economic viability of USAID's conservation programs. According to a 1996 USAID study, the Agency is a leader among donors in establishing environmental endowment funds. Since 1990 it has committed $94.2 million to launch eight environmental endowments, leveraging $50.9 million in actual or expected contributions from donors, governments, and other outside sources (see table 4.2).

Funds have helped countries realize a broad range of benefits for sustainable development. In the case of the **Mexico** Nature Conservation Fund, hundreds of NGOs and community leaders joined together to lay the groundwork for the endowment. This, in turn, helped strengthen Mexico's civil society. The establishment of **Madagascar**'s fund led to legislation to create the country's first private foundation. That precedent is expected to set the stage for other foundations. Assistance in establishing **Indonesia**'s Biodiversity Foundation helped build the local NGO that manages the foundation into one of the country's premier environmental organizations. The NGO has contributed to several non-USAID projects, including designs for a $150 million multidonor coral reef protection program.

The Agency also has encouraged innovative financing plans to link the benefits of biodiversity conservation with their costs. USAID and its partners are studying a proposal to set up a groundbreaking fund with the water authority of Quito, **Ecuador**. The fund, financed by a $2 annual fee from the city's 250,000 paying water users, will support management of a park that provides the city's water and is home to the endangered condor. This could link beneficiaries of conservation (Quito's water users) to the cost of managing a precious resource—the capital city's primary source of potable water. If successful, this effort will serve as a model for similar programs in other countries.

Such innovative financing schemes have led to significant leveraging of resources from other development agencies and the private sector.

■ The Agency's modest support in **Nepal**'s Chitwan National Park and Makalu–Barun National Park, averaging $200,000 a year since 1989, contributed to additional donor involvement valued at $3 million. With secure funding in hand, the Nepalese parks were phased out of USAID's program in late 1996.

■ USAID assistance to bolster ecotourism in **Uganda** helped its park service increase revenues by nearly 900 percent in the last three years. A portion of park user fees was to have been set aside for local communities beginning in 1996. Moving ahead as a test case, one national park gave the local park management advisory committee $50,000 for community-initiated projects.

Promoting Sustainable Use of Biological Resources

The biological diversity in the 93 percent of land area not officially protected must also be managed to ensure the integrity of ecosystems and sustainable development. Mismanagement of unprotected lands makes them and adjacent protected lands vulnerable to habitat and species loss. USAID's strategy is to help lay a firm foundation for local people, the private sector, and governments to capture economic and social benefits through sound use of biological resources. This motivates citizens to value and protect their natural resources (see box 4.2).

Ensuring that communities have legal tenure over their land is a crucial step in making them stakeholders in conservation. In **Bolivia, Indonesia, Peru,** and the **Philippines**, USAID's Peoples and Forests Program has helped 26 indigenous communities maintain their ancestral lands for sustainable resource use.

In East Kalimantan, a province of Indonesia, the program worked closely with the Bentian Dayak people to keep 150,000 hectares of rain forest from being cut down. The land was used for generations under a strict regime of rotational gardening, hunting, and gathering that met the community's subsistence needs. Although this regime conserved the forest, the land was at risk of being converted for a logging or resettlement venture.

Lacking official land title, the Bentian community had little say over the future of their territory. USAID helped the community map its forest and document traditional land-use practices. This is expected to lead to the Bentian securing tenure over their ancestral land. It has already contributed to a national dialog on the role of community forest management in Kalimantan.

Similar efforts with the Tarahumara indigenous community in northern **Mexico** motivated local people to regain control of their land and way of life. Their forests were threatened by unregulated logging and encroaching marijuana and opium farms. A USAID-supported grass-roots effort, led by a Mexican NGO, resulted in official recognition of a 17,000-hectare community forest reserve for Tarahumara lands. Since the reserve's establishment, deforestation has decreased, two illegal logging operations have been closed, and drug growers have been driven from indigenous lands. Moreover, the leader of the effort was given the prestigious Goldman Environmental Prize

for North America for his work defending the human rights and lands of the Tarahumara.

Supporting Conservation Of Genetic Diversity

To complement programs that maintain biodiversity in their natural setting, USAID promotes ex situ conservation. The goal is to preserve the genetic diversity of species outside their natural habitats in managed environments, such as seed and sperm banks. Ex situ conservation is critical to regional and global food security. Preserving the genetic variability of crops is essential for agricultural systems to maintain resistance to environmental stresses such as pest infestations and droughts.

The Agency carries out its ex situ conservation program primarily through support for the Consultative Group on International Agriculture Research centers (CGIAR). The centers manage the world's largest international effort to preserve and use agricultural biodiversity through gene banks.

The CGIAR program covers crops and their wild relatives, forest and agroforestry species, livestock, and aquatic resources. For instance, following the civil war in **Rwanda**, CGIAR worked with other international donors to reintroduce planting material adapted to the local environment. This assistance, combined with food aid in some areas, allowed farmers to begin replanting immediately after hostilities ceased. Similar activities have taken place in **India** and **Somalia**.

Box 4.2. Alleviating Poverty Through Sustainable Rain Forest Use

Subsistence farmers living outside one of Central America's most biologically rich areas are learning nondestructive ways of harvesting the forest to achieve a better quality of life. It was the search for a better way of life that first brought waves of farmers to **Guatemala**'s Petén region in the 1970s. Living outside the Maya Biosphere Reserve, they practiced slash-and-burn agriculture and unsustainable harvesting with great hardship. Each farmer earned an average $70 a month and contributed to one of the highest deforestation rates in Latin America.

USAID and various Guatemalan and U.S. organizations have helped more than 16,000 people in the region lower the "deforestation curve." In the village of San Miguel, for instance, USAID helped residents gain land security and forest management rights in return for assuming responsibility for maintaining 5,000 hectares of forest cover. Residents learned to make fine furniture using a sustainably produced and harvested rattanlike vine. Rather than burning an additional 10 acres of forest each year to plant corn, farmers now earn more than $250 a month each from furniture sales.

As a result of USAID assistance, an estimated 410,000 hectares of natural habitat has been saved from conversion to cropland in the Petén. In addition, the Agency has helped the National Council for Protected Areas, USAID's primary government counterpart, increase its non-USAID financing from $80,000 in 1990 to $885,000 in 1995. That exceeded its target of $800,000.

Reducing the Threat Of Global Climate Change

Evidence continued to build this year in support of the theory that human-induced emissions of greenhouse gases such as carbon dioxide and methane, which trap heat in the earth's atmosphere, have caused a measurable rise in average global surface temperatures since the turn of the century. The findings from a recently released report of the Intergovernmental Panel on Climate Change indicate that observed temperature changes in the past century are unlikely to be the result of natural climatic variation alone. According to the latest climate models, if population growth and eco-

