



## Chapter 7

# Financial Resources and Transfer of Technology

The United States is committed to working with developing countries and countries with economies in transition to address the challenge of global climate change. The U.S. government has participated actively in the Technology Transfer Consultative Process under the United Nations Framework Convention on Climate Change (UNFCCC), and has implemented international programs and activities to facilitate the transfer of environmentally sound technologies and practices that reduce growth in greenhouse gas emissions and address vulnerability to climate impacts.

Under Article 4.5 of the UNFCCC, Annex I Parties, such as the United States, committed to “take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties.” The Parties defined *technology transfer* at the Second Meeting of the

Conference of the Parties to the FCCC (COP-2) in Geneva as follows:

*The term "transfer of technology" encompasses practices and processes such as "soft" technologies, for example, capacity building, information networks, training and research, as well as "hard" technologies, for example, equipment to control, reduce, or prevent anthropogenic emissions of greenhouse gases in energy, transport, forestry, agriculture, and industry sectors, to enhance removal by sinks, and to facilitate adaptation.*

This chapter summarizes efforts undertaken by the United States in support of its strong commitment to technology cooperation and transfer. It also reports financial flows from the United States to different international bodies, foreign governments, and institutions that support climate-friendly activities.

Between 1997 and 2000, the U.S. government appropriated \$285.8 million to the Global Environment Facility (GEF). A significant portion of overall GEF financing has been dedicated to climate-related activities. It provided nearly \$4.5 billion to multilateral institutions and programs, such as the United Nations and affiliated multilateral banks, to address climate change and related international development priorities.

In addition, during the years 1997–2000 U.S. direct, bilateral, and regional assistance in support of climate change mitigation, adaptation, and crosscutting activities totaled \$4.1 billion. Commercial sales for technologies that supported emissions mitigation and reduced vulnerability amounted to \$3.6 billion. Over this same period, the United States leveraged \$954.3 million in indirect financing through U.S. government-based financial instruments.

Some important highlights of U.S. assistance described in this chapter include:

- The U.S. Country Studies Program, which has helped 56 countries meet their UNFCCC obligations to report climate trends.
- The U.S. Agency for International Development's Climate Change Initiative, a program to leverage \$1 billion in development assistance to address climate change through activities supporting renewable- and clean-energy activities, energy efficiency, forest and biodiversity conservation, and reduced vulnerability to climate impacts.
- A variety of public–private partnership programs that provide access to funding and expertise from the private sector, government, and NGOs to facilitate cooperation and foster innovation in climate-friendly sustainable development.
- Targeted programs to assist developing countries that are particularly vulnerable to the adverse effects of climate change, through weather forecasting and warning systems, climate and vulnerability modeling, and disaster preparedness and response.

This chapter also provides success stories to illustrate programs that demonstrate significant achievement and innovation in climate change mitigation and adaptation activities under U.S. leadership.

## TYPES AND SOURCES OF U.S. ASSISTANCE

The United States recognizes that effectively addressing global climate change requires assistance to developing countries and countries with economies in transition to limit their net greenhouse gas emissions and reduce their vulnerability to climate impacts. As such, U.S. government agencies, private foundations, NGOs, research institutions, and businesses channel significant financial and technical resources to these countries to promote technology transfer that helps address the challenges posed by global climate change. In addition to the transfer of "hard" technologies, the United States supports extensive "soft"

technology transfer, such as the sharing of technical experience and know-how for targeted capacity building and strengthening of in-country institutions.

U.S. financial flows to developing and transition economies that support the diffusion of climate-friendly technologies include official development assistance (ODA) and official aid (OA), government-based project financing, foundation grants, NGO resources, private-sector commercial sales, commercial lending, foreign direct investment, foreign private equity investment, and venture capital. Financial resources are also provided indirectly in the forms of U.S. government-supported credit enhancements (loan and risk guarantees) and investment insurance. U.S. ODA and OA provide grants for a variety of technology transfer programs, while U.S. government-supported project financing and credit enhancements, commercial sales, commercial lending, foreign private equity investment, and foreign direct investment typically involve investments in physical capital, such as plants and equipment.<sup>1</sup> Note that this chapter provides only a partial monetary accounting of the flow types mentioned above, and does not account for commercial lending, foreign private equity investment, or venture capital, except for some brief illustrative examples. Further detail on how these flows are accounted is provided in the section of this chapter entitled "U.S. Financial Flow Information: 1997–2000."

ODA and OA are important to help create the economic, legal, and regulatory environment that is necessary to attract potential foreign investors, and enable larger flows of private financial resources to be leveraged in recipient countries. Private-sector participation is critical to the successful transfer of much-needed technical know-how and technologies in most regions of the world because it finances, produces, and supplies most climate-friendly

<sup>1</sup> The financial flow types reported in this chapter reflect those described in chapter 2 of IPCC 2000.

technologies, and thus can provide much of the human and financial capital for their effective deployment. U.S. government agencies, foundations, NGOs, and businesses each play a different role in promoting climate technology transfer to developing and transition economies.

### **U.S. Government Assistance**

The U.S. government has facilitated technology transfer initiatives in developing and transition economies by forming partnerships and creating incentives for investment in climate-friendly technologies. U.S. government climate change projects support core U.S. development assistance priorities and the essential elements needed to achieve sustainable development. These priorities include supporting economic growth and social development that protects the resources of the host country; supporting the design and implementation of policy and institutional frameworks for sustainable development; and strengthening in-country institutions that involve and empower citizenry.

#### ***Official Development Assistance and Official Aid***

The U.S. government provides ODA and OA to foreign governments and provides financial support to U.S. and host-country NGOs that have expertise in climate change mitigation and adaptation measures. Through this kind of assistance, the U.S. government has facilitated technology transfer in developing and transition economies by advancing the market for climate-friendly technologies and by forming partnerships and creating incentives for investment in climate-friendly technologies. U.S. ODA and OA strive to build local capacity as well as the policy frameworks and regulatory reforms needed to ensure that developing and transition economies can grow economically while limiting their net greenhouse gas emissions. U.S. ODA and OA are especially important in sectors where private-sector flows are comparatively low.

**U.S. Agency for International Development.** To date, U.S. bilateral assistance has primarily been implemented through the U.S. Agency for International Development (USAID), the foreign assistance arm of the U.S. government. Since 1997, USAID has implemented many new programs in developing and transition economies to address climate change. Specifically, USAID launched a \$1 billion Climate Change Initiative to expand the Agency's already extensive efforts to help developing and transition economies. The goals of this initiative have been to help USAID-assisted countries reduce their net greenhouse gas emissions and their vulnerability to the impacts of climate change, and increase their participation in the UNFCCC. Between 1998 (when the initiative began) and 2000, USAID had committed \$478.6 million to support climate change objectives throughout its programs and \$6.3 million in leveraged credit. (Additional information about USAID's Climate Change Initiative is provided in the following sections.) USAID also works closely with other U.S. government agencies to leverage additional resources and expertise in addressing a variety of climate-related issues.

**U.S. Department of Energy.** In addition to providing funding support for inter-agency activities such as the U.S. Initiative on Joint Implementation (USIJI), the U.S. Country Studies Program (CSP), and the Technology Cooperation Agreement Pilot Project (TCAPP), the U.S. Department of Energy (DOE) works directly with foreign governments and institutions to promote dissemination of energy-efficiency, renewable-energy, and clean-energy technologies and practices. DOE's International Clean Cities program, for example, works with foreign governments, industry, and NGOs to help them implement viable activities that address climate change, transportation needs, local air quality, and related health risks.

**U.S. Environmental Protection Agency.** The U.S. Environmental Protection Agency (EPA) supports bilateral climate change programs, as well as such international programs as USIJI, CSP, and TCAPP. EPA is instrumental in designing and implementing innovative programs on a variety of global environmental challenges, including efforts to reduce greenhouse gas emissions and local air pollution and efforts to protect marine resources.

**U.S. Department of Agriculture.** The U.S. Department of Agriculture (USDA) supports international efforts to promote forest conservation and sustainable forestry, agroforestry, and improved agricultural practices. Such activities have provided meaningful benefits in addressing both climate change mitigation, through improved carbon sequestration, and adaptation to climate impacts, often related to food supply and conservation of agricultural resources. USDA is also instrumental in establishing food security warning systems.

**National Oceanic and Atmospheric Administration.** The National Oceanic and Atmospheric Administration (NOAA) has played an important role as a world leader in the study and provision of meteorological and hydrological forecasting and modeling; satellite imaging and analysis; climate change assessment, analysis, and modeling; and hazardous weather prediction. Critical information gained from these activities is made available to developing and transition country partners to address areas of vulnerability to climate-related impacts.

**National Aeronautics and Space Administration.** Like NOAA, the National Aeronautics and Space Administration (NASA) provides important technical information; satellite imaging and other surveillance; analysis and research related to climate changes, predictions, and weather trends; as well as analysis of shifts in the conditions of forests, natural areas, and agricultural zones.



### *Trade and Development Financing*

U.S. government agencies also provide trade and development financing to developing and transition economies. These agencies facilitate the transfer of climate-friendly technologies by providing OA, export credits, project financing, risk and loan guarantees, and investment insurance to U.S. companies as well as credit enhancements for host-country financial institutions. Trade and development financing leverages foreign direct investment, foreign private equity investment, or host-country and non-U.S. private capital by decreasing the risk involved in long-term, capital-intensive projects or projects in nontraditional sectors. Several agencies engage in this type of financing.

**Overseas Private Investment Corporation.** The Overseas Private Investment Corporation (OPIC) provides project financing, political risk insurance, and investment guarantees for U.S. company projects covering a range of investments, including clean-energy projects in developing countries. OPIC also supports a variety of funds that make direct equity and equity-related investments in new, expanding, and privatizing companies in emerging market economies.

**Export-Import Bank.** The Export-Import Bank (Ex-Im) provides loan guarantees to U.S. exporters, guarantees the repayment of loans, and makes loans to foreign purchasers of U.S. goods and services. It also provides credit insurance that protects U.S. exporters against the risks of nonpayment by foreign buyers for political or commercial reasons. Ex-Im has provided project loans and risk guarantees related to climate change mitigation for clean-energy and renewable-energy projects in developing and transition economies.

**USAID Development Credit Authority.** USAID's Development Credit Authority (DCA) provides partial loans and risk guarantees to host-country and international financial intermediaries to encourage project finance in nontradi-

tional sectors, such as energy efficiency. In addition to this immediate financial leverage benefit, DCA facilitates long-term relationships with the private sector that outlive USAID's project involvement, allowing USAID to contribute to the direction of investment of the ever-increasing global private capital flows.

**U.S. Trade and Development Agency.** The U.S. Trade and Development Agency (TDA) helps U.S. companies pursue overseas business opportunities through OA. By supporting feasibility studies, orientation visits, specialized training grants, business workshops, and technical assistance, TDA enables American businesses to compete for infrastructure and industrial projects in developing countries. TDA has promoted the transfer of climate-friendly technology in the energy, environment, and water resources sectors.

**U.S. Department of Commerce.** The U.S. Department of Commerce (DOC) recently established an International Clean Energy Initiative that links U.S. companies with foreign markets to facilitate dissemination of clean-energy technologies, products, and services. The initiative seeks to realize a vision for enhanced exports of clean-energy technology.

### **NGO Assistance**

U.S. foundations and NGOs have played a pivotal role in helping countries undertake sustainable development projects that have increased their ability to mitigate and adapt to the effects of global climate change. These organizations help improve host-country capacity by implementing small-scale, targeted initiatives related to the mitigation of and adaptation to climate change impacts. Following are some examples of these organizations.

#### *W. Alton Jones Foundation*

The W. Alton Jones Foundation supports the development of climate-friendly energy in developing countries. The Foundation also seeks to

build the capacity of entrepreneurs in developing countries to bring renewable-energy technologies to market.

#### *Rockefeller Brothers Fund*

The Rockefeller Brothers Fund seeks to help developing countries define and pursue locally appropriate development strategies. In East Asia, the Fund provides grants for coastal zone management and integrated watershed planning efforts that will help these countries prepare to adapt to the effects of global climate change.

#### *The Nature Conservancy*

The Nature Conservancy (TNC), in partnership with the U.S. private sector,<sup>2</sup> is working to lower net CO<sub>2</sub> emissions in Belize (the Río Bravo Carbon Sequestration Pilot Project) and Bolivia (the Noel Kempff Mercado Climate Action Project) through the prevention of deforestation and sustainable forest management practices. These projects are also helping to conserve local biodiversity, improve local environmental quality, and meet sustainable development goals.

#### *Conservation International*

Through its innovative partnerships with donors, businesses, and foundations, Conservation International (CI) protects biodiversity and promotes cost-effective emission reductions with a special emphasis on conservation and restoration of critical forest ecosystems. CI implements programs through its conservation financing mechanism, the Conservation Enterprise Fund. It has also established the Center for Environmental Leadership in Business, a CI/Ford Motor Company joint venture that promotes collaborative business practices that reduce industry's ecological impacts, contribute to conservation efforts, and create economic value for the companies that adopt them.

<sup>2</sup> U.S. private-sector investors participating in these activities have included Cinergy, Detroit Edison, PacifiCorp, Suncor, Utilitree Carbon Company, Wisconsin Electric/Wisconsin Gas (formerly Wisconsin Electric Power Company), and American Electric Power.