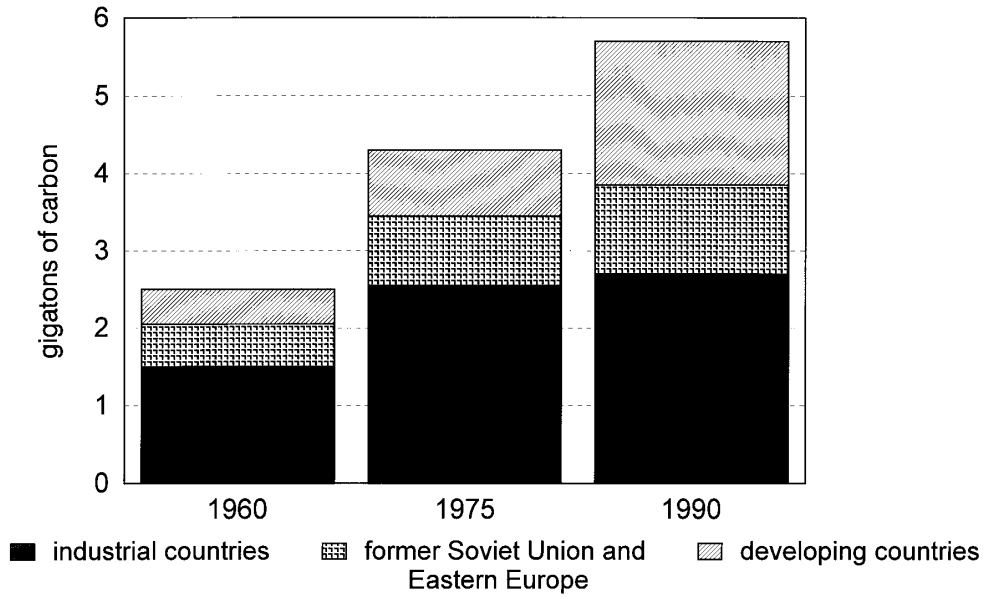
nomic expansion continue at moderate rates with no attempt to reduce current greenhouse gas emissions, the earth's surface temperature could rise by as much as 2˚C by the year 2100. An increase of this magnitude is predicted to cause shifts in agricultural zones, higher sea levels, and more frequent weather-related disasters in both industrial and developing countries.

Greenhouse gas emissions from industrial countries continue to increase. However, emissions from developing countries will increase at almost double that rate for the immediate future because of rapid economic expansion, high population growth, and continued use of highly polluting technologies (see figure 4.5). As a result, developing countries will increase their share of global emissions of carbon dioxide from less than one third to almost one half by the year 2010. USAID's global climate change strategy, therefore, demonstrates a strong commitment on the part of the U.S. government to work with developing countries to reduce this global threat.

The Agency's global climate change strategy aims to reduce greenhouse gas emissions from energy and land use in developing countries and countries in transition. The program targets nine countries (see figure 4.6) and central Africa. In 1992 these countries were responsible for 22 percent of the global industrial emissions of carbon dioxide. Two major climate-change countries, Brazil and Indonesia, lead the developing world in carbon dioxide emissions from land-use change, primarily owing to deforestation. USAID's sustainable energy and forestry programs in other countries also contribute to slowing possible climate change. And all climate-change programs contribute to economic growth and address local environmental needs.

The Agency is also involved in the international Climate Technology Initiative. This endeavor encompasses a set of integrated national and international activities sponsored by member countries of the Organization for Economic

Figure 4.5. Global Carbon Dioxide Emissions From the Energy Sector



Source: Second Assessment Report of the IPCC, Scientific-Technical Analyses, 1996.

Cooperation and Development. The initiative accelerates the development, application, and diffusion of climate-friendly technologies. USAID also collaborates in two multiagency efforts advancing the U.S. commitment to climate-change mitigation (see box 4.3).

Reducing Greenhouse Gas Emissions From Energy Use

The energy sector is the principal source of greenhouse gas emissions in many of USAID's major climate-change countries. To reduce these emissions, the Agency promotes dissemination of energy-efficient and renewable-energy technologies in the nine key Missions. USAID collaborates with developing-country partners to promote better demand-side management to reduce inefficient energy use. The Agency also helps electric utilities increase the efficiency of power production and distribution. For example, USAID-sponsored rural electrification in the **Philippines** reduced average power-line losses by 3 percent, eliminating annual emissions of nearly 250,000 metric tons of greenhouse gases from a heavily polluting coal-powered plant.

In **Mexico**, USAID carried out a high-efficiency lighting program that reduced electricity costs and consumer power bills, averting annual emissions of 118,000 metric tons of carbon dioxide. Another demand-side management program provided 23 firms with low-cost and no-cost industrial audits and sector-specific strategies for saving energy. Enacting the recommendations from these audits has reduced carbon dioxide emissions by 10,000 metric tons a year.

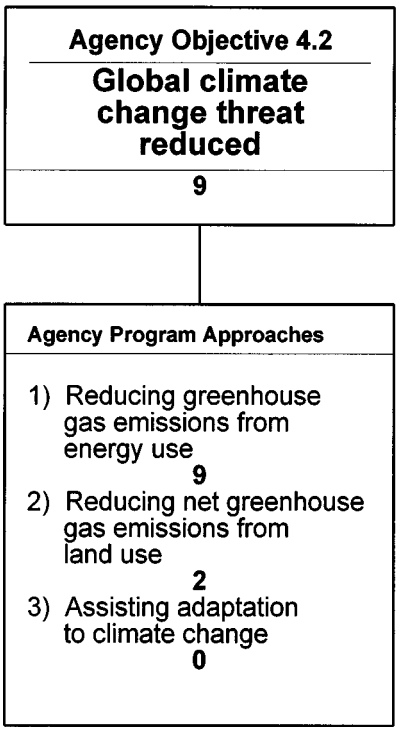
Conversion to less-polluting technologies can produce significant economic savings and reduce greenhouse gas emissions. USAID support for equipment and technical assistance helped the eight largest fossil fuel plants in **Ukraine** increase overall efficiency by 3 percent to 5

Box 4.3. Interagency Cooperation for Climate-Change Mitigation

The Agency participates in two programs that support the United States' commitment to the UN Framework Convention on Climate Change. The U.S. Country Studies Program is a collaboration between USAID and nine other U.S. government agencies. It works with developing nations and countries in transition to assess their greenhouse gas emissions, develop strategies to lower net greenhouse gas emissions, and formulate strategies for adapting to potential adverse effects of global climate change. This initiative has now supported studies in 55 countries. A recently launched follow-on program, Support for National Action Plans, helps eight countries formulate national climate-change action plans. Other countries have requested assistance. USAID funding will help support action plans in countries such as **Indonesia, Mexico**, and the **Philippines**.

USAID also participates in the U.S. Initiative on Joint Implementation, an interagency program carried out under the Clinton administration's Climate Change Action Plan. This initiative encourages the development and execution of voluntary, cost-effective projects between the U.S. private sector and non-U.S. partners aimed at reducing or sequestering greenhouse gas emissions. USAID is helping administer this program, which has approved 15 projects in six countries and has sponsored eight international workshops. In 1996, USAID worked with government, nongovernment, and private sector partners in **Guatemala** to develop a work plan for establishing the national joint implementation program and office.

Figure 4.6. Number of Country Programs Contributing to Agency Objective 4.2



percent a year. This translates into $48 million in potential savings.

USAID's ongoing policy dialog with the government of **Indonesia** and financial support from USAID's Asia Sustainable Energy Initiative (see box 4.1) are leading to increased use of renewable energy resources for electricity generation. The most recent power plant completed using renewable energy resources added 55 megawatts in generating capacity. The Agency plans to help Indonesia produce nearly 600 megawatts of generating capacity from renewable energy sources by the year 2000.

Reducing Net Greenhouse Gas Emissions From Land Use

Changes in land use in developing countries, particularly deforestation, have produced significant greenhouse gas emissions. USAID forestry programs in key countries support initiatives to reduce deforestation, increase carbon storage in existing and new forests, and support the Agency's goal of protecting biological diversity. Forest conservation and reforestation activities in other countries also make valuable contributions to reducing greenhouse gas emissions.