## Private-Sector Assistance

As part of their normal business practices, many U.S. private-sector entities seek opportunities to expand their markets outside of the United States. As a result, these companies are contributing to the transfer of climate-friendly technologies through foreign direct investment, commercial lending, private equity investment, venture capital investment, and commercial sales of "hard" technology in developing and transition economies. Consequently, many technologies have been transferred to the industrial, energy supply, transportation, agriculture, and water supply sectors.

Foreign direct investment and commercial lending together represent the primary means for long-term, private-sector technology transfer. U.S. companies like the Global Environment Fund are making investments in foreign private equity through such funds as the Global Environment Strategic Technology Partners, LP fund. This Fund seeks investments in U.S.-based companies whose technologies promote improvements in economic efficiency, the environment, health, and safety. It seeks new equity investment opportunities in the range of \$1–\$2 million.<sup>3</sup>

Among the member countries of the Organization for Economic Cooperation and Development (OECD), venture capital—normally reserved for high-risk, long-term investments—is most prominent in the United States. U.S. venture capital firms have begun to make innovative and high-risk investments in the environmental sector in developing countries. For example, the Corporación Financiera Ambiental, capitalized in part by U.S. investors, invests in small and medium-

sized private enterprises that undertake environmental projects in Central America.<sup>4</sup> Investments range from \$100,000 to \$800,000 per project.

The United States is the largest producer of environmental technologies and services. In 2000, commercial sales of these technologies represented \$18 billion of U.S. export flows (Business Roundtable 2001). Typical U.S. climate change mitigation and adaptation exports include wastewater treatment, water supply, renewable energy, and heat/energy savings and management equipment. For mitigation technologies in the commercial, industrial, residential use, energy supply, and transportation sectors, U.S. developing country market share in 2000 was estimated to be \$5.3 billion, or 18 percent of the entire market for these technologies in developing and transition economies (USAID 2000b).

## MAJOR U.S. GOVERNMENT INITIATIVES

Three major U.S. government initiatives are the U.S. Initiative on Joint Implementation, the U.S. Country Studies Program, and the Climate Change Initiative.

### U.S. Initiative on Joint Implementation

Launched in 1993 as part of the U.S. Climate Change Action Plan, the U.S. Initiative on Joint Implementation (USIJI)<sup>5</sup> supports the development of voluntary projects that reduce, avoid, or sequester greenhouse gas emissions. These projects are implemented between partners located in the United States and their counterparts in other countries. USIJI is a flexible, nonregulatory pilot program that encourages U.S. businesses and NGOs to voluntar-

ily use their resources and innovative technologies and practices to reduce greenhouse gas emissions and promote sustainable development. USIJI also promotes projects that test and evaluate methodologies for measuring and tracking greenhouse gas reductions and verifying the costs and benefits of projects.

USIJI is the largest and most developed worldwide program exploring the potential of project-based mechanisms. It is administered by an interagency secretariat co-chaired by DOE and EPA, with significant participation from USAID and the U.S. Departments of Agriculture, Commerce, Interior, State, and Treasury.<sup>6</sup>

Between 1994 and 2000, the USIJI project portfolio included 52 projects in the following 26 countries: Argentina (3), Belize (2), Bolivia (3), Chile (3), Columbia (1), Costa Rica (7), Czech Republic (1), Djibouti (1), Ecuador (1), El Salvador (1), Equatorial Guinea (1), Guatemala (3), Honduras (3), India (1), Indonesia (1), Mali (1), Mauritius (1), Mexico (4), Nicaragua (1), Panama (1), Peru (1), Philippines (1), the Russian Federation (6), South Africa (1), Sri Lanka (1) and Uganda (2). On-site implementation has begun for 24 of these projects. In addition, eight new projects are currently under development (USIJI 2000).<sup>7</sup> To support USIJI, the U.S. government provided more than \$15.9 million in funding. Seven projects leveraged a total of \$8.5 million in financing from private sources.<sup>8</sup>

USIJI projects involve a range of participants and are funded through several different mechanisms. Projects include participants and technical experts from U.S. and host-government agencies, private-sector companies, industry associations, NGOs, state and local governments, universities, research

<sup>3</sup> <http://www.globalenvironmentfund.com/funds.htm>.

<sup>4</sup> <http://www.cfa-fund.com>.

<sup>5</sup> The concept of "Joint Implementation" (JI) was introduced early in the negotiations leading up to the 1992 Earth Summit in Rio de Janeiro, and was formally adopted into the text of the UNFCCC. The United States joined more than 150 countries in signing the UNFCCC, which explicitly provides through Article 4(2)(a) for signatories to meet their obligation to reduce greenhouse gas emissions "jointly with other Parties." The term has been used subsequently to describe a wide range of possible arrangements between entities in two or more countries, leading to the implementation of cooperative development projects that seek to reduce, avoid, or sequester greenhouse gas emissions (<http://www.gcric.org/usiji/about/whatisji.html>).

<sup>6</sup> <http://www.gcric.org/usiji/about/whatisji.html>.

<sup>7</sup> This designation could mean, for example, that although project implementation activities (e.g., construction and planning) have begun, greenhouse gas benefits have not yet necessarily begun to accrue. The remaining projects have not yet initiated on-site activities, and are classified as "mutually agreed."

<sup>8</sup> Because information about private-sector investment in such projects is proprietary, the full breadth of leveraged funding under USIJI cannot be ascertained.

institutes, national laboratories, and financing organizations. Project funding is typically based on the anticipated sale of carbon offsets; revenues generated directly by project activities (e.g., the sale of timber, other biomass resources, and energy); investment capital from private-sector companies; loans provided by commercial banks and multilateral organizations, such as the International Finance Corporation; government incentives; endowments; and grants.<sup>9</sup> Past technical assistance under USJI generally has consisted of workshops, guidance documents, issue papers, hotline assistance, and meetings.<sup>10</sup>

USJI projects span the land-use change and forestry, energy, waste, and agricultural sectors, and involve a range of activities that achieve greenhouse gas benefits. As of 2000, the aggregate USJI projects were anticipated to generate greenhouse gas reductions totaling at least 259.8 teragrams of CO<sub>2</sub> over a period of approximately 60 years, including 5.7 teragrams of CH<sub>4</sub> and 4.6 gigagrams of N<sub>2</sub>O. These benefits are equivalent to 350.5 teragrams of CO<sub>2</sub>, which are expected to accrue over project lifetimes that vary from 10 to 60 years if fully funded and implemented (U.S. IJI 2000). For example, the Noel Kempff Mercado Climate Action Project, which conserves forest area in the Bolivian Amazon covering over 600,000 hectares (nearly 15 million acres), is expected to have a net carbon benefit of 15 teragrams of carbon over the next 30 years.

### U.S. Country Studies Program

The UNFCCC requires all signatory countries to provide to the Secretariat of the Convention a national inventory of greenhouse gas emissions by sources and removals by sinks, and to describe the steps they are taking to implement the Convention, including mitigation and adaptation measures. The U.S. Country Studies Program (CSP) provided assistance to developing and transition economies to help meet this commitment, and to fulfill U.S. obligations under the UNFCCC to provide additional financial and technical

resources to developing countries. The first round of two-year studies began in October 1993 after the United Nations Conference on Environment and Development (UNCED, the Earth Summit) in Rio de Janeiro in 1992.

The CSP has helped 56 countries build the human and institutional capacities necessary to assess their vulnerability to climate change and opportunities to mitigate it. Under the CSP, the United States has helped countries develop inventories of their anthropogenic greenhouse gas emissions, evaluate their response options for mitigating and adapting to climate change, assess their vulnerability to climate change, perform technology assessments,<sup>11</sup> develop National Communications, and disseminate analytical information to further national and international discussions on global strategies for reducing the threat of climate change.<sup>12</sup> Technical assistance was delivered through workshops, research, major country reports, guidance documents, technical papers, consultations with technical experts, analytic tools, data, equipment, and grants to support and facilitate climate change studies around the world.<sup>13</sup>

In all, the CSP has helped other countries and international institutions produce over 160 major country reports, 10 guidance documents, 60 workshop and conference proceedings, and 16 special journal editions. In 1997, the CSP completed a report entitled *Global Climate Change Mitigation Assessment Results for Fourteen Transition and Developing Countries* (U.S. CSP 1997), and in 1998 produced *Climate Change Assessments by Developing and Transition Countries* (U.S. CSP 1998). These and numerous other reports continue to make important contributions to the work of the GEF, the Intergovernmental Panel on Cli-

mate Change (IPCC), and the Subsidiary Bodies to the Convention.

In response to requests from developing and transition economies, the U.S. government supplemented the CSP activity by helping countries develop their national climate change action plans. Building on the experience of the CSP, the Support for National Action Plans (SNAP) program provided financial and technical assistance to help countries use the results of their climate change country studies to develop action plans and technology assessments for implementing a portfolio of mitigation and adaptation measures. An objective of the SNAP phase is to promote diffusion of mitigation and adaptation technologies by assisting countries with assessments of opportunities for technology exchange and diffusion. Countries can use these studies, action plans, and technology assessments as a basis for developing their national communications, and to meet their obligations under the UNFCCC. Eighteen countries participated in the SNAP phase of the CSP.<sup>14</sup> The CSP activity has been completed, and the information gained from the program is being converted to an electronic database available for future use.

Oversight for the program was provided by the U.S. Country Studies Management Team, which was composed of technical experts from EPA, DOE, USAID, USDA, NOAA, the National Science Foundation, and the Departments of State, Interior, and Health and Human Services. Between 1997 and 2000, these agencies jointly provided a total of \$9.4 million in funding for the CSP.

### Climate Change Initiative

In 1998 USAID launched the Climate Change Initiative (CCI), a

<sup>9</sup> <http://www.gcric.org/usiji/about/whatisji.html>.

<sup>10</sup> <http://www.gcric.org/usiji/about/whatben.html>.

<sup>11</sup> <http://www.gcric.org/CSP/ap.html>.

<sup>12</sup> <http://www.epa.gov/globalwarming/actions/international/countrystudies/index.html>.

<sup>13</sup> <http://www.gcric.org/CSP/ap.html>. See also <http://www.epa.gov/globalwarming/actions/international/countrystudies/index.html>.

<sup>14</sup> <http://www.gcric.org/CSP/ap.html>. These countries include Bolivia, Bulgaria, China, Czech Republic, Egypt, Hungary, Indonesia, Kazakhstan, Mauritius, Mexico, Micronesia, Philippines, Russian Federation, Tanzania, Thailand, Ukraine, Uruguay, and Venezuela. See also <http://www.epa.gov/globalwarming/actions/international/countrystudies/index.html>.

\$1 billion, five-year program to collaborate with developing nations and countries with economies in transition to reduce the threat of climate change. This multi-agency initiative supports activities that address climate change in more than 40 countries and regions around the world. Its overarching objective is to promote sustainable development that minimizes the associated growth in greenhouse gas emissions and to reduce vulnerability to climate change.

Through the CCI, USAID has helped countries to mitigate greenhouse gas emissions from the energy sector, industries, and urban areas; protect forests and farmland that can sequester CO<sub>2</sub> from the atmosphere; participate more effectively in the UNFCCC; and reduce their vulnerability to the impacts of climate change. An important aspect of the CCI is continued support for technology transfer and public-private partnerships that work to achieve the UNFCCC's goals. The initiative has strengthened the U.S. government's ability to measure the impact of its global assistance work to address climate change, and has helped fulfill U.S. obligations to assist and collaborate with developing countries under the UNFCCC.

From 1998 to 2000, USAID committed \$478.6 million under the CCI to support climate change objectives. In addition, USAID leveraged approximately \$2.9 billion to support climate change activities in developing and transition economies. This funding was directly leveraged from other bilateral and multilateral donors, the private sector, foundations, NGOs, and host-country governments. USAID also indirectly leveraged \$5.3 billion in further investments from outside sources that built on projects it originally initiated.

In addition to the funding leveraged under the CCI, USAID used credit instruments available through the Agency's Development Credit Authority (DCA) to leverage funding for "climate-friendly" investment in developing and transition economies. DCA is a credit enhancement mechanism that provides

greater flexibility in choosing the appropriate financing tool, such as loans, guarantees, grants, or a combination of these, for climate change and other sustainable development projects. Since its inception in 1999, DCA credit enhancements have leveraged \$6.3 million in climate-friendly private-sector financed activities.

### **PUBLIC-PRIVATE PARTNERSHIP ACTIVITIES**

An important U.S. objective is to leverage the private sector's financial and technical capabilities to promote sustainable development and help address climate change in developing and transition economies. The U.S. government and its partners do this through programs designed to facilitate dialogue, build partnerships, and support direct investment in climate-friendly and other sustainable development projects. Examples of such projects include the Technology Cooperation Agreement Pilot Project, the U.S.-Asia Environment Partnership, EcoLinks, and several energy and forest conservation partnerships.

The U.S. government also makes significant efforts to engage the private sector directly in many of its ongoing development assistance programs, both as key implementation partners and as a source of supplemental funding for climate-related activities. For example, USAID leveraged over \$3 million from outside sources to support its Maya Biosphere Reserve project in Guatemala, and used a two-to-one matching-fund program with several organizations to collect \$1.8 million in additional funding. USAID also helped the Mgahinga and Bwindi Impenetrable Forest Conservation Trust in Uganda grow to approximately \$6 million, and leveraged an additional \$1 million from the Government of Denmark to support USAID's community conservation in 25 parishes adjacent to the Bwindi and Mgahinga National Parks. In Ukraine, USAID also leveraged \$18 million from

the World Bank to support energy efficiency in government buildings in Kyiv, and helped private sugar mills in India obtain \$66 million in loans to construct new bagasse cogeneration units.