USAID worked to slow climate change through improved forest management in **Brazil**. The Agency funded the first full demonstration of low-impact logging for the Amazon region. This demonstration now serves as a model for adoption by private timber companies. One firm is using the demonstrated techniques to better manage an 80,000-hectare forest tract in the state of Amazonas. In the Atlantic Forest, USAID partners have worked with the Brazilian Ministry of the Environment in the state of Bahia to institute a new forest conservation policy. This policy allocates a portion of state taxes to municipal governments that adopt measures to protect forests surrounding a protected area.

In **Mexico**, USAID has pursued forest management and conservation activities in 11 protected areas totaling 3.1 million hectares, or the equivalent of 3.8 percent of the country's remaining forests. Since the inception of these programs, the estimated rate of deforestation has dropped from 1.3 percent on average to 0.9 percent last year in the target areas. The Agency is also helping marginalized local communities develop alternative economic activities to prevent further deforestation.

Russia's forest reserves, totaling nearly one fifth of the world's forest cover, are threatened by poor economic management and environmentally unsustainable forestry practices. USAID is addressing these threats through an array of programs. The Agency has partnered with the U.S. Forest Service and its Russian counterpart to construct greenhouses in the region. These greenhouses are ensuring the provision of commercially valuable tree seedlings for the regeneration of extensive burned or cleared areas. USAID is also helping promote nontimber products, which may provide sustainable alternatives to logging. The Agency is helping private processors of nontimber forest products acquire low-cost equipment and develop access to markets.

Assisting Adaptation to Climate Change

USAID's strategy centers on activities designed to slow predicted climate change. Developing countries are particularly vulnerable to the consequences of possible climate change, such as droughts, sea-level rise, and increased damage from storms. To date, the Agency has not targeted objectives to assist developing countries in reducing vulnerability caused by climate change and increasing adaptive capacity. However, USAID programs in coastal zone management, drought and water management, and famine early-warning systems all help countries increase their capacity to respond to any adverse effects of climate change. In addition, the U.S. Country Studies Program has included vulnerability and adaptation assessments in 40 reports.

Promoting Sustainable Urbanization and Reducing Pollution

In 1975 roughly one third of the world's population lived in urban regions. If current trends continue, more than 50 percent of the world's population will live in urban areas within 10 years. In developing nations and countries in transition, urban environmental degradation is a significant threat to the well-being of urban populations and natural ecosystems. Lack of access to clean water and sanitation services contributes to high infant and child morbidity and mortality and increases the risk of other health problems. The cost of these problems, combined with those resulting from high ambient outdoor and indoor air pollution, poses a serious obstacle to development.

Problems of the urban environment have received significant attention during the last year. The recently concluded Habitat II conference, held in Istanbul, brought to the fore the many environmental hazards that city dwellers worldwide face on a daily basis. Cities produce the majority of any country's gross domestic product. Participants emphasized that addressing brown environmental issues of water and sanitation, municipal management, and air pollution is crucial if efforts at sustainable development are to succeed. Additionally, Habitat II emphasized the intrinsic link between these efforts and that of strengthening local governments and facilitating private partnerships to fund environmentally sound urban development.

USAID's sustainable urbanization strategy seeks to improve urban management and ameliorate poor living conditions in the world's cities. This year 23 programs had sustainable urbanization and pollution management strategies (see figure 4.7). The number of Missions pursuing this objective in Eastern Europe and the new independent states dropped as the budget for sustainable urbanization and pollution control decreased. The Environmental Initiative for the Americas has led to increased activities in the Latin America and Caribbean region. USAID's program approaches in this objective are

- Increasing access to safe water and sanitation services
- Promoting improved urban management
- Supporting pollution prevention and control

These approaches are intricately linked. It is common for USAID efforts targeting one area of sustainable urbanization and pollution management to lead to improvements in others.

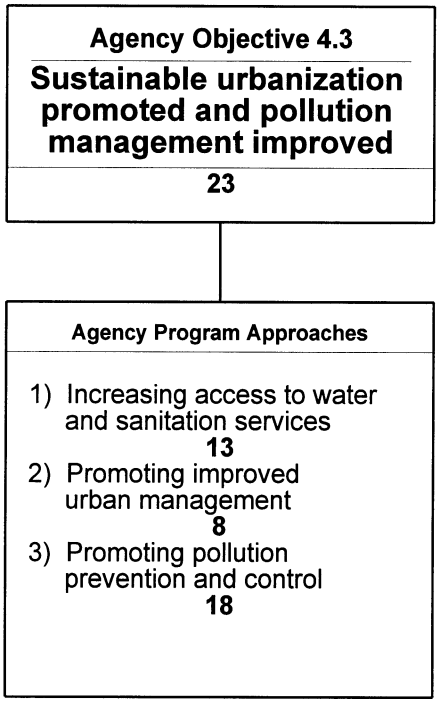
Increasing Access to Water And Sanitation Services

According to the World Resources Institute, more than 220 million people in the developing world had no access to clean water in their homes in 1994, and more than 420 million did not have access to a latrine. Poor sanitation and the lack of access to potable water services have led to outbreaks of cholera and plague. The costs of fighting these outbreaks far outweigh the costs of preventive measures to provide sanitation and water services. USAID seeks to enhance access to water and sanitation services through interventions that improve and expand water supply, wastewater treatment, and solid-waste management.

The urban environment of Lima, **Peru**, has long suffered from inadequate solid-waste collection and disposal. Urban residents dump solid waste in rivers and open landfills without environmental controls, leading to severe water pollution. In a first step to reduce this environmental health hazard, USAID helped carry out an innovative solid-waste program in the shantytowns of Lima run by four women-owned and -managed microenterprises. These businesses collect domestic solid wastes, reclaim recyclables, and dispose of the remainder in sanitary landfills, thus improving sanitation, protecting the environment, and providing employment for residents. Just six months into the project, 60 percent (20 metric tons) of solid waste is being collected daily in the targeted area.

Since 1980, 20 million **Egypt**ians have benefited from USAID-supported expansions in water-treatment capacity and distribution and collection networks in major cities. In the past year, completion of construction projects in Cairo and Suez made safe water available to more than 3 million additional people and gave 1.2 million more people access to sewage and wastewater treatment. In the **West Bank and Gaza**, USAID is supporting feasibility studies, planning, and construction of water systems for 150,000 residents who face a critical water shortage. Early returns indicate positive results. One intervention, for instance, has benefited 3,000 residents through support for a two-village water system and five water catchments.

Figure 4.7. Number of Country Programs Contributing to Agency Objective 4.3



In the **Czech Republic**, 40 environmental and energy-related municipal infrastructure projects, funded with a housing guaranty loan, directly benefited more than 35,000 households and 124,000 people in 26 municipalities. These projects include new sanitary sewers (to replace open drains in the nation's rivers), water lines, environmental landfills, natural gas distribution and conversion, and heat metering and control devices on residential buildings. Hundreds of Czech municipalities and commercial banks are using debt-financing techniques USAID taught them to pay for environmental infrastructure projects.

Promoting Improved Urban Management

Improved urban management is critical for sustainable urbanization and industrial pollution prevention and control as well as for promoting democracy. Direct support for infrastructure projects that alleviate the effects of urbanization and industrialization is frequently beyond the financial capacity of USAID. However, working with local partners to help establish the legal and institutional frameworks for public–private partnerships can have positive results. USAID seeks to improve urban management through training and technical assistance in legal, financial, environmental, and administrative municipal management, and through outreach programs to change public attitudes.