### **Technology Cooperation Agreement Pilot Project**

The Technology Cooperation Agreement Pilot Project (TCAPP) was a bilateral program initiated in 1997 as a collaborative effort of USAID, EPA, and DOE.<sup>15</sup> TCAPP's primary goal was to assist developing country partners in defining clean-technology priorities. To encourage the transfer of clean technologies, it focused on helping countries remove market barriers and promote direct private investment.<sup>16</sup> The pilot project was successful in building support for a country-driven, market-oriented, technology transfer approach under the UNFCCC. Building on lessons learned from TCAPP, which ended in 2001, these agencies continue to support efforts to accelerate adoption of clean-energy technologies and practices in partner countries.

Between 1997 and 2000, the U.S. government provided \$2.9 million to TCAPP to support technology transfer activities in Brazil, China, Egypt, Kazakhstan, Mexico, Philippines, and South Korea. Through TCAPP, the U.S. government has facilitated the development of more than 20 clean-energy business investment projects in participating countries. Overall, TCAPP has engaged more than 400 U.S. and international business representatives to collaborate in developing new investment projects and to assist with implementation of actions to remove market barriers. Examples of TCAPP successes include renewable-energy policy reforms in the Philippines, development of an industrial energy services company (ESCO) pilot program in Mexico, financial support for sugar mill co-generation projects in Brazil, training for conducting energy audits in

<sup>15</sup> <http://www.epa.gov/globalwarming/actions/international/techcoop/tcapp.html> and <http://www.nrel.gov/tcapp>.

<sup>16</sup> <http://www.epa.gov/globalwarming/actions/international/techcoop/tcapp.html> and <http://www.nrel.gov/tcapp>.



Korea, training to verify the performance of wind turbines manufactured in China, and development of refinery energy efficiency pilot projects in Egypt.

### Climate Technology Initiative

The Climate Technology Initiative (CTI), a voluntary, multilateral cooperative program, supports implementation of the UNFCCC by fostering international cooperation for accelerated development and diffusion of climate-friendly technologies and practices.<sup>17</sup> The United States, the European Commission, and 22 other OECD nations established the CTI at the First Meeting of the Conference of Parties to the UNFCCC (COP-1) in Berlin in 1995.<sup>18</sup> They agreed to work collaboratively to "accelerate development, application and diffusion of climate-friendly technologies in all relevant sectors."<sup>19</sup>

The CTI has become an international model of multilateral support for technology transfer and has built developing country support for a market-relevant approach to technology transfer implementation. An important component of the CTI is the reduction of market barriers and other obstacles to the transfer of climate-friendly technologies consistent with UNFCCC objectives.<sup>20</sup> Committed to focusing on areas where it can make a significant difference, the CTI works in voluntary partnership with stakeholders, including the private sector, NGOs, and other international organizations. While the CTI was designed to address all greenhouse gases from a variety of sources, its primary focus to date has been on efficient and renewable-energy technologies.

Within the U.S. government, support for the CTI is provided jointly by DOE, EPA, and USAID. Since 1998, these agencies have committed over \$2 million to capacity-building activities, such as providing regional technology training courses, conducting technology needs assessments, and developing in-country technology implementation plans. These plans define opportunities for accelerating

implementation of such technologies as energy-efficient and photovoltaic lighting, efficient motors and boilers, energy-efficient housing, solar energy, biomass electricity generation, and natural gas. They also propose actions to improve technical capacity, increase access to funding, or reduce policy barriers to investment. More recently, the CTI has been working with the Southern Africa Development Community (SADC) to promote investment in climate-friendly technologies through public-private partnerships. This extensive effort under the CTI's Cooperative Technology Implementation Plan program was initiated in response to a request by SADC energy and environment ministers participating in a March 1999 CTI/Joint Industry seminar in Zimbabwe. Since then, the United States has provided approximately \$320,000 in support of this effort.

### U.S.–Asia Environmental Partnership

The United States–Asia Environmental Partnership (US–AEP) promotes environmentally sustainable development in Asia by building public-private partnerships, developing technical capacity, and promoting policy reforms that lead to environmentally sound investments, including climate-friendly technologies. US–AEP is jointly implemented by several U.S. government agencies, under the leadership of USAID.<sup>21</sup> Overall, US–AEP has supported climate change activities in Bangladesh, Hong Kong, India, Indonesia, South Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam.<sup>22</sup>

US–AEP was created with the recog-

nition of Asia's growing commitment to sustainable development and growing U.S. interest in sharing its experience, technology, and management practices. With the participation of governments, NGOs, academia, and the private sector, US–AEP has become a flexible, responsive vehicle for delivering timely answers to environmental questions. US–AEP's mission has been to promote a "clean revolution" in Asia, transforming how Asia industrializes and protects its environment through the continuing development and adoption of less polluting and more resource-efficient products, processes, and services.<sup>23</sup>

A significant number of US–AEP activities address climate change by targeting the efficient use of energy resources, and the conversion of waste to energy. Other activities include waste minimization, power-sector reform, efficient electricity generation and transmission, and renewable energy. In 1999, for example, US–AEP activities led to \$6.6 million in confirmed sales of energy-efficiency and related climate-friendly technologies and services. Additionally, US–AEP contributed \$1.5 million to the USAID mission in Bangladesh to launch a major energy program there. Among its technology transfer activities, US–AEP also directly engaged small- to medium-sized U.S. private-sector firms to provide training and demonstrations of climate-related technologies and practices in 11 Asian countries, most of which involved converting waste to either energy or products, and recycling, recovering, and reusing materials. Also, 29 climate-related professional exchanges and study tours were conducted through US–AEP's

<sup>17</sup> <http://www.climatech.org/home.shtml>.

<sup>18</sup> <http://www.climatech.org/about/index.shtml>.

<sup>19</sup> <http://www.epa.gov/globalwarming/actions/international/techcoop/cti.html>. See <http://www.climatech.org/home.shtml>.

<sup>20</sup> <http://www.epa.gov/globalwarming/actions/international/techcoop/cti.html>. The CTI is intended to implement and support a number of objectives of the UNFCCC, including, for example, the requirement under Article 4.1.c, which calls for Parties to "Promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes." Similarly, the CTI furthers the goals of Article 4.5, which states that Annex I Parties "shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to environmentally sound technologies and know-how." <http://www.epa.gov/globalwarming/actions/international/techcoop/cti.html>.

<sup>21</sup> <http://www.usaep.org/about.htm>.

<sup>22</sup> US–AEP Secretariat.

<sup>23</sup> <http://www.usaep.org/about.htm>.



Environmental Exchange Program. The majority of these activities addressed the conversion of waste to energy and products, and enhancing the efficient use of energy and resources.

### EcoLinks

Launched in 1998, Eurasian–American Partnerships for Environmentally Sustainable Economies (EcoLinks) is a USAID initiative to help solve urban and industrial environmental problems through improved access to financial resources, trade and investment, and information technology. The program promotes sustainable, market-based partnerships among businesses, local governments, and associations in Central and Eastern Europe and in Eurasia with U.S. businesses to identify environmental problems and adopt best management practices and technologies. As these partnerships mature, trade and investment in environmental goods and services are expected to increase.<sup>24</sup> EcoLinks provides support through technology transfer and investment activities, partnership grants, and an information technology initiative. Countries participating in EcoLinks include Bulgaria, Croatia, the Czech Republic, Hungary, Kazakhstan, Macedonia, Poland, Romania, Russia (Far East), and Ukraine (USAID 2000a and 2001a).

While EcoLinks does not specifically target climate change, a large percentage of its technology transfer activities provide climate benefits. For example, EcoLinks addresses inadequate wastewater treatment capacity, inefficient and highly polluting industries and public utilities, poor waste management practices, and weak environmental management and regulatory systems. Some examples of EcoLinks' trade and investment support and grants activities include:

- *In a Bulgarian municipality*—Developing environmental management systems for mitigating greenhouse gas emissions.

- *In Bulgaria*—Developing landfill gas extraction systems.
- *In Romania*—Introducing a comprehensive energy audit methodology.
- *In Croatia*—Assessing water turbines in water delivery systems.
- *In all participating countries*—Facilitating technology demonstrations in energy efficiency and alternative energy.
- *In the Czech Republic*—Promoting landfill gas utilization technology.
- *In Kazakhstan*—Promoting cleaner production in the oil and gas industry.
- *In Hungary*—Facilitating a \$1.2 million loan to a joint U.S.–Hungarian company promoting a new wastewater treatment technology (USAID 2000a and 2001a).

Funding and implementation for EcoLinks are jointly provided by USAID, the U.S. Department of Commerce, the Environmental Export Council, the Global Environment and Technology Foundation, the Institute for International Education, and the Regional Environment Center for Central and Eastern Europe. Since EcoLinks began, four grant cycles have been completed, 135 grants have been awarded, and currently more than 100 active projects are funded (USAID 2001a). In 2000 alone, EcoLinks awarded 41 Challenge Grants to participating country institutions totaling nearly \$2 million. EcoLinks also provided over \$536,000 in Quick Response Awards in 2000 throughout the region (USAID 2001c).

### Energy Partnership Program

Funded by USAID and implemented by the United States Energy Association (USEA), the Energy Partnership Program is an important public–private partnership activity with climate benefits. This program establishes practitioner-to-practitioner, multi-year partnerships between U.S. and developing country utilities and regulatory agencies in Asia, Africa, Latin America, Central and Eastern Europe, and the former Soviet Union. Its main objective is to provide a mechanism for the U.S. energy industry (utilities, regulators,

and policymakers) to transfer its experience in market-based energy production, transmission, and distribution to its international counterparts, while providing U.S. participants with the opportunity to learn about the energy industry in another country. Regional program activities encompass such topics as regulation, the environment, system reliability and efficiency, renewable energy, customer service, and financial management, with an emphasis on mitigating greenhouse gas emissions.

Working with USAID, USEA identifies and matches utilities or regulatory agencies in the United States and overseas according to the compatibility of their needs and capabilities, the similarity of their energy systems, potential common business interest, and other criteria. The benefits to the foreign partners include the opportunity for senior executives of foreign utilities and regulatory agencies to observe how their U.S. counterparts are structured, financed, managed, and regulated under free-market conditions. The program also offers U.S. energy executives the opportunity to understand the dynamics of non-U.S. energy markets and to forge strategic international alliances. Once selected, the participating organizations execute partnership agreements and commit to cooperate for a two-year period, during which the partners focus their exchange activities on several key issues. Following are some examples of these efforts.

- *In India*—Corporate restructuring, increased energy efficiency through reduction of distribution losses, improved plant operations, development of India's National Institute for Power Systems and Distribution Management, and joint-venture and pilot projects with U.S. partners.
- *In Indonesia*—Managing a distribution company in a privatized environment, utility decision making from the private company perspective, regulation and trading mechanisms, and privatization of the gas industry.
- *In the Philippines*—Management and corporate restructuring, quality of service, and customer service.

<sup>24</sup> <http://www.ecolinks.org/about.html>.

- *In Senegal*—Generating capacity through independent power production, improved efficiency, and improved system reliability through enhanced water, fuel, and materials analysis.
- *In Brazil*—Delegation of regulatory powers to Brazil's states, staff development and training, and generation resource portfolio planning.

### Forest Conservation Partnerships

Among the leading U.S. innovative programs to address climate change through forest conservation activities are those being implemented through NGOs, such as The Nature Conservancy (TNC) and Conservation International (CI), often in partnership with the U.S. government and the private sector.

#### *International Partnership Program*

TNC's International Partnership Program (IPP) aims to strengthen the capacity of local organizations through collaborative efforts to preserve biological diversity and forest resources—efforts with valuable climate benefits. Through the IPP, TNC now works with more than 70 partner organizations in 26 countries throughout the Asia Pacific, Caribbean, and Latin America regions. The program specifically emphasizes the opportunities for promoting local leadership in biodiversity conservation, and improving access to technical information and expertise. As a result of the program, TNC and its partners have protected more than 32,375 hectares (over 80 million acres) of land in these locations that include climate projects to preserve forests, protect carbon sinks, and provide jobs; ecotourism training that enables fishermen to thrive by protecting rivers and coastal areas; and community-led marine conservation that empowers villagers to manage the fisheries that support their livelihoods.<sup>25</sup>

#### *EcoEnterprise Fund*

TNC's relatively new EcoEnterprise Fund is a joint initiative with the Inter-American Development Bank that seeks to use venture capital to protect natural areas in Latin America and the Caribbean. The Fund includes two components: (1) an investment fund that provides venture capital to profitable businesses involved in sustainable agriculture, sustainable forestry, ecotourism, and other environmentally compatible businesses; and (2) limited technical assistance funds to provide business advisory services to prospective projects. Participating companies are required to collaborate with a non-profit conservation or community partner, by paying fees for monitoring services, by sharing profits, or by other financial arrangements. The Fund invests in ventures at all stages of development with prospective sales revenues up to \$3 million. It gives preference to businesses that are unable to secure financing from conventional sources due to their small size, the innovative nature of their business, and/or the financial risks involved.<sup>26</sup>

#### *Conservation Enterprise Fund*

Similar to TNC's EcoEnterprise Fund, CI's Conservation Enterprise Fund (CEF) was created in 1999 with a \$1 million loan from the International Finance Corporation's Small and Medium Enterprise Global Environmental Facility program. The CEF is a development tool that enables conservation enterprises to expand their operations through financial leveraging. CI acts as the financial intermediary to provide \$25,000–\$250,000 in debt and equity financing to small and medium-sized enterprises (possessing \$5 million or less in assets) that are strategically important to conservation. For instance, a CEF loan helped coffee farmers in Chiapas, Mexico, finance post-harvest expenses in 1999. CEF funds are also directed to businesses

engaged in agroforestry, ecotourism, and wild-harvest products.<sup>27</sup>

### U.S. GOVERNMENT ASSISTANCE ADDRESSING VULNERABILITY AND ADAPTATION

Assisting countries that are particularly vulnerable to the adverse effects of climate change is a high priority for the United States. The U.S. government has provided extensive financial and technical support to such countries for many years, primarily through a number of programs designed to address disaster preparedness and relief, food security and sustainable agricultural production, biodiversity conservation, water resources management, and climate research and weather prediction programs. These activities involve numerous government agencies, such as USAID, NOAA, USDA, DOE, and EPA.

For example, under the U.S. Country Studies Program, the U.S. government has provided support to developing countries to conduct assessments of climate change vulnerability and adaptation options. Under the UNFCCC and pursuant to guidance from the GEF, donor nations are obligated to help developing nations participate in research and systematic observation of climate change, assess their vulnerability, prepare adaptation strategies, and implement adaptation measures. The results of these assessments and studies have been highly successful at promoting more meaningful participation by developing countries in the UNFCCC process, and at more accurately gauging potential risks and adaptation measures to address long- and short-term climate impacts. More detail on these activities is provided later in this chapter. More specific financial information about U.S. adaptation activities appears in Appendix C and in the section of this chapter concerning financial flows.

<sup>25</sup> <http://nature.org/international/specialinitiatives/>.

<sup>26</sup> <http://nature.org/international/specialinitiatives/ecofund/>.

<sup>27</sup> [http://www.conservation.org/WEB/FIELDACT/C-C\\_PROG/ECON/fund.htm](http://www.conservation.org/WEB/FIELDACT/C-C_PROG/ECON/fund.htm).

## U.S. FINANCIAL FLOW INFORMATION, 1997–2000

This chapter presents financial resource information for the years 1997–2000. This information is also presented in Tables 7-1, 7-2, and 7-3. For the table on financial flows to specific countries and regions (Table 7-3 in Appendix C), this chapter goes beyond the minimum guidance requirement of presenting each flow by year, country, and sector. To provide a more complete description of these financial flows, further detail has been included to show both the type of flow and its source. To provide a framework for analysis, the chapter follows the approach of *Methodological and Technological Issues in Technology Trends* (IPCC 2000).

Financial information provided in this chapter is derived from the U.S. government, foundations, and other sources of financing to institutions supporting climate change mitigation, adaptation, and technology transfer activities in developing and transition economies. To a limited extent, this report also includes information about financial flows from the U.S. private sector, which if fully accounted for would be expected to far outweigh all other financial flows. Because private-sector financial and investment information is mostly proprietary and not available to the public, only two of these flows to climate change mitigation and adaptation activities are even partly accounted for in the tables that follow.<sup>28</sup>

Recipients of U.S. financial resources include the GEF (reported in Table 7-1), multilateral institutions (reported in Table 7-2), as well as NGOs, universities, research institutions, and foreign governments. While some of this funding is provided to U.S.-based institutions, only those activities providing assistance directly to developing countries and countries with economies in transition are reported here.

Due to the difficulty in identifying exact expenditures under most U.S. government programs, financial information provided in this report refers

only to those activities for which funding was obligated in the given year, from 1997 to 2000, and in some cases 2001. In most cases, U.S. government information referred to the fiscal year for which funding was obligated—i.e., beginning October 1 in the year prior to and ending September 30 in the calendar year in question. For example, Fiscal Year 1997 began October 1, 1996, and ended September 30, 1997. In most other cases, including funding from U.S. foundations and other public and private institutions, information relates to the calendar year in which funding was awarded.

## Financial Contributions to the Global Environment Facility

The Global Environment Facility (GEF) was established in 1991 to forge international cooperation and finance actions for addressing critical threats to the global environment resulting from the loss of biological diversity, climate change, degradation of international waters, and ozone depletion. It also provides funding to address the pervasive problem of land degradation. The GEF is now the interim financial mechanism for the Protocol on Persistent Organic Pollutants and acts as the financial mechanism of both the Convention on Biological Diversity and the UNFCCC. The GEF leverages its resources through co-financing and cooperation with other donor groups and the private sector. In 1998, 36 nations pledged a total of \$2.75 billion in funding to protect the global environment and promote sustainable development. The United States has been a member country and supporter of the GEF since 1994. As of December 2000, 167 countries were participating members of the GEF.<sup>29</sup>

## Aggregated U.S. Government Funding

Between 1997 and 2000, the U.S. government has provided \$285.8 million to the GEF. Recently, President Bush announced his Administration's intention to fully fund payment for arrears incurred during the previous Administration. The President's budget request for fiscal year 2003 includes \$70 million for the first installment of this payment.

U.S. government funding to the GEF, as all donors' funding, is provided in aggregate and not differentiated by type of activity. However, a significant portion of GEF activities addresses climate change, both directly through the climate change focal area and indirectly through other focal areas. For instance, programs that address biological diversity and coastal zone management also help address vulnerability and adaptation of numerous species to changing climatic conditions. Currently approximately 38 percent of GEF grants support activities specifically related to climate change. This is only surpassed by GEF support for biodiversity activities, which comprise 42 percent of the overall portfolio. Table 7-1 provides annual U.S. contributions to the GEF for the years 1997 through 2000.

## Financial Contributions to Multilateral Institutions and Programs

The U.S. government provides direct financial support to multilateral institutions, such as the United Nations and development banks, in recognition of their important role in meeting the goals of sustainable economic development, poverty alleviation, and protection of the global environment (Table 7-2).

<sup>28</sup> The information reported here was collected and analyzed from primary sources, including surveys of various U.S. government agencies, foundations, NGOs, private-sector companies, and queries of official U.S. government databases. In the case of commercial sales flows, the United States queried the U.S. International Trade Commission's database for U.S. export values for the energy (renewables and process efficiency) and water supply/wastewater sectors based on internationally agreed-upon harmonized tariff system codes (HTS). The United States chose the appropriate codes (HTS6 and HTS10) at the most detailed level possible to best select and account for only climate-friendly exports. The United States referenced both its own and OECD's analyses on environmental export values in creating this query (US-AEP 2000, OECD 2000).

<sup>29</sup> <http://www.gefweb.org/>.



### Aggregated U.S. Government Funding for Multilateral Institutions

Between 1997 and 2000, the U.S. government provided funds to numerous multilateral banks and institutions through block grants. The funding is not specifically disaggregated by type of activity because donors meet their commitments by providing annual contributions that do not include earmarks for specific activities. Therefore, those activities that supported greenhouse gas emissions mitigation or addressed vulnerability and adaptation to climate impacts in developing and transition economies represent a portion of the total funding shown.

Between 1997 and 2000, the U.S. government also provided \$3.9 million to the supplementary UNFCCC trust fund to support general participation in the Convention. These activities included support for the development of National Communications by non-Annex I (developing) countries, as well as information systems and databases of national greenhouse gas emission inventories.

### Other Funding for Multilateral Scientific, Technological, and Training Programs

In 2000, the U.S. government provided grant funding to the World Mete-

orological Organization in support of climate forecasting at the Drought Monitoring Center in Nairobi, Kenya (DMC-N). In collaboration with Columbia University's International Institute for Climate Prediction, this activity seeks to improve the capabilities of the DMC-N to provide reliable forecasts and early warning of extreme climate events, such as drought and floods.

### Bilateral and Regional Financial Contributions

This section provides information on bilateral and regional financial contributions by U.S. foundations, NGOs, universities, the private sector, and the U.S. government related to climate change mitigation and adaptation activities. U.S. financial flows by year, country, and type of activity are presented in Table 7-3 in Appendix C.

To provide a more accurate representation of U.S. financial flows, several categories of activities have been expanded from those in the UNFCCC guidance, and two new categories have been added. The new category *Support for FCCC Participation* refers to activities where the United States has supported developing and transition economies to participate in international meetings, discussions, and training events. *Crosscutting Activities* refers to activities and programs that cannot be easily listed under a single category. Many of these "crosscutting" activities, for example, simultaneously provide both mitigation and adaptation benefits.

It is important to note that U.S. funding data—collected from hundreds of offices and divisions of over a dozen U.S. government agencies, as well as from numerous other public and private institutions—are difficult to categorize into the list of climate change topics requested in the UNFCCC guidelines. In many instances, U.S.-funded climate change activities could have been included under more than one topic area. For example, U.S. government agencies often label most activities that support industry, transportation, or waste management as "energy." In

**TABLE 7-1 Financial Contributions to the Global Environment Facility: 1997–2000** (Millions of U.S. Dollars)

Since 1997, the U.S. government has provided \$285.8 million to the GEF, which has a number of focal areas, including climate change.

Institution	1997	1998	1999	2000	Total
Global Environment Facility	35	47.5	167.5	35.8	285.8

Note: Information for GEF contributions is based on U.S. annual appropriations by fiscal year (October 1–September 30), which does not directly correspond to the calendar year. For example, for calendar year 1997, the figure used is from fiscal year 1997 (October 1, 1996–September 30, 1997).

**TABLE 7-2 Financial Contributions to Multilateral Institutions and Programs** (Millions of U.S. Dollars)

The U.S. government provides direct funding to multilateral institutions in support of sustainable economic development, poverty alleviation, and protection of the global environment.

Institution or Program	1997	1998	1999	2000	Total
<b>Multilateral Institutions</b>					
World Bank	700.0	1,034.0	800.0	771.1	3,305.1
International Finance Corporation	6.7	0	0	0	6.7
African Development Bank	0	45.0	128.0	131.1	304.1
Asian Development Bank	113.2	150.0	223.2	90.7	577.1
European Bank for Reconstruction and Development	11.9	35.8	35.8	35.8	119.3
Inter-American Development Bank	25.6	25.6	25.6	25.6	102.4
United Nations Development Program	76.0	93.7	97.4	77.9	345.0
United Nations Environment Program*	11.0	9.0	12.0	10.0	42.0
UN Framework Convention on Climate Change	2.6	3.9	3.8	4.9	15.2
<b>Multilateral Scientific, Technological, and Training Programs</b>					
World Meteorological Organization*	2.0	1.5	2.0	2.0	7.5
Intergovernmental Panel on Climate Change	0.7	1.0	2.7	1.6	6.0

\*U.S. total voluntary contributions only from the International Organizations and Programs account.

addition, it is difficult in U.S. government programs to clearly distinguish between forest and biodiversity conservation programs, or between carbon sequestration programs (that apply forest and biodiversity conservation approaches) and adaptation programs (that seek to protect species endangered by changing climatic conditions). Similarly, many agricultural programs simultaneously support vulnerability assessments for climate impacts (i.e., severe weather), flood risk, desertification, drought, water supply, and/or food security.

While new categories have been included, most have been added as sub-categories of the original headings provided in the UNFCCC guidelines. In this manner, total figures may be calculated within each main category for direct comparison with other countries' submissions. In addition, total figures may be calculated across regions and sectors. This more detailed representation of U.S.-funded climate change activities should promote more transparent and comprehensive understanding of the kind of support and attention the United States has provided in responding to climate change through technology transfer and development assistance programs.

### SUMMARY OF FINANCIAL FLOW INFORMATION FOR 1997–2000

From 1997 to 2000, the United States provided more than \$4.1 billion in direct funding to activities in developing and transition economies. This funding included greenhouse gas mitigation in the energy, industrial, and waste management sectors; carbon sequestration through improved forest and biodiversity conservation and sustainable agriculture; activities that address vulnerability and adaptation to climate impacts through improved water supply, disaster preparedness, food security, and research; and other global climate change activities. In the energy and water supply categories, commercial sales from private industry have enabled the transfer of technologies valued at

approximately \$3.6 billion.

As shown in Table 7-3 in Appendix C, funding levels varied considerably between different categories. In addition to variations in U.S. government programming practices, this occurred in part because some categories (such as energy, water supply, and waste management) are very capital-intensive, while others (such as forest management or vulnerability assessment) require less capital investment.

In addition to direct funding and commercial sales, the United States provided \$954.3 million in indirect funding between 1997 and 2000. This funding contributed to infrastructure projects and technologies that supported greenhouse gas mitigation in the energy sector.

### Funding Types

This chapter reports direct support in the form of official development assistance (ODA) and official assistance (OA), grants from foundations and other philanthropic institutions, U.S. government-backed project financing, NGO funds, foreign direct investment (FDI), and commercial sales from private industry.<sup>30</sup> From 1997 to 2000, commercial sales and ODA/OA accounted for the largest share of direct support, followed by loans, foundation grants, FDI, and NGO funding (Figure 7-1). ODA, OA, grants, and to some extent NGO funds were directed to foreign governments, NGOs, and research institutions, as well as to U.S.-based institutions working in developing countries and transition economies.