Using capital resources available under the housing guarantee program, USAID/**India** and USAID/**Indonesia** are helping local governments access the capital market to finance urban infrastructure investment. Recently, USAID facilitated the completion of the first credit rating of an Indian municipal government—assignment of an A+ rating to the Ahmedabad Municipal Corporation. The rating is a landmark in municipal reforms and has had a ripple effect. USAID will help the country's rating organization complete additional ratings of municipal authorities. Ahmedabad, with USAID assistance, is currently exploring the potential for capital market financing of major improvements in water supply and sewage projects for the city's more than three million residents.

Agency policy assistance and institution building have helped many partner countries improve municipal water management. USAID/**Guatemala**–Central American Programs and bilateral Mission assistance helped Central American governments transfer authority for municipal services to local governments to improve management of local water resources.

El Salvador delegated water authority to municipalities, part of the restructuring of its national water policy. **Honduras** formalized the transfer of water authority to two municipalities and plans to devolve authority to an additional 22 municipalities. In **Indonesia**, USAID assistance resulted in new procedures for initiating local government agencies' sale of municipal revenue bonds. It has helped create new community-led environmental infrastructure plans.

The Agency has helped develop guidance for the appraisal and approval of privately financed urban infrastructure projects. In **Eastern Europe and the new independent states**, USAID supported training in environmental impact and risk assessment, development of environmental management frameworks, and assistance in planning, designing, and financing wastewater and solid-waste management systems.

Pollution Prevention And Control

In many countries, inadequate treatment and emission standards for industrial municipal waste place the environment and human health at significant risk. In the **new independent states**, the legacy of central planning and unregulated industrialization continues to pose a threat to people living in highly industrial regions. In many developing countries, economic expansion requires

enhanced efforts in pollution prevention and control, since the majority of industrial facilities that will be on-line in 2010 have yet to be built. USAID interventions seek to promote pollution prevention and reduction through advocacy for policy reform, adoption of best urban management practices, and promotion of clean production–waste minimization technologies.

The Global Bureau's Environment Center promotes the adoption of cleaner industrial production techniques in Africa, Asia, and Latin America. A combination of policy advice, capacity building, and technical assistance has ensured sustainability of the program's pollution prevention initiatives.

In **Chile**, USAID provided facility assessments to identify pollution prevention opportunities in various pollution-producing industries. Assessments at 28 firms led to capital improvements that decreased pollution and provided financial benefits ranging from $23,000 to $76,000. USAID supported pollution assessments at four industrial plants. Adjustments at the plants will save $886,000 a year and will reduce energy use and pollution. In **Mexico**, USAID is supporting workshops for pollution prevention and energy efficiency.

In **Romania**, USAID's Waste Minimization Impact Program has identified 20 potential waste minimization programs at five chemical plants. Plants that implemented the program reaped annual savings ranging from $8,500 by recovering wastewater oil residue to $140,000 from reducing water discharge. One participating chemical company avoided a $700,000 investment for capital plant improvements.

USAID is also providing support for pollution prevention and control in Asia, where rapid industrialization has generated environmental pollution (see box 4.4). The program is helping the government of **Indonesia** incorporate cleaner production incentives into the

Box 4.4. Achieving Cost-Effective Pollution Prevention

In the **Philippines**, USAID's program to promote cost-effective pollution prevention has reduced national emissions of industrial organic pollution by almost 2 percent in the demonstration phase. A $21 million voluntary capital investment has yielded $30 million in annual savings to the private sector.

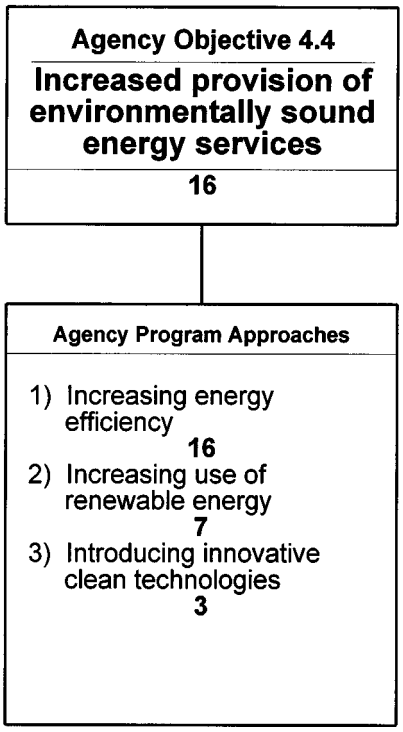
The program promotes waste minimization and pollution prevention as cost-effective and environmentally beneficial alternatives to costly cleanup; it links its benefits to operating efficiency and increased profit for participating plants. USAID provided pollution management appraisals to more than 130 firms working in highly polluting industries. Appraisal teams, including local experts, helped managers identify technologies and practices. These included improved equipment maintenance and other no-cost measures to achieve such economically beneficial results as reduced emissions and wastes, avoidance of fines and material costs, and improved employee health. The money firms invested was often recouped in a matter of months. Among the results:

- Pollution load reduction and waste sharing with a beverage company helped a coconut-processing firm reduce pollution by 50 percent, cut treatment costs by 10 percent, and increase workers' efficiency.
- Technical improvements in feeders at a large pig farm paid for themselves in 2½ months and reduced feed spills by 40 percent, water consumption by 50 percent, and wastewater by 85 percent.
- Process changes, improved equipment maintenance, and recycling and sale of waste at a glue and coconut flour manufacturer eliminated the generation of wastewater laden with suspended solids (and the need for settling basins and sludge disposal). The measures also reduced total wastewater generation by 20 percent and diminished offensive odors, which had caused complaints.

environmental impact analysis process. In **India** the Agency is working to reduce pollution in wastewater and improve air quality at selected industrial sites. USAID supported a joint venture to manufacture air-pollution-control equipment for the cement, steel, and power industries. Sales exceed $10 million, and where the equipment has been installed, air pollution has been reduced 80 percent. USAID also helped develop a technology licensing agreement for water-pollution-abatement equipment. The equipment will reduce water pollution at paper mills using the technology by 60 percent.

The Agency is helping the government of Indonesia address air and water pollution resulting from rapid industrialization. There, it provides technical assessments of industrial concerns and training for these firms. USAID has also helped the government establish a business rating program that rewards firms meeting environmental standards.

Figure 4.8. Number of Country Programs Contributing to Agency Objective 4.4



Increasing the Provision Of Environmentally Sound Energy Services

USAID recognizes the strong link between sustainable development, economic growth, environmental protection, and energy consumption in the developing world. The Agency promotes market-based activities that address those issues in three programming areas (see figure 4.8): 1) increased energy efficiency, 2) expanded use of renewable energy sources, and 3) introduction of clean-energy technologies. Activities in these areas often achieve secondary benefits, such as reducing the rate of increase in global emissions of carbon dioxide and local pollutants such as sulfur dioxide, nitrous oxides, and suspended particulate matter. USAID has provided technology transfer and direct technical assistance. In addition, in 1995 alone, the Agency trained more than 1,300 energy professionals (both men and women), some of whom have reached high levels of decision-making authority. This kind of local expertise is the building block for sustainability.

Increasing Energy Efficiency

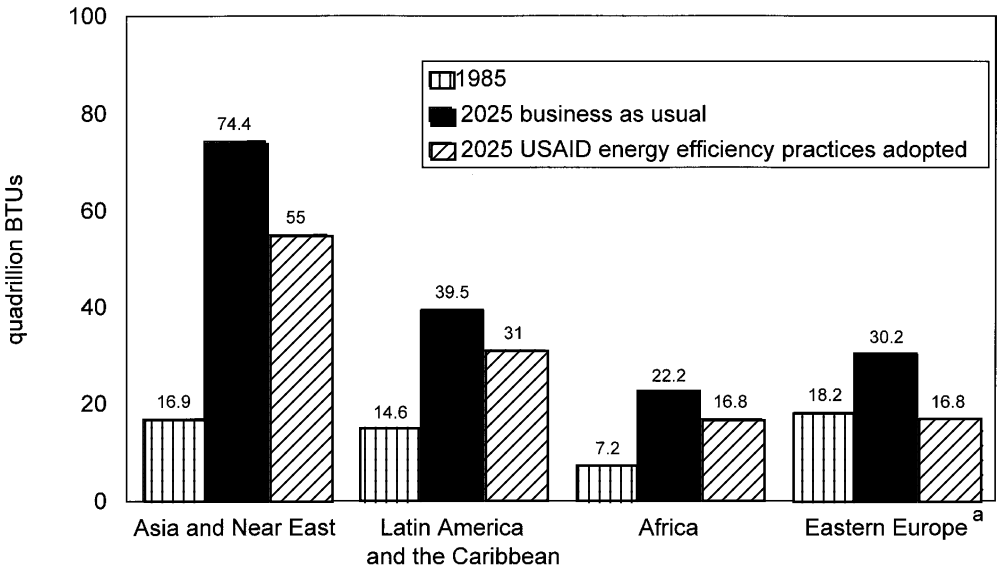
Inefficient power production, weak energy policies and institutions, and wasteful consumer use of electricity contribute to elevated levels of harmful emissions and reduced productivity in developing countries. In most developing countries, cost-effective energy-efficiency technology could

achieve 20 percent to 30 percent savings in energy consumption, with no loss in energy services (see figure 4.9). To promote energy efficiency, the Agency supports price restructuring, policy reform, conservation programs for users, increased provision of decentralized and private-sector services, provision of U.S.-manufactured pollution prevention equipment, and pairing of developing-country utilities with highly efficient U.S.-based utilities.

To help cut energy costs and reduce pollutants in **Egypt**, USAID acquired portable gas analyzers and sensors. The analyzers measure global and local emissions and increase efficiency at little cost. Ninety-two of them were distributed to 60 factories. Their long-term use has averted emissions of 596,000 metric tons of carbon dioxide and 15,600 metric tons of sulfur dioxide, saving $26 million in fuel costs. Lower emissions reduce human health risks.

In **Mexico** the Ilumex program, a model energy efficiency activity started with USAID funds, has reduced electricity costs and consumer power bills. At the same time, it is preventing annual emissions of 118,000 metric tons of carbon dioxide and 3,000 metric tons of sulfur dioxide. Since May 1995, the program has sold electricity users more than 500,000 compact fluorescent lamps through the Mexican Central Utility. The utility's monitoring and evaluation process demonstrates that from April 1995 to January 1996, Ilumex averted generation of 24,400 kilowatt-hours. It also saved 31 megawatts in capacity, 7.1 million liters of fuel oil, and 90,000 metric tons of carbon dioxide. The utility is trying to replicate the success of this program by offering other demand-side management rebates and incentive programs, including measures to reduce energy waste in the industrial and commercial sectors with more efficient motors, compressors, lighting, and municipal pumping.

Figure 4.9. Primary Energy Use by Region, 1985–2025



[a]Excludes the former Soviet Union.

Source: "Energy Efficiency, Developing Nations, and Eastern Europe," Secretariat, Global Energy Efficiency Initiative/U.S. Working Group on Global Energy Efficiency, 1991.

Increasing the Use of Renewable Energy

Renewable energy offers a way of supplying clean energy and reducing the environmental and health problems associated with fossil fuel or wood-fired energy. The biggest barrier manufacturers of renewable-energy technologies have faced in the developing world has been not a lack of technical solutions, but a lack of investment opportunities. The Agency is addressing this and other issues by supporting feasibility studies, offering policy and technical assistance, and providing training aimed at demonstrating and institutionalizing the use of alternative sources of energy. These include photovoltaic, solar thermal, hydro, wind, geothermal, and biomass energy (see box 4.5).

Agency support for financing studies in sugarcane cogeneration has been particularly successful. (In cogeneration, waste heat is used to generate electricity.) In **India**, where the investment climate favors renewable energy, USAID supported a $200,000 study on the potential of sugarcane cogeneration at several mills in 1992. One of the mills is generating electrical power and selling to the grid with a total installed capacity (on-line) of 18.6 megawatts. The sugar industry is now selling more than 40 megawatts of export capacity (additional) to the grid. The planned installed capacity is 285 megawatts. Potential generation capacity from India's sugar industry is estimated at 3,000 megawatts. That would represent a $1.5 billion investment in new electrical generating capacity (preinstalled, but not yet on-line).

A $150,000 study in **Guatemala** contributed to the development of more than 130 megawatts of installed capacity there. These USAID-assisted activities total less than $650,000. Yet they've resulted in more than 260 megawatts of installed generating capacity (valued at $130 million) in 12 sugar-producing countries (excluding the United States). At least 300 more megawatts are under construction or in the planning stage. Most of this new capacity was installed in the last five years. Hundreds of millions of dollars have been invested, and banks no longer view as too risky an investment in power generation by the sugar industry.

Five years ago, funding for clean, renewable energy other than large-scale hydro projects was virtually nonexistent. USAID has taken several steps to increase availability of loans and local currency in support of renewable energy projects. Toward that end, the Agency has sought to broaden the pool of renewable energy programs and services, to increase access to funding and technology, and to encourage multilateral development banks to increase loan disbursements for renewable energy programs.

Box 4.5. Indonesia and Wind Power

In 1992 USAID/Indonesia gave a $24,900 grant to the Oklahoma-based firm Bergey Windpower Company for a small wind-turbine demonstration project on the island of Timor. The project was to show the reliability and cost-effectiveness of replacing highly polluting diesel-powered irrigation pumps with cleaner wind power. It was jointly funded by the Japanese International Cooperation Agency (JICA), which provided a grant to cover equipment costs.

As a result of the demonstration, the Indonesian Ministry for Public Works is installing 30 more small wind turbines to provide irrigation and drinking water for farming communities. A Japanese trading group fully funded wind turbines for Timor, providing $500,000 to purchase Bergey systems. The low-maintenance, nonpolluting wind turbines have a 25-year operational life. They replace two-horsepower diesel pumps, which emit greenhouse gases (as well as harmful local pollutants) and have an operational life of only five years. A second JICA procurement has been delivered, yielding $1 million in direct U.S. exports to date from the initial USAID investment.

These efforts have helped **Brazil, Central America,** and **Indonesia** increase their lending portfolios in these technologies. USAID has also provided technical assistance that has resulted in loans from numerous multinational banks, and increased support from other U.S. agencies for renewable energy. Today, the portfolio of renewable energy projects has grown to more than $1 billion in 10 countries.

Introducing Innovative Clean Technologies

USAID seeks to help governments and communities in developing nations reap environmental and economic benefits from cleaner fossil-fuel techniques such as coal washing, retrofitting, and desulfurization. Clean coal technology, for example, reduces the environmental impact of energy production and transportation. In addition, USAID is helping countries limit emissions of local pollutants without detriment to economic growth. The Agency's approach has paved the way for many partnerships between U.S. businesses and developing-country organizations interested in protecting the environment. Those partnerships have increased environmentally sound energy production and use, and economic growth.