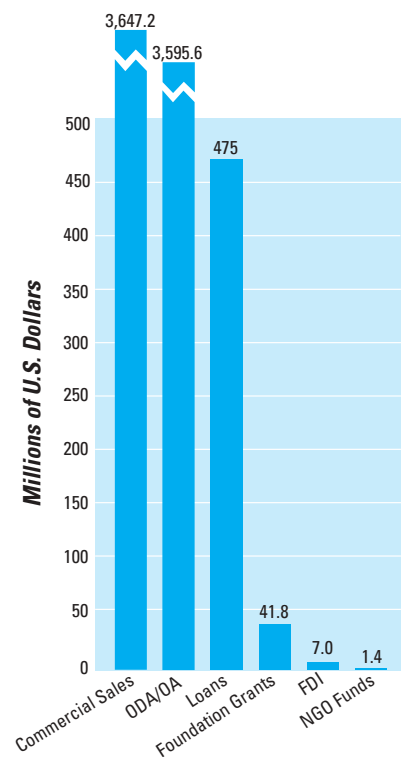
It is estimated that U.S. FDI comprises the vast majority of funding that goes to climate change-related activities in developing and transition economies. However, because most information about the financing and implementation of private-sector projects is proprietary, very little FDI is reported under Table 7-3. What is

reported generally includes project development and implementation of USJI energy and land-use mitigation projects. For these particular projects, annual financial contributions have ranged from \$9,000 to \$1.8 million per project.

U.S. government-based project financing has supported financing for private-sector infrastructure development. Loan amounts typically ranged from \$60 million to \$123 million per project, often providing a portion of the full project capitalization in conjunction with other funding sources. U.S. commercial sales of climate-friendly

**FIGURE 7-1 Commercial Sales and Direct Financial Flows: 1997–2000**

From 1997 to 2000, commercial sales and official development assistance/official assistance (ODA/OA) accounted for the largest shares of direct support for activities that address mitigation of and adaptation to climate change.



Note: ODA/OA = official development assistance/official assistance; FDI = foreign direct investment; NGO = nongovernmental organizations.

<sup>30</sup> Justification for including commercial sales in this analysis of financial flows is derived from guidance provided in chapter 2 of IPCC 2000: "commercial sales refer to the sale (and corresponding purchase), on commercial terms, of equipment and knowledge."

environmental goods and services capture much of the “hard” technology or equipment exported to developing and transition economies. Annual commercial sales flows have ranged from \$2,505 to \$75.6 million per transaction.

Indirect financing, which includes risk guarantees, loan guarantees, and investment insurance, has contributed to the development of large private-sector energy infrastructure projects (Figure 7-2). The difference between direct and indirect financing is that the indirect flows do not represent actual transfers of cash, but rather guarantees to financial institutions and companies that the United States will cover the guaranteed amount of the total losses resulting from loan defaults, or other risks to a creditor or company. Indirect

flows typically have ranged from \$3.1 million to \$200 million per project.

### Regional Trends

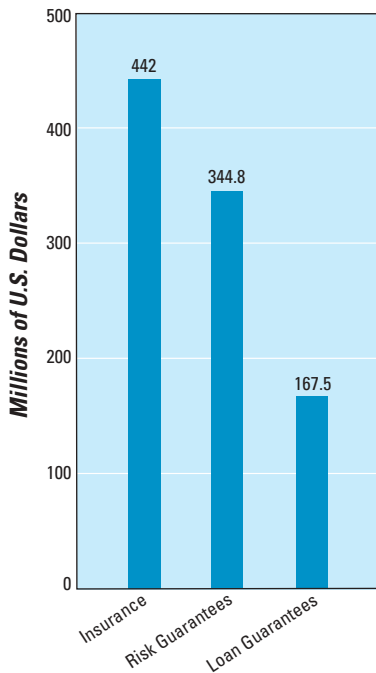
From 1997 to 2000, the United States provided over \$1.1 billion to Asia and the Near East, \$2 billion to Latin America and the Caribbean, \$390.9 million to sub-Saharan Africa, \$276.9 million to Europe and Eurasia, and \$275.4 million to other global programs for the direct financing of mitigation, adaptation, and other climate change activities. With commercial sales of technologies and services, the United States provided \$1.9 billion to Asia and the Near East, \$1.5 billion to Latin America and the Caribbean, \$134.0 million to sub-Saharan Africa, and \$76.2 million to Europe and Eurasia.

With respect to indirect financing, the United States provided \$425.5 million to Asia and the Near East, \$467.1 million to Latin America and the Caribbean, and \$61.7 million to Europe and Eurasia (Figure 7-3).

Funding has varied across regions in part because of differences between regional development priorities and because of the types of financial resources that have been mobilized for that region. A region’s or subregion’s development needs, geography, and investment environment often determine the types of climate change mitigation and adaptation projects that the United States funds. In addition, the distribution of the three dominant financial flow types—ODA, loans, and commercial sales—explains the huge

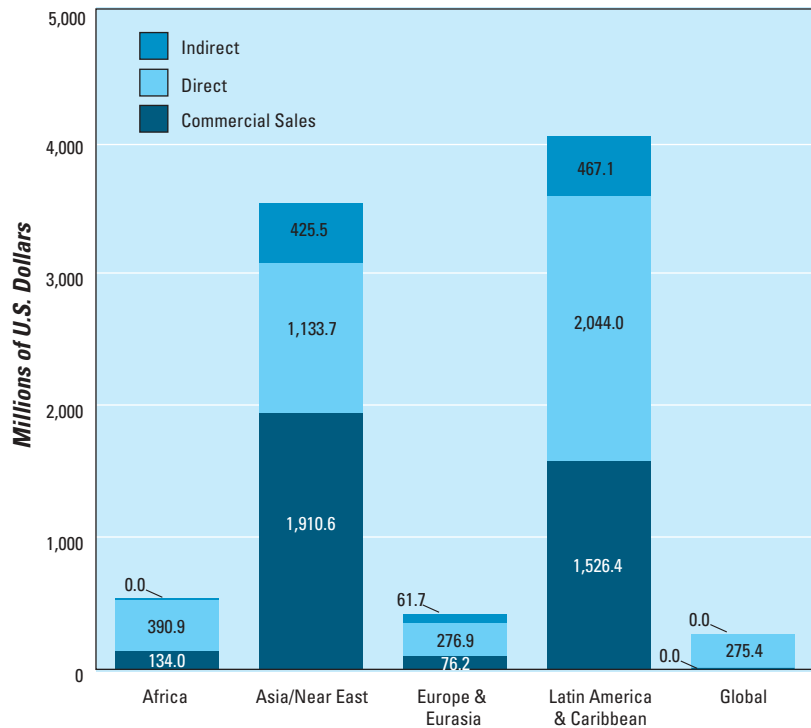
**FIGURE 7-2 Indirect Financial Flows in the U.S. Energy Sector: 1997–2000**

Indirect flows, which includes risk guarantees, loan guarantees, and investment insurance, has contributed to the development of large private-sector energy infrastructure projects. Indirect flows represent guarantees to financial institutions and companies that the United States will cover the guaranteed amount of the total losses resulting from loan defaults, or other risks to a creditor or company.



**FIGURE 7-3 Regional and Global Direct, Commercial Sales, and Indirect Financial Flows: 1997–2000**

From 1997 to 2000, the United States provided billions of dollars for mitigation, adaptation, and other climate change activities, specifically: \$4.1 billion in direct financing, \$3.6 billion for commercial sales of technologies and services, and \$943 million in indirect financing.





variances in the magnitude of financial flows across regions and across time. In particular, a few loans that supported energy-sector activities far exceeded the relative funding levels provided through ODA, and actually doubled or tripled the baseline flows to a particular region. These activities have tended to be infrequent, one-time loans for single projects in a single country.

For example, from 1997 to 2000 in Asia and the Near East, the United States provided the energy sector \$504.5 million in direct financing, \$411.2 million in commercial sales, and \$425.5 million in indirect financing. For the water supply sector, the United States provided \$337.7 million in direct financing and \$1.5 billion in commercial sales of relevant equipment and technologies. This funding distribution is representative of the region's experience with water supply constraints and increasing energy demand. In another example, to support forestry-related activities, the United States provided direct financing of \$144.3 million to Latin America and the Caribbean, \$121.2 million to Africa, and \$121.2 million to Asia and the Near East over the same period. These regions boast significant potential for conservation of carbon stocks and other climate-friendly forest and biodiversity conservation opportunities (see Appendix C).

### Mitigation Activities

From 1997 to 2000, the United States spent \$2.4 billion overall on climate change mitigation in the form of ODA, U.S. government-backed loans, foundation grants, NGO funds, FDI, and commercial sales. The United States also indirectly financed climate change mitigation activities in the amount of \$954.3 million. Following the UNFCCC guidance for Table 7-3 (in Appendix C), the mitigation activities reported here include emission-reduction initiatives in the energy,

transportation, forestry, agriculture, waste management, and industrial sectors. To more accurately represent U.S.-supported activities, the forestry sector has been divided into two sub-categories: forest conservation and biodiversity conservation (Figure 7-4).

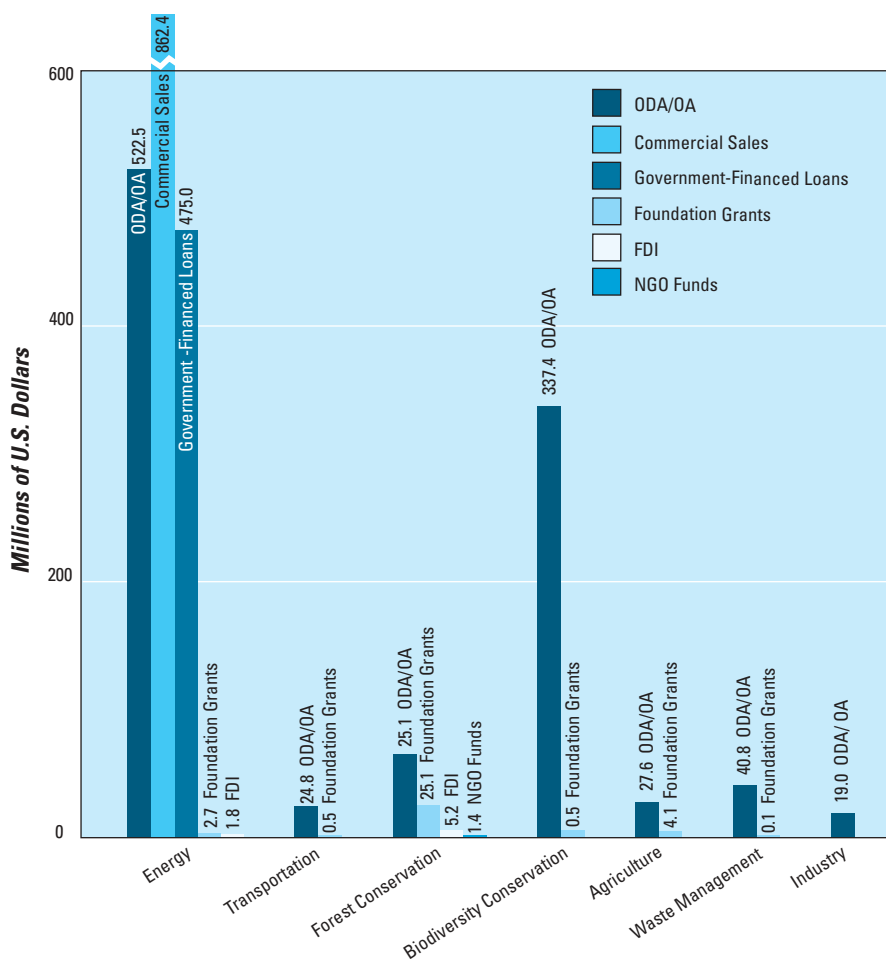
### Energy

The majority of U.S. spending on mitigation of climate change from 1997 to 2000 was directed toward energy-

related projects, totaling approximately \$1 billion in direct financing and \$862.4 million in commercial sales.<sup>31</sup> In indirect financing, the United States leveraged \$954.3 million for climate-friendly investments, all of which went to the energy sector (see Appendix C). U.S. support for climate technology transfer in this sector has varied widely throughout the world to include complex, large-scale infrastructure investment and development; extensive

**FIGURE 7-4 U.S. Financial Flows by Mitigation Sector and Financial Flow Type: 1997-2000**

From 1997 to 2000, the United States directly financed \$2.4 billion and indirectly financed \$954.3 million for activities to mitigate the effects of climate change.



Note: ODA/OA = official development assistance/official assistance; FDI = foreign direct investment; NGO = nongovernmental organization.

<sup>31</sup> In selecting commercial sales transactions applicable to the energy sector, the U.S. limited its query to equipment for heat and energy management and renewable energy plants, as determined by the US-AEP study that examined U.S. environmental exports (US-AEP/USAID 2000). These commodities included (1) photosensitive semiconductor devices/photovoltaic cells and light-emitting diodes; (2) heat-exchange units, nondomestic, nonelectric; (3) electric-generating sets; (4) parts of hydraulic turbines and water wheels, including regulators; (5) hydraulic turbines and water wheels of a power exceeding 10,000 KW; (6) instantaneous or storage water heater, nonelectric; (7) hydraulic turbines and water wheels of a power exceeding 1,000 KW but not exceeding 10,000 KW; and (8) hydraulic turbines and water wheels of a power not exceeding 1,000 KW.

capacity building for power-sector policy and regulatory reform; improvements in the development and propagation of energy-efficiency, renewable-energy, and clean-energy technologies and practices; and conservation practices at the municipal and household levels. U.S. support for this sector has often included overlap with the transportation, industrial, and waste management sectors.

U.S. support for technical assistance and training has contributed to policy reforms and increased energy-efficient operations in the power and industrial sectors. For example, USAID supported a number of significant utility restructuring and regulatory reform activities, including adjustments to energy tariffs and fuel pricing in countries in Asia, the Near East, Europe, and Eurasia. These efforts have largely resulted in improved market efficiency, cost-effective management, and reduced greenhouse gas emissions through the use of innovative technologies, improved management practices, and incentives that increase the efficiency of energy production, distribution, and consumption. Among its numerous energy-efficiency activities worldwide, USAID has worked with the Egyptian government to provide technical assistance to enhance power station efficiency, reduce losses in transmission, and introduce time-of-day metering to regulate the flow of electricity. These efforts have resulted in considerable savings in annual carbon dioxide (CO<sub>2</sub>) emissions.

USAID also partnered with the United States Energy Association to establish an International Climate Change Project Fund that provides support to U.S. investor-owned utilities and other energy companies to implement specific projects that mitigate emissions in USAID-assisted countries in Asia, Africa, and Latin America. One of the Fund's projects selected in 2000 is the SENELEC Network Power Generation Efficiency Project in Senegal which, through partnering with the U.S.-based Electrotek Concepts, will increase the efficiency, reliability, and power quality of the primary electricity supply system

operated by this national electric utility. This project is expected to eliminate 315 gigagrams of CO<sub>2</sub> over its 10-year lifetime and reduce fuel imports to Senegal by an estimated 140,000 barrels a year. In Mexico, USAID's Steam and Combustion Efficiency Pilot Project has promoted high-efficiency motors, compressors, pumps, and lighting to demonstrate the linkages between reducing emissions and increasing energy efficiency. In 1999, this effort resulted in a reduction of more than 325 gigagrams of CO<sub>2</sub> emissions.

U.S. support for broader infrastructure financing has also helped advance the use of renewable energy, energy efficiency, and clean energy in developing and transition economies. For example, the Export-Import Bank of the United States has financed combined-cycle plants in Latin America and the Caribbean, Asia, the Near East, Europe, and Eurasia. These plants exhibit high efficiency as they combine the use of natural gas and a low heat rate, which results in lower CO<sub>2</sub> production per kilowatt-hour of generated electricity. Support from U.S. power companies and NGOs financed the pilot phase of a rural solar electrification project in Bolivia, which is expected to avoid 1.3 gigagrams of CO<sub>2</sub> over its 20-year lifetime. In Bulgaria, USAID's Development Credit Authority program provided a partial loan guarantee for United Bank of Bulgaria to enable consumers in Bulgaria to finance municipal energy-efficiency improvements. As a result of this credit enhancement program, USAID leveraged \$6.3 million in private capital at a cost of \$435,000.

In addition to supporting large projects focused on energy supply, the United States has addressed the demand side of the power sector. For example, EPA has collaborated with authorities in China to reduce energy use by establishing minimum energy-efficiency levels for fluorescent lamp ballasts and room air conditioners. EPA has also worked to increase the energy-efficiency levels of refrigerators. Plans are now underway to strengthen the

Chinese voluntary energy-efficiency label through technical cooperation with the U.S. ENERGY STAR® program—an initiative that promotes energy-efficient solutions for businesses and consumers that save money as well as the environment.

### *Transportation*

From 1997 to 2000, the United States spent approximately \$25.3 million in ODA funding on climate-related activities in the transportation sector (see Appendix C). Note that a significant number of U.S. government projects supporting climate-related activities in the transportation sector are counted under "Energy."

U.S. international programs to address climate change through transportation have included efforts to improve engine and fuel efficiency, promote improved transportation management and planning, support alternative transportation systems, and introduce cleaner fuels and alternative-fuel technologies. For example, several USAID programs operating in Egypt, India, the Philippines, and Mexico seek to reduce greenhouse gas emissions from motor vehicles, while also reducing lead, particulates, and smog-forming emissions. The U.S. Department of Transportation's Center for Climate Change and Environmental Forecasting has supported strategic planning, policy research, communication, and outreach, as well as the preliminary assessment of project-specific international emission-trading opportunities in India, China, Indonesia, and Brazil.<sup>32</sup> DOE and the Ministry of Science and Technology of the People's Republic of China have been collaborating on research and development of electric and hybrid electric vehicle technology.

The U.S. Trade and Development Agency (TDA) has financed numerous feasibility studies, orientation visits, and other training and technical

<sup>32</sup> Given the current U.S. congressional restrictions on resource allocation for all efforts aimed at implementing Kyoto Protocol provisions, the USDOT/FHWA activities are focused only on raising the level of awareness among the potential domestic and international stakeholders.

assistance activities for railway, mass transit, and transportation system efficiency improvements throughout the developing world. For example, TDA provided \$220,000 for a feasibility study of the light rail project on the island of Cebu—the fastest-growing region and second-largest metropolitan area in the Philippines.

### Forestry

The United States spent over \$439.4 from 1997 to 2000 on climate change activities in the forestry sector (see Appendix C). This funding included traditional forest conservation and management activities, biodiversity conservation, and related natural resource management activities that improved the technical capacity of national and local governments, NGOs, and local communities to manage and conserve forests. The United States has also provided direct investment in protection of natural areas to reduce the rate of loss of, preserve, or increase carbon stock capacity. Overall, the majority of resources expended in this area went toward biodiversity conservation programs.

**Forest Conservation.** From 1997 to 2000, the U.S. government spent \$96.7 million on forest conservation in Central and South America, Africa, Asia, and Europe and Eurasia (Figure 7-5). For example, USAID has addressed rapid deforestation in the Amazon tropical rain forest by funding scientific studies that use satellite imagery to analyze deforestation trends to better understand specific risks from drought, illegal logging, accidental fires, and agriculture practices.

In Mexico, following the 1997 and 1998 wildfire disasters, USAID, the Mexican government, and local NGOs jointly developed a wildfire prevention and land restoration program to mitigate environmental, health, and climate effects from forest fires. USAID helped lead several efforts to adopt policies discouraging slash-and-burn agriculture, improve collaboration between Mexico’s federal government and

NGOs, and provide training on fire prevention and wildfire management. As a result, local fire brigades were able to control and extinguish fires much more effectively, and in 1999 Mexico experienced a decrease in the area normally affected by fires. Efforts are underway to assess the amount of carbon potentially sequestered as a result of Mexico’s fire restoration efforts.

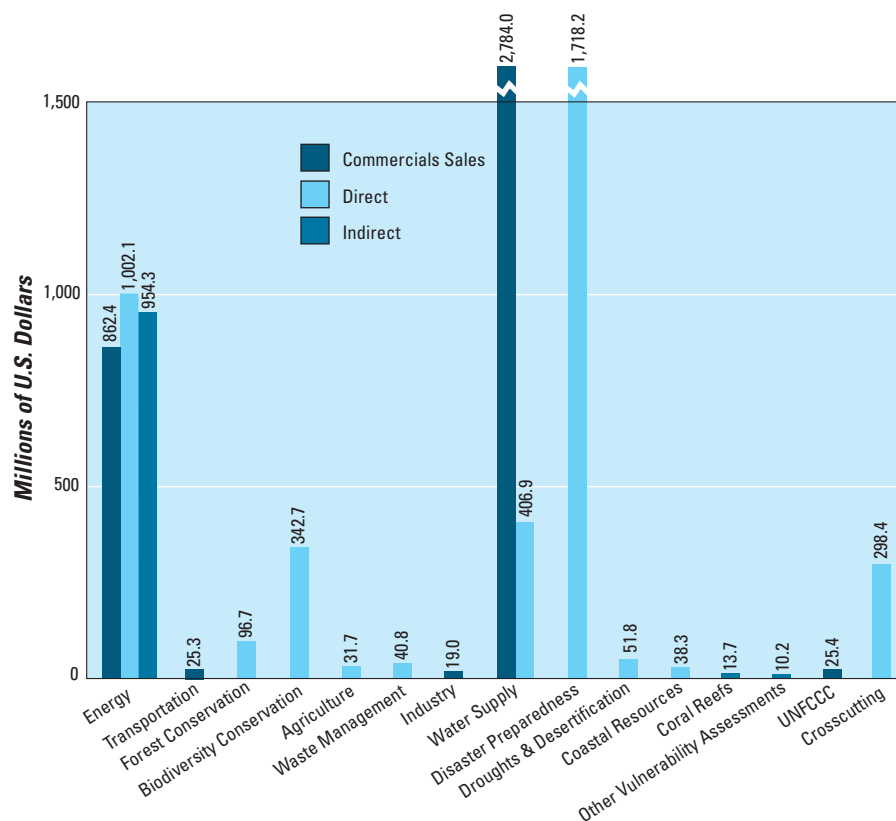
By working with communities to establish clear boundaries for community management, control agricultural clearing, and implement monitoring plans, USAID facilitated the transfer of over 625,000 hectares (over 15 million acres) of forest to local management in the Philippines. After four years, about 5.5 million hectares of forestland—over 60 percent of the country’s open-access forests—are now under community

management. Without such interventions, the country’s forest cover would have declined by an estimated 6 percent during the same period.

Through the USIJI program, the U.S.-based NatSource Institutional Energy Brokers, the Costa Rican Ministry of the Environment and Energy, and the Costa Rican National Parks Foundation have begun implementing the Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves Project. This “certified tradable offset” project facilitates the transfer of primary forest, secondary forest, and pasture lands that have been declared National Parks or Biological Reserve to the Costa Rican Ministry of Environment and Energy (MINAE). Over its 25-year life, the project is expected to avoid an

**FIGURE 7-5 Direct, Commercial Sales, and Indirect Financial Flows by Mitigation/Adaptation Sector: 1997–2000**

From 1997 to 2000, the majority of U.S. spending on climate change mitigation activities was directed toward energy-related projects, totaling approximately \$1 billion in direct financing, \$862.4 million in commercial sales, and \$954.3 million in indirect financing for climate-friendly investments.





estimated 57 teragrams of CO<sub>2</sub> emissions.

**Biodiversity Conservation.** From 1997 to 2000, the U.S. government spent \$342.7 on biodiversity conservation activities, such as establishing and managing protected areas, providing training in habitat conservation, and promoting sustainable resource management (Figure 7-5). Funding for biodiversity activities has come primarily from USAID, USIJI projects, and private foundations, usually in partnership with international NGOs, research institutions, and host-country governments and organizations.

USAID's Parks-in-Peril program, a partnership with The Nature Conservancy and local NGOs, has become Latin America's largest, most successful site-based conservation effort. Working in 37 protected areas in 15 countries, this program has helped protect over 11 million hectares (more than 271 million acres) of natural forests, of which 6.3 million hectares (more than 155 million acres) contain substantial carbon stocks.

In Bulgaria, USAID's GEF Biodiversity Project has strengthened a network of protected areas, with a specific focus on the Rila and Central Balkan National Parks, totaling 179,622 hectares (over 4 million acres). The project has provided policy development assistance, promoted sustainable economic use of biological resources, and built local capacity to manage the parks.

In similar efforts, the MacArthur Foundation's Ecosystems Conservation Policy grant program has supported initiatives in Nepal and Tibet totaling \$100,000. The March for Conservation program has supported coastal zone biodiversity and conservation education in Sri Lanka (\$75,000), and Terra Capital Investors Limited's venture capital fund (\$1 million) invests in Latin American businesses that involve the sustainable use of natural resources and foster the preservation of biological diversity.

In Guatemala, the home of the Maya Biosphere Reserve and one of the largest tracts of intact tropical forests, USAID has worked to reduce deforestation rates

and promote carbon sequestration. By supporting improved land- and resource-use practices, an improved policy framework, and stronger local institutions through technical assistance, training, and farmer-to-farmer extension networks, this work had led to the protection of approximately 700,000 hectares (more than 17 million acres) in 1999.

USAID's work in Indonesia took steps to protect the West Kalimantan tropical broadleaf forest, where approximately 43,000 hectares (more than 1 million acres) are now under effective management as villagers organize, create maps of, and impose rules on harvesting the natural resources. In 2000, USAID also supported resource valuation studies for communities in Indonesia's Bunaken National Park to demonstrate the relative monetary value per hectare and per family that biologically diverse forests have, as compared with oil palm monoculture forests.

In Madagascar, USAID has sought to preserve biologically diverse carbon stocks and reduce their rate of loss. Working with the National Association for Management of Protected Areas (ANGAP) and the Ministry of Water and Forest (MEF), USAID supported the growth and sound management of Madagascar's Protected Area Network, as well as forests and important biological areas outside of the network. These programs specifically focus on protection and improved management of existing areas of biological importance, reducing slash-and-burn agriculture, and increasing agroforestry and tree nursery efforts to promote reforestation of multiple-use, high-economic-value, or indigenous tree species.