In 1982, USAID initiated a project to improve the reliability and economic efficiency of the Aswan High Dam Hydroelectric Power Station. This facility, **Egypt**'s largest electrical energy source, produces nearly eight billion kilowatt-hours of electrical energy annually—equivalent to that produced by burning two million tons of oil. USAID financed foreign exchange costs for the design, manufacture, testing, and commissioning of the replacement or rehabilitation of the mechanical equipment for the dam's 12 hydroturbogenerators. In the past year, USAID's contribution to major efficiency improvements has extended the life of the power station. It has also averted use of two million tons a year of oil and annual emissions of 7.7 million tons of carbon dioxide, 118,000 tons of sulfur dioxide, and 2,000 tons of nitrous oxides.

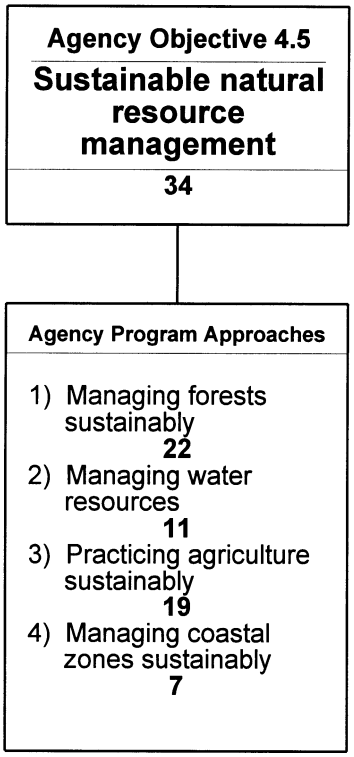
USAID assistance was instrumental in furthering privatization of the power sectors in **Hungary** and **Kazakstan**. A goal of the privatization scheme was to introduce clean technologies for energy production. USAID advisers helped the Hungarian Energy Office develop a grid code and regulatory framework. That attracted $1.3 billion in financing for six electricity distribution companies and two generation companies in the first phase alone. USAID supported demonopolization and regulatory reform of the Kazakstan system. That change permitted the recent sale of three major generation units, including a large thermal plant, from a U.S. company.

USAID is working with the government of **Mexico** to reduce pollution at the Manzanillo power plant. This six-unit 1,900 megawatt oil-fired power plant generates power for the industries of Guadalajara. Polluted plumes from the plant's stacks are clearly visible at nearby tourist locations, including world-renowned beaches and Las Hadas resort. The hardware for the plant—reduced-emissions and advanced-combustion technology—will be installed in late 1996 in two of the Manzanillo units. It will be tested for efficiency following installation. This technology is expected to increase the boilers' efficiency by 1 percent, reducing oil consumption by 35,000 barrels per unit annually, with a corresponding drop in operating costs. It will also reduce particulate emissions by 50 percent, including an 8,800-ton reduction in carbon dioxide emissions and a 20 percent to 40 percent reduction in nitrous oxide production.

Sustainable Natural Resource Management

The long-term productivity of renewable natural resources is vital to the economic and social development of all countries. USAID's objective in natural resource management (see figure 4.10) targets the four resources that provide the greatest range of benefits to the largest number of

Figure 4.10. Number of Country Programs Contributing to Agency Objective 4.5



people: forests, coastal resources, agricultural lands, and freshwater resources.

USAID natural resource management programs for each of the four resources have a central purpose: to help men and women make environmentally and economically sound decisions about how to use them. Better management of these resources requires a greater understanding of the direct social and economic needs of the farmers, fisherfolk, and forest dwellers who use them. Thus, the Agency's approach to natural resource management concentrates on testing and disseminating culturally appropriate management practices and technologies, and bringing diverse stakeholders together to forge equitable solutions.

Managing Forests Sustainably

Forty percent of the world's land area now planted for crops or used for pasture was formerly forest or grassland. The rate of land conversion is closely linked to the need for greater food and timber production as populations increase. It is also related to poorly conceived policies. Land conversion has been increasing steadily and is most acute in developing countries. In the 1980s, tropical deforestation in Africa, Asia, and Latin America averaged 16.9 million hectares a year (about 1 percent). That represents a 50 percent increase over the deforestation rate for the years from 1976 to 1980, according to the UN Environment Program's *Environmental Data Report 1993–94*. USAID is responding to this challenge by working with countries to balance the need for agriculture and timber with the value of natural forests in terms of recreation, climate, and biodiversity. In the last few years, the Agency has increased the number of programs that explicitly link these environmental interests. Twenty-two operating units now have objectives in sustainable forest management.

In the **Latin America and Caribbean** region, several countries have expanded or strengthened forestry components of environmental programs. USAID-supported scientific research in Brazil is providing answers to fundamental questions about forest fires and global climate change. Multiagency training programs are increasing local capacities in forest management and fire control in the Amazon basin.

USAID has greatly improved resource management by working with governments and communities to increase local involvement and investment in forest resources. According to a USAID study released in 1995, communities that have greater authority over forest resource use are seeing increases in tree growth, ground cover, and soil moisture retention, and decreases in erosion. The Agency helped the governments of **Indonesia** and the **Philippines** expand their national commitment to community-based natural resource management. Indonesia has achieved its first-ever forest stewardship agreements, transferring 2,000 hectares to communities. The Philippines has authorized community management of 217,000 hectares of forests, up 1,100 percent from 19,600 hectares in 1994. The World Bank and the Asian Development Bank have adopted USAID's community-based approach in 30 sites in the Philippines.

In Africa, USAID has helped the governments of **Tanzania** and **Uganda** strengthen the links between their existing biodiversity programs and forestry activities. **Guinea** and **Mali** have augmented agriculture programs to include stronger agroforestry components. In Guinea, 574 villagers, nearly half women, have planted 50,000 forest and fruit trees. That has reduced erosion and improved water quality. Positive experiences with community forest management have encouraged Guinea to expand this approach to water resources.

In **Sri Lanka**, USAID is testing participatory approaches, using a package of measures that include new crops, appropriate land and water conservation practices, and user rights, to integrate conservation with production goals. This approach has taken hold in 28 subwatersheds, where 6,780 farm families are collaborating with 70 user groups, farm companies, government agencies, NGOs, and the private sector. A total of 570 user groups jointly manage their natural resources, nearly double the USAID target of 308 groups.

Ecuador has taken community management one step further. In 1995, USAID/Ecuador helped train 17 community representatives, including six women, as paralegals, to help their communities obtain ownership rights over lands and establish resource management plans.