### *Agriculture*

Between 1997 and 2000, the United States spent approximately \$31.7 million on climate-related activities in agriculture (see Appendix C). These financial resources have promoted agroforestry, reduced tillage, erosion control, introduction of perennial crops and crop rotation, improved nitrogen

and soil management, use of organic fertilizers, and improved management of agrochemicals.

In Uganda and Madagascar, for example, USAID has supported sustainable farming systems and agroforestry to improve agricultural output while enhancing the carbon storage potential in soils and crops. In Kenya, the Ford Foundation has supported Winrock International's Institute for Agricultural Development to strengthen associations of women professionals in agriculture and the environment in East Africa. The Institute has enhanced food security and environmental conservation by preparing women for leadership roles in agricultural and environment-related sciences.

In Chiapas, Mexico, a ground-breaking partnership between Starbucks Coffee and Conservation International (CI) begun in 1998 has promoted cultivation that incorporates biodiversity protection and environmentally sustainable agricultural practices. Under the partnership, CI assists farmers in the El Triunfo Biosphere Reserve, in the Sierra Madre de Chiapas, to produce coffee under the shade of the forest canopy using practices that avoid the need to clear forested lands.

### *Waste Management*

The United States spent over \$40.8 million from 1997 to 2000 on activities supporting greenhouse gas mitigation in the waste management sector (see Appendix C).<sup>33</sup> These activities primarily addressed the development and implementation of waste-to-energy programs involving the recovery of greenhouse gases, such as methane from solid waste disposal facilities. For example, US-AEP and Conservation Services Group (CSG) Energy Services jointly implemented an energy-efficiency technology and pollution prevention project in India in partnership with several universities and India's

<sup>33</sup> Financial information on some waste management initiatives was not available, especially with regard to private-sector activities. Note, a considerable number of industrial-sector activities have been included under "Energy," above.

Thane-Belapur Industries Association. The partners will use the CSG grant to assess the potential of selected landfill methane-recovery sites to mitigate greenhouse gas emissions.

Under USJI, the regional Argentinean government agency, Coordinación Ecológica Area Metropolitana Sociedad del Estado (CEAMSE) and U.S.-based Pacific Energy Systems, Inc., have developed a landfill gas management project in Greater Buenos Aires, where up to 5 million tons of waste are deposited annually. Studies initiated under the project estimate that capturing and combusting 70 percent of the gas generated from the waste in the CEAMSE landfills could result in an annual net emission reduction of 4 teragrams of CO<sub>2</sub> equivalent. Further reductions could be achieved as the gas is used to displace combustion of more carbon-intensive fossil fuels.<sup>34</sup>

### Industry

Between 1997 and 2000, the United States spent more than \$19 million on climate-friendly activities in the industrial sector (see Appendix C).<sup>35</sup> These activities have improved industrial energy efficiency, environmental management systems, process efficiency, and waste-to-energy programs, particularly in energy-intensive industries.

In Mexico, for example, USAID and DOE have collaborated to develop greenhouse gas emission benchmarks for key industries, as well as energy-efficiency initiatives in the public sector. These efforts have demonstrated that investments in resource management systems are both technically and economically sound, paying for themselves through energy and other savings within a few years. In the Philippines, USAID supported the adoption of ISO 14000 certification, a voluntary system that

promotes environmental management improvements in production practices at a Ford Motor Company plant and throughout its chain of 38 suppliers. In Chennai, India, USAID worked with a starch manufacturing company in the Salem District of Tamil Nadu to recover methane emissions from its tapioca-processing effluents. A USAID-commissioned study found that the 800 manufacturing facilities of Salem produce enough methane to generate about 80 MW of power, compelling the local chamber of commerce to implement a demonstration project in 1998 with USAID assistance to convert the recaptured methane for fuel use.

Other U.S. government facilitation of climate-friendly industrial development has involved the transfer of U.S. equipment and technical expertise. In 1997, the U.S. Trade and Development Agency provided a \$600,000 grant to the Ukrainian Ministry of Coal to study the feasibility of the production of coalbed methane and utilization of gases to generate electric power in the Donetsk Basin. The U.S. firm International Coal Bed Methane Group (composed of Black Warrior Methane and E.L. Lassister) carried out the study. U.S. exports to the project consisted of drilling and completion equipment, drilling rigs, service rigs, combustion power turbines, logging and geophysical equipment, and engineering and legal services. In 2000, the Department of Commerce, through its International Clean Energy Initiative, began promoting the transfer of U.S.-developed waste recovery technology to developing countries. A trade mission to China involved the participation of the Asian American Coal Company, which has developed technology that captures coalbed methane for conversion to natural gas.<sup>36</sup>

### Adaptation Activities

From 1997 to 2000, the United States spent over \$5 billion on climate change vulnerability and adaptation activities. These activities, funded mostly by commercial sales and ODA, are presented in Appendix C under the categories provided by the UNFCCC guidance: capacity building, coastal zone management, and other vulnerability assessments. However, to more accurately represent the numerous adaptation activities the United States has supported that are relevant to climate change, the following subcategories were created under capacity building: water supply, disaster preparedness and response, and drought and desertification. Under coastal zone management, the following two categories were created: coastal resources and coral reef protection.

#### Capacity Building

From 1997 to 2000, the United States provided \$4.9 billion in funding for climate change activities in the broad category of capacity building. The major sources of funding for capacity building came from commercial sales for much of the technology transferred in the “water supply” subcategory, while ODA and foundation grants funded disaster preparedness and response programs and droughts and desertification programs.

**Water Supply.** Between 1997 and 2000, the United States spent approximately \$406.9 million in direct financing for water supply programs primarily directed at the development and improvement of water supply and wastewater treatment infrastructure.<sup>37</sup> Hard technologies transferred through commercial sales amounted to approximately \$2.8 billion<sup>38</sup> (Figure 7-6). Following are some examples of this financial and technical assistance.

<sup>34</sup> USJI Project Descriptions—CD.

<sup>35</sup> A considerable number of industrial-sector activities have been included under “Energy,” above.

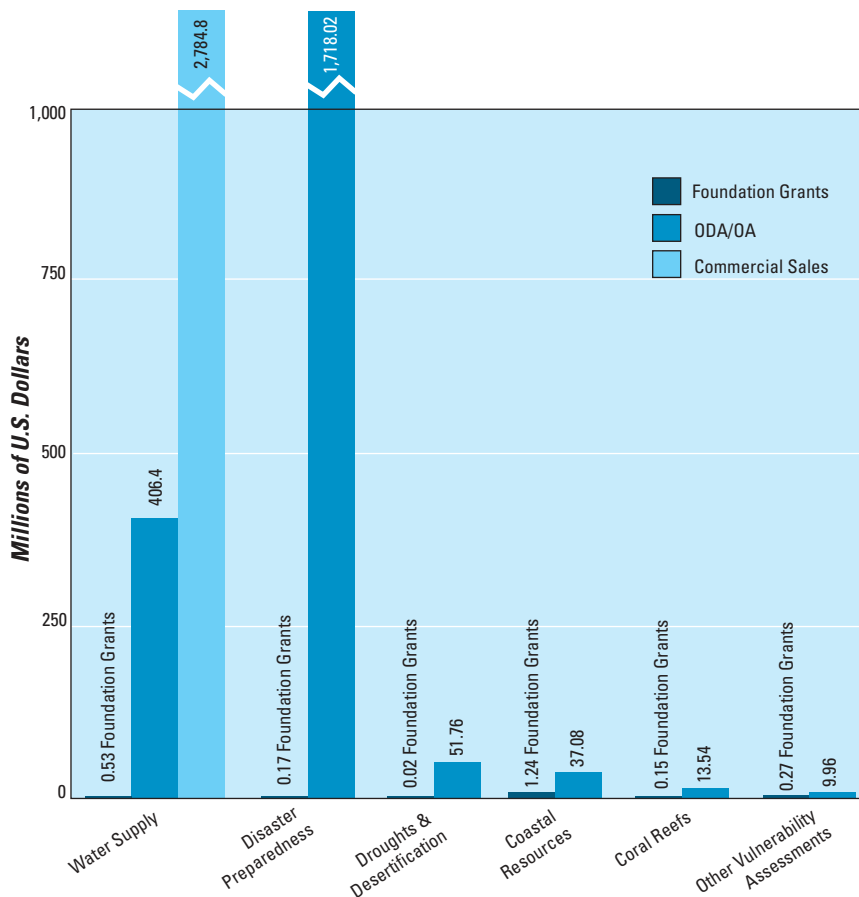
<sup>36</sup> ITA Web site.

<sup>37</sup> IPCC Working Group II included water supply as a capacity-building category in IPCC 2001a, based on the integrated water resource management approaches identified for adapting to climate change impacts in the hydrology and water resources sector.

<sup>38</sup> In selecting commercial sales relevant to the water supply sector, the United States limited its query to wastewater treatment equipment, an IPCC-determined supply-side option for adapting to climate change impacts in the hydrology and water resources sector (IPCC 2001a, p. 220). Based on the methodology of a US-AEP study that examined U.S. environmental exports (US-AEP/USAID 2000), the United States chose to include sales of the following types of commodities: (1) mats, matting, and screens of vegetable plaiting materials; (2) rotary positive displacement pumps; (3) centrifugal pumps; (4) filtering or purifying machinery and apparatus for water; (5) filtering or purifying machinery and apparatus for liquids; and (6) machines for mixing, kneading, crushing, grinding, etc.

**FIGURE 7-6 Financial Flows by Adaptation Sector and Financial Flow Type: 1997–2000**

From 1997 to 2000, the United States spent over \$5 billion on climate change vulnerability and adaptation activities. These activities were funded primarily by commercial sales and official development assistance/official assistance (ODA/OA).



In mid-1998, USAID provided emergency assistance to the Zai Water Treatment Plant in Jordan, which is the source of drinking water for 40 percent of Amman's population. In coordination with Japan and Germany, USAID has funded efforts to expand and upgrade the plant to reduce the likelihood of future water crises, and is funding the rehabilitation of 27 contaminated springs and wells. In Egypt, USAID is continuing work on the rehabilitation and expansion of the southern portion of Cairo's Rod El Farag water treatment plant, a \$97.4-million project. As a result of this work, four million Cairo residents now benefit from a more reliable and safer water supply service.

In 1997, the U.S. Trade and Devel-

opment Agency (TDA) provided \$168,500 to FMI International to conduct a feasibility study for the development of a wastewater treatment plant in northeastern Estonia. In another example, at the request of the Royal Thai government, TDA provided \$40,000 for an orientation visit for 16 Thai officials interested in U.S. flood control technology in 1997. That same year, TDA also granted \$367,000 for a feasibility study on water-loss reduction for the city of Curitiba in Parana, Brazil.

**Disaster Preparedness and Response.** Between 1997 and 2000, the United States spent \$1.7 billion on climate-related disaster preparedness, mitigation, and relief (see Appendix C). The

United States recognizes that prevention, reduction, and preparedness are important factors in reducing the large-scale devastation that disasters can have on vulnerable populations. As a result, the United States has provided extensive assistance for recovery from natural disasters around the world.

*Severe weather disasters.* In May 1999, the U.S. Congress appropriated \$621 million under the Emergency Supplemental Appropriations Act, primarily to support the reconstruction of the Dominican Republic and Haiti, which were devastated in late 1998 by Hurricane Georges. This funding also assisted Central America's recovery from Hurricane Mitch, which struck on the scale of a storm seen only once in 100–200 years. These funds were later extended for reconstruction in the Bahamas and the Caribbean, which were struck by Hurricanes Floyd and Lenny in 1999.

After surveying the extensive damage caused by Hurricane Mitch, the United States announced the \$11 million Central American Mitigation Initiative. This project aims to reduce the impacts of natural disasters by building national capacity in Central American countries to forecast, monitor, and prevent those disasters. In the wake of Hurricane Mitch, the United States initiated a multi-agency effort to strengthen worldwide climate-related disaster preparedness and mitigation, with particular emphasis on Mexico and Central America.

In a joint effort, a group of U.S. government agencies<sup>39</sup> implemented a variety of disaster preparedness and relief programs for hurricane-related impacts throughout Latin America. These programs have included, for example, the development of more

<sup>39</sup> USAID, NOAA, USDA, USGS, EPA, Federal Emergency Management Agency (FEMA), the Department of the Interior (DOI), Department of Health and Human Services (HHS), Department of Transportation (DOT), Department of Housing and Urban Development (HUD), the Peace Corps, Export-Import Bank (Ex-Im Bank), Overseas Private Investment Corporation (OPIC), Department of State, and the General Accounting Office (GAO).

resilient infrastructure, climate forecasting and warning systems, and various forms of humanitarian aid. USAID helped establish a training and technical assistance program to develop adaptation plans for extreme climatic events in the region, supported watershed rehabilitation through a transnational watershed program, and helped install stream gauges and early-warning systems in Honduras.

To continue addressing connected disaster risks in the Caribbean region, USAID recently initiated the Caribbean Disaster Mitigation Project. Implemented by the Organization of American States' Unit of Sustainable Development and Environment, this \$5-million, six-year project promotes the adoption of natural disaster preparedness and loss-reduction practices by both the public and the private sectors through regional, national, and local activities. These activities target six major themes: (1) community-based preparedness, (2) hazard assessment and mapping, (3) hazard-resistant building practices, (4) vulnerability and risk audits for lifeline facilities, (5) promotion of hazard mitigation within the property insurance industry, and (6) incorporation of hazard mitigation into post-disaster recovery. To date, pilot projects have been implemented in 11 Caribbean countries.