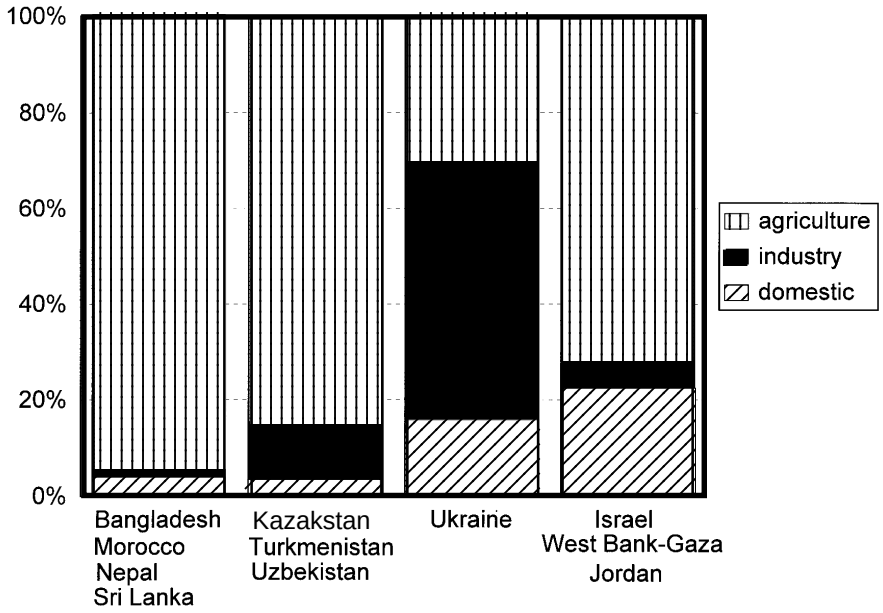
Managing Water Resources

Dealing with competition for a clean, reliable water supply is one of the great environmental challenges of the coming years. This competition occurs not only among countries and regions but also among sectors of the economy—agriculture, industry, and domestic use. Competition will increase as populations and economies grow. In 1992, 200 million people were living in countries where water scarcity hindered economic growth, human health, and resource productivity. By 2050, about one *billion* people will live in water-scarce countries.

USAID is helping 11 countries in all regions address the most pressing water management issues. Agency approaches to managing water resources emphasize reducing the volume of pollutants entering water systems and improving their technical and fiscal management.

As figure 4.11 shows, water use for agricultural development is a critical issue in **Bangladesh, Morocco, Nepal,** and **Sri Lanka**, where agriculture accounts for an average of 90 percent of all water withdrawals. USAID has promoted adoption of water conservation technologies and policies and creation of water user associations to distribute water more efficiently and equitably. In Nepal the Agency has helped boost the efficiency of irrigation, increasing the number of crops planted each year on a unit of land from 1.53 in 1994 to nearly 1.74 in 1996. Bangladesh, **Guinea**, and **Mali** have reported similar successes with communal management of water resources.

Figure 4.11. Use of Fresh Water by Sector



Source: World Resources Institute.

In arid **Morocco**, Agency assistance helped pass a comprehensive new water law that radically improves the planning and allocation of water systems. The Agency also introduced new irrigation technologies that led to a 20 percent water saving in the agricultural sector. Many of USAID's improvements have been adopted or replicated in the World Bank's $365 million loan to improve water management in the country's nine irrigated regions.

In the **Central Asian republics** and **Ukraine**, industrial effluent has contaminated water supply and distribution systems, threatening human health. In Ukraine, the Agency is providing water-monitoring and purification technologies. **Kazakstan**, **Turkmenistan**, and **Uzbekistan** are collaborating on a regional plan to improve water quality and distribution, centered on the Aral Sea. The Aral Sea initiative should ultimately benefit more than a million people by increasing potable water and up to 1.5 million people through a public health program.

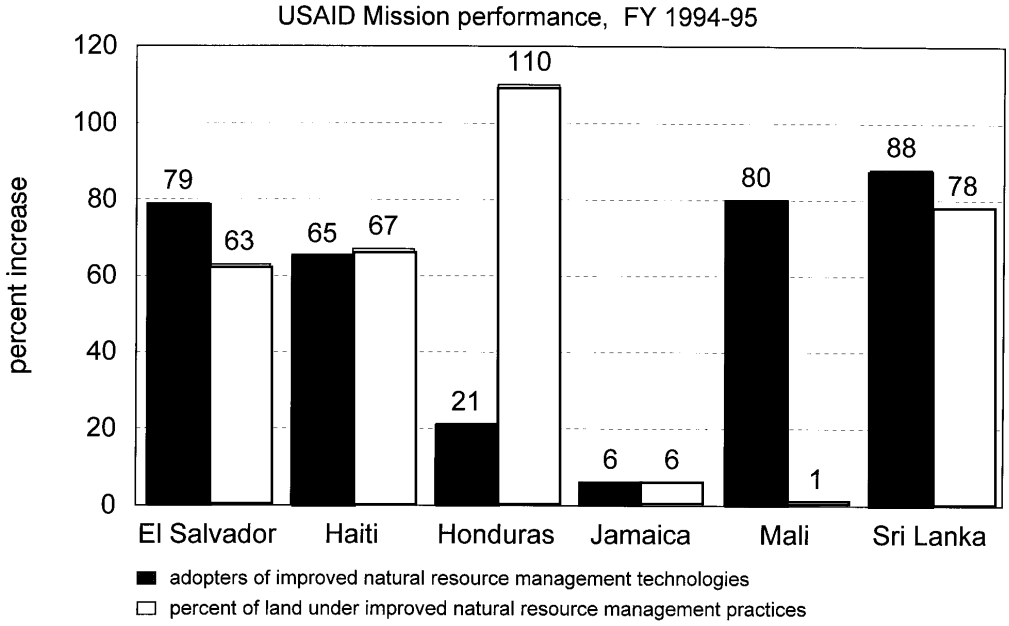
In **Jordan** and the **West Bank–Gaza**, where water shortages affect nearly every human activity, USAID is taking a multifaceted approach. It includes more efficient irrigation technologies, industrial water-use audits, and metering and household conservation measures for domestic users. In the last year, this approach helped increase Jordan's water availability by 19 percent.

Practicing Agriculture Sustainably

Global agricultural production continues to grow, but the rate of increase is slowing. In the world's poorest countries, rapid population growth has sharpened problems of food scarcity and undernutrition. In countries with high agricultural productivity, intensive farming has led to soil erosion, forest clearing, and pesticide pollution.

A recent USAID evaluation covering 30 years of agricultural assistance to low-income countries concludes, "The main

Figure 4.12. Adopters of Natural Resource Management Technologies



Source: USAID Mission 1995 Results Review and Resource Request.

bottlenecks binding agricultural growth are most likely to be inadequate policies, technologies, and rural infrastructure." The Agency's current agriculture approach reflects this lesson, emphasizing technology transfer for improved resource production and conservation (see figure 4.12.)

The Agency's largest portfolio of natural resource management activities is in sustainable agriculture. Nineteen Missions are pursuing sustainable agriculture. Sustainable agricultural production is integrally linked to all USAID objectives, especially economic growth. This relationship is particularly evident in Africa. Nine countries there have objectives in sustainable agriculture, and in six of them, economic growth objectives are linked to agricultural production.

USAID/**Mali** reports a 59 percent increase in crop production in the last five years. The increase is, in large part, a result of USAID support for introduction of improved farming and soil conservation techniques coupled with expansion of agricultural land.

In **Senegal**, USAID has merged programs dealing with crop productivity and tree production. Thanks to the introduction of antisalt and water-retention dikes, 20 percent more land (10,000 hectares) is under cultivation in Senegal's Casamance region, contributing to a 21 percent increase in rice production. The fertility of some land has been restored sufficiently to allow double cropping.

USAID's long history of involvement in **Jamaica**'s agricultural sector has provided valuable lessons and concrete results. Aiming to help farmers in the country's steep hills improve productivity and protect watersheds, the Agency's initial approach—to construct dikes and channels—failed to generate significant farmer support. The Agency learned from this experience and readjusted its program to encourage farmers to adopt improved technologies and conservation practices related to tree crops they were familiar with. This initiative, now in its

10th year, has helped 18,500 farmers plant and improve the health of 3.5 million economically valuable trees.

With Agency help, **Haiti** planted more than five million trees in the most important watersheds. The Agency also promoted sustainable agricultural practices, which were adopted by 91,000 farmers working 100,000 hectares. More than 30 local NGOs are helping develop Haiti's national environmental action plan.

Nontraditional agricultural exports can potentially revitalize stagnating agricultural economies. However, intensive farming associated with nontraditional agriculture also causes potential environmental damage, including pesticide poisoning. USAID and its partners are working to minimize the environmental impact by introducing integrated pest management and sustainable production technologies. In **Costa Rica**, the **Dominican Republic**, **Ecuador, Guatemala, Honduras, Indonesia, Nicaragua**, and the **Philippines**, Agency-promoted integrated pest management, for both traditional and nontraditional crops, has produced positive results with benefits beyond increased production and income.

In Ecuador, for example, USAID encouraged 270 large and small firms to reduce employee exposure to pesticides. This has been particularly beneficial to women, who have in the past experienced increased prevalence of spontaneous abortion, premature birth, and children with congenital malformations after working in floriculture.

Managing Coastal Zones

More than half the world's coasts are under moderate or high risk of degradation (see map 4.2). Destruction of coral reefs, depletion of fish stocks, increasingly frequent die-offs of seals and dolphins, and greater incidence of algal blooms indicate that the health of coastal ecosystems is in steady decline. The consequences for coastal resource users—loss of food, tourist income, and employment, and harmful effects on indigenous cultures—are serious. They are clear signs of the urgency of improved management of coastal resources.

For more than a decade, USAID has sustained its commitment to promoting integrated coastal management in developing countries (see box 4.6). The Agency supports nine Mission-based coastal resource management programs and several regional initiatives. In the international arena, the Agency supports the International Coral Reef Initiative, a partnership of nations and organizations seeking to foster sustainable use of marine and coastal resources. The initiative is the first global program to address policy, implementation, research, and monitoring capacity in an integrated fashion.

In **Latin America and the Caribbean,** several countries have begun coastal activities that target the sustainable use of marine resources (see box 4.7). In **Nicaragua**, USAID has helped a cooperative of 90 families increase shrimp harvests from a few hundred pounds to 1,800 pounds per hectare in 1995. The Agency is introducing environmentally sound techniques to ensure that shrimp farming can provide long-term employment and income. USAID is promoting harmonizing national environmental policies among eastern Caribbean states to encourage regional coastal zone management. More than 20 USAID-supported small projects at three demonstration sites are helping communities recognize the importance and fragility of the coastal environment and encouraging them to become more active in coastal management.

In a test of its commitment to regional peace and to coastal resource management, USAID has been working with **Jordan**

Box 4.6. Successful Integrated Coastal Management Strategies

USAID has learned a great deal from a decade of coastal management pilot programs, as documented in a recent Agency publication on the coastal portfolio. The Agency has applied the following lessons in a variety of settings:

■ *Link local and national efforts to encourage participatory identification of problems and solutions.* **Ecuador**'s Coastal Resource Management Program first introduced a two-track approach—residents' local knowledge was combined with that of national and international experts to identify and set priorities for issues affecting Ecuador's coasts.

■ *Build national capacity through short- and long-term training and long-term partnerships with host country colleagues.* The Environmental and Coastal Resources project in the eastern **Caribbean** has sponsored training courses for more than 700 NGOs, community members, and government personnel to ensure that member countries have the technical and administrative capability to carry out coastal management guidelines and strategies.

■ *Use small demonstration projects to show the effectiveness of innovative policies.* Several Asian and Pacific nations have received funding to test the viability of business ventures founded on sustainable use of coastal biological resources. In the eastern Caribbean island of **Dominica**, communities have experimented successfully with using pumice for local construction instead of destroying beaches and habitats by mining beach sand.

■ *Set specific targets and monitor and self-evaluate performance.* On average, 32 percent of coastal resource management grants of the Biodiversity Conservation Network (part of the Global Bureau's Biodiversity Support project) is allocated for monitoring the social, economic, and ecological effects of environmentally based business ventures, with a view toward replicating successful activities.

and **Israel** to make the binational Red Sea Marine Peace Park a reality. The Agency is encouraging Jordanian–Israeli cooperation in marine science and biological research, environmental monitoring, exchange of environmental data, and staff training in coral reef management. USAID and the State Department are providing funding for mooring buoys to protect the world-famous reefs and to establish basic infrastructure for park maintenance and operation.

Conclusion

In 1995 the Agency achieved substantial outcomes, despite mounting evidence that environmental degradation is increasing, with negative consequences for the United States and the rest of the world. Though the task of reversing global environmental trends is herculean, the Agency and its partners made numerous inroads. In more than 50 countries, USAID helped strengthen environmental policies and institutional capacity, increase community stewardship of natural resources, and encourage adoption of technologies and practices that lead to sound urban growth and sustainable energy development. A major goal of these initiatives was to ensure the sustainability of environmental activities beyond USAID's presence.

USAID programs motivated other players in development to take action. The Agency pioneered programs to help partner governments solve their envi-

Box 4.7. USAID Capacity-Building Support to Central America

In 1989 the presidents and environmental officials of five Central American countries established a regional forum for action—the Central American Commission for Environment and Development (CCAD)—to consolidate their pursuit of environmental sustainability. USAID's regional environmental offices were among the most important supporters of CCAD's institution-building process in the last six years in terms of financial and technical support.

USAID Mission staff provided financial and technical assistance and counsel. This allowed CCAD to bring about significant results for the region.

- CCAD helped develop and promote ratification of 11 regional treaties and agreements on issues ranging from biodiversity protection to the cross-border transfer of hazardous wastes.

- Commission efforts helped integrate environmental concerns into other sectors at the national and regional levels. For example, CCAD's experiences in regional coordination helped solidify the 1994 Alliance for Sustainable Development, a regional plan to promote not only peace and democracy but also sustainable development.

- CCAD has been successful in leveraging USAID contributions for regional environmental initiatives from other donors and governments. The commission has also helped involve NGOs in regional decision-making.

ronmental problems and benefit millions of people at all levels of society. The Agency also engaged NGOs, communities, and developing-country businesses in environmental initiatives that are profitable and socially sound.

The Agency's leadership among international donors in several critical areas—notably biodiversity conservation, renewable energy, and community resource management—paved the way for major multilateral programs. In addition, USAID's leadership fostered strong links between the U.S. private sector and growing environmental markets abroad. These accomplishments yielded a wide array of benefits, contributing to improved environmental management as well as to economic growth, democracy-building, and healthier and well-nourished populations—crucial factors in sustainable development.

But continued budget cuts will inevitably impede USAID's ability to achieve these kinds of results in the future. Already, the Agency's role in central and Eastern Europe and the new independent states has been curtailed significantly. Further cuts will have a cascading effect. USAID will lose its ability to motivate other development partners to support and replicate successful environmental strategies. Continued environmental degradation could undermine other Agency achievements, particularly in food security, public health, and economic growth.

Endnotes

[1]Philip E. Church and Katrina Brandon. 1995. *Stemming the Loss of Biological Diversity: An Assessment of USAID Support for Protected-Area Management.* Washington: U.S. Agency for International Development.

[2] Center for Development Information and Evaluation. 1996. *USAID Working Paper No. 221. Endowments as a Tool for Sustainable Development.* Washington: U.S. Agency for International Development.

[3]Philip E. Church and J. Laarman. 1995. *Forestry and the Environment: An Assessment of USAID Support for Forest Stewardship.* Washington: U.S. Agency for International Development.

[4]Donald G. McClelland, Center for Development Information and Evaluation. 1996. *Investments in Agriculture.* Washington: U.S. Agency for International Development.