Similarly, the Federal Emergency Management Agency (FEMA) has a long history of interaction with foreign governments to help them more effectively respond to and prevent disasters, including expert exchanges and "train-the-trainer" courses. FEMA recently established pilot projects for building disaster-resistant communities with Argentina, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, and Nicaragua and expanded civil emergency planning work through NATO partners to include East European nations.

*Watershed management.* In continued efforts to reduce severe weather risks in Central America, USAID has undertaken activities in the transboundary

Río Lempa watershed, shared by Guatemala, Honduras, and El Salvador. The adaptation strategy for the Río Lempa has focused on three components: the National Weather Service River Forecast Center,<sup>40</sup> capacity building on the operation and maintenance of the forecast system, and the development of a geographic information system and watershed disaster mitigation plan to mitigate the impacts of extreme events. The watershed disaster mitigation plan includes identification of vulnerable populations, flood-prone areas, areas at risk of landslides, the location of shelters, and road networks for delivery of supplies. The program facilitated a tri-national agreement to mitigate the impacts of transnational disasters in the Lempa Watershed, with the goal of exporting the lessons learned from the Río Lempa to other transnational watersheds in the region.

*Flood preparedness and response.* The United States has also provided flood preparedness and response support to developing countries around the world, both in terms of disaster relief and in planning and mitigating future risks. Among the many catastrophic floods that occurred between 1997 and 2000, the United States has helped victims and communities in over a dozen developing countries around the world.

In 1999, USAID's Office of Foreign Disaster Assistance (OFDA) announced \$3 million in funding to assist relief efforts related to massive flooding, landslides, and mudslides in Venezuela, which killed an unknown number of people and displaced many more. The same year, the U.S. Geological Survey provided follow-on disaster planning assistance to produce hazard maps for future response to and recovery from disastrous flood and landslides in Venezuela. In addition, USAID funded the provision of emergency relief supplies to flood victims in Mozambique, South Africa, and Zimbabwe in response to severe flooding in southern Africa in 1999.

In 1998, OFDA provided funds for emergency housing, clothing, mosquito

nets, and cooking utensils to Vietnam after heavy rains and severe flooding devastated the country. To minimize future flood risks, in 2000, USAID started supporting efforts to map flood plains and determine where people should avoid building their homes in the future. These efforts included locating emergency shelters and determining evacuation routes to be used during future flooding.

In 1998, floods struck Kinshasa, Democratic Republic of the Congo, affecting an estimated 100,000 people. After the emergency, OFDA designed a project to reduce the population's vulnerability to future floods. With OFDA funding, Catholic Relief Services built 17 small check-dams from locally available materials, cleaned drainage canals, and reseeded degraded watershed areas to improve soil and moisture retention. When torrential rains again struck Kinshasa in February 1999, there were no injuries, no displaced residents, and no damaged homes in the project area. This successful project enabled the residents of Kinshasa—where monthly household incomes are less than \$70—to avoid a repeat of the \$7.7 million in economic losses they suffered in 1998.

*Climate forecasting and research.* Climate, meteorological, and hydrological forecasting has played an increasingly important role in warning developing country populations of pending severe storm risks, as well as better informing them of long-term disaster mitigation and response efforts. Under NOAA's National Weather Service, the United States has regularly provided developing countries with meteorological and hydrological forecasts and prediction models, floods, droughts, and river flow predictions; tropical cyclone/hurricane forecasts for the Western Hemisphere; global aviation hazardous weather forecasts; high-sea forecasts for the North Atlantic and North Pacific; and meteorological training programs for countries throughout Central America, the

<sup>40</sup> The NWSRFS was developed by NOAA and is being implemented by NOAA, the U.S. Geological Survey, and the System for Central American Integration.



Caribbean, and Africa. NOAA also provides research and response activities to prepare for severe impacts expected from extremes of climate variability, climate forecast research and applications, predictions related to El Niño phenomena, support for a scientific network, and capacity building in Africa, Latin America and Caribbean, South-east Asia, and the South Pacific. During the disastrous flooding in Mozambique in March and April of 2000, for example, NOAA provided real-time weather forecasts to the affected regions as well as to international response and relief agencies.

In cooperation with 26 countries, NASA implemented the Pacific Rim II airborne campaign in the southern and western portions of the Pacific Rim region. The campaign resulted in the deployment of research aircraft and remote-sensing instrumentation for collecting data that will enable scientists to better assess local environmental conditions and natural hazards to enhance disaster management and mitigation practices in Pacific Rim countries. Similarly, NOAA has implemented the Pan American Climate Studies Sounding Network (PACS SONET) for extended monitoring of climate variability over the Americas. This project enhances understanding of low-level atmospheric circulation features within monsoonal North and South America, provides a means of validating numerical model simulations, and establishes a long-term, upper-air observing system for climate prediction and research.

In another climate-hydrological forecasting effort, USAID and NOAA have cooperated to provide snow-monitoring and river-forecasting assistance to Central Asian Hydrometeorological Services, known as *Glaavidromets*. This effort will download imagery over Central Asia from NOAA's polar-orbiting satellites. The imagery will be used by the *Glaavidromets* to monitor the extent of the snowpack in the Himalayan Mountains, which is the source of most of the water that flows through the Amu Darya and Syr Darya rivers.

Numerous partners, including USAID

and NOAA, created the Radio and Internet Technology for Communication of Hydro-Meteorological and Climate Related Information (RANET) program. The program consists of information and applications networks in southern Africa, the Greater Horn of Africa, and West Africa. These networks provide regular seasonal climate forecast information and work directly with users to reduce climate-related vulnerability. RANET will make information, translated into appropriate local languages, directly available to farm-level users through wind-up radio.

**Droughts and Desertification.** From 1997 to 2000, the United States spent approximately \$51.8 million on activities that address droughts and desertification (see Appendix C). These activities are often implemented in connection with the U.S. government's foreign disaster response programs, although a number of long-term adaptation initiatives have also been supported. They include weather forecasting, drought prediction, hazard mapping, and research, technical assistance, and capacity building. Through NOAA, for example, the U.S. government has provided vegetation stress and drought prediction information to China, Georgia, Kazakhstan, Morocco, and Poland, and technical assistance to China and Tajikistan for estimating drought intensity and duration.

The U.S. Department of Agriculture, the U.S. Geological Survey, the GEF, and the government of Kazakhstan have begun implementing the pilot phase of the Kazakhstan Dryland Management Project. The project's objective is to conserve, rehabilitate, and sustainably use natural resources in the marginal cereal-growing area of the Shetsky Raion of northern Karaganda Oblast, Kazakhstan. This project works with communities and the Kazakh government to (1) develop alternative land uses and rehabilitate ecosystems for conservation of plant and animal bio-diversity; (2) develop a coherent framework and national capacity to monitor carbon sequestration; and (3) build public

capacity and develop a replication strategy so that project activities can be adopted in other similar areas of Kazakhstan and other Central Asian countries.

In the drought-prone Bie province of Angola, USAID has funded Africare, a private voluntary organization, to distribute 339 metric tons of seeds and 55,000 farming tools to 27,500 internally displaced people. In 2000 in Afghanistan, USAID/OFDA provided immediate drought relief measures through Save the Children to engage in drought-related activities, with a focus on maternal and child care.

The United States provides much support for food security through foreign agriculture programs and climate monitoring systems. For example, the Famine Early Warning System (FEWS) was started in 1985 and is funded at approximately \$6 million a year to provide decision makers with the information they need to effectively respond to drought and food insecurity. Working in 17 drought-prone countries across Sub-Saharan Africa, FEWS analyzes remote-sensing data and ground-based meteorological, crop, and rangeland observations by field staff to track the progress of the rainy seasons in semi-arid regions of Africa and to identify early indications of potential famine. Other factors affecting local food availability and access are also carefully evaluated to identify vulnerable population groups requiring assistance. These assessments are continuously updated and disseminated to provide host-country governments and other decision makers with the most timely and accurate information available. Overall, FEWS activities strengthen the capacities of public and private institutions to monitor and respond to drought, the principal impact of climate variability in Sahelian Africa. By helping to anticipate potential famine conditions and lessen vulnerability, FEWS has helped save lives, while also promoting a more efficient use of limited financial resources.

USDA provides a number of additional food security activities around the world, including:

- the West Africa Regional Food Security Project, which provides information on vulnerable populations, food balances, food needs, food aid, and commercial import requirements;
- development of agricultural and natural hazard profiles for selected African countries to assist in mitigation, response, and rehabilitation;
- direct food aid in response to drought-related famine in Ethiopia and the Horn of Africa;
- disaster management and logistics support for African desert locust response; and
- collaboration with Central American countries to develop strategies to overcome soil erosion, manage water quality, and resolve food safety problems resulting from Hurricanes Mitch and Georges.

### **Coastal Zone Management**

From 1997 to 2000, the United States provided about \$52 million in ODA and foundation grants for climate change adaptation activities supporting coastal zone management. These activities included efforts to address coastal resources, sea level rise, severe weather and storm surges, risks to ecosystems (such as rising seawater temperatures), and protection of coral reefs.

**Coastal Resources.** Adaptation activities addressing coastal resources fall under the broad categories of integrated coastal management (ICM); coastal zone management and planning; conservation of critical coastal habitats and ecosystems (such as coral reefs, mangrove forests, and sand dunes) to maintain vital ecosystem functions; protection of coastal areas from storm surge and sea level rise; reduction of coastal erosion to limit future displacements of settlements and industries; development of guidelines for best coastal development practices and resource use; and the dissemination of best practices for coastal planning and capacity building. The United States financed \$38.3 million in coastal resources activities between 1997 and 2000 (Figure 7-5).

The United States has implemented a number of ICM programs in several countries around the world. In 1985, USAID initiated the Coastal Resources Management program and again renewed this program in 2000 as part of a new \$32-million commitment for coastal zone management programs worldwide. The CRM project is now funded at approximately \$6 million a year and has operated in Mexico, Ecuador, Jamaica, the Dominican Republic, El Salvador, Kenya, Tanzania, Egypt, Thailand, Indonesia, and the Philippines. CRM projects largely promote improved governance, public participation, and stewardship toward the management of multi-sectoral activities within the coastal zone and surrounding watershed—helping to address a variety of climate-related threats to coastal and marine biodiversity and resource-dependent communities (USAID 2001b).

In addition to providing extensive technical assistance and research addressing coastal zone management needs, USAID's Coastal Resources Management program has helped generate a number of significant practical tools, such as coastal maps, program performance management guidelines, community coastal zone management strategies, national ICM policies, and best management guidelines in such areas as aquaculture, mariculture, and tourism development. The program has also promoted outreach mechanisms about best practices through reports, publications, journals, CD-ROMs, e-mail list servers, Web sites, and training and communications publications.

**Coral Reefs and Other Marine Resources.** Between 1997 and 2000, the United States supported the protection of coral reefs and other marine resources through the creation of marine sanctuaries, the introduction of sustainable fishing practices and coastal zone management, and research on coral reef habitats and climate risks in the amount of \$13.7 million (see Appendix C). For example, community-based marine sanctuaries in the

Philippines and South Pacific have proven to be effective in conserving coral reef ecosystems, as well as increasing fish biomass and production. Efforts have been underway to reproduce these successful conservation areas in Indonesia under USAID's ICM project in North Sulawesi. These community-based marine sanctuaries are small areas of subtidal marine environment, primarily coral reef habitat, where all extractive and destructive activities are permanently prohibited. They were developed with the widespread support and participation of the local community and government, were established by formal village ordinance, and are managed by community groups.

USAID has implemented a number of programs involving site preservation for marine-protected areas. For instance, it provided support for the implementation of a new Galapagos Special Law to establish a marine park and has begun funding a Bering Sea Marine Ecoregion Conservation program.

In related efforts, the MacArthur Foundation provided \$105,000 between 1998 and 2000 to establish a coral reef monitoring program with the Hong Kong University of Science and Technology. This project will provide important information to international conservation efforts about the health of coral reefs and risks to their survival.

### **Other Vulnerability Assessments**

U.S. funding between 1997 and 2000 on vulnerability assessments and studies associated with adaptation to the impacts of climate change amounted to approximately \$10.2 million (see Appendix C). Much of this funding went toward the U.S. Country Studies Program (CSP) to help developing countries assess their unique vulnerabilities to long- and short-term climate impacts, their adaptation options for addressing those risks, and their contributions to global greenhouse gas emissions. Since its inception, the CSP has helped 56 countries build the human and institutional capacities necessary to assess their vulnerability to climate change.

NOAA has focused on reducing the vulnerability of coastal populations to hazardous weather. Since 1997, it has developed a community-based vulnerability assessment methodology to aid local hazard mitigation planning and has begun working with the Organization of American States to provide training on vulnerability assessment to Caribbean countries.

### **Other Global Climate Change Activities**

To account for those activities that did not easily fit within the mitigation and adaptation categories provided by the guidance for Appendix C of this chapter, two additional categories were created: UNFCCC participation and crosscutting activities. Both categories are relevant to implementation of the UNFCCC. Between 1997 and 2000, the United States spent approximately \$323.8 million on "other global climate change activities."

#### *UNFCCC Participation*

The United States spent approximately \$25.4 million between 1997 and

2000 to promote meaningful participation in the UNFCCC process by developing and transition economies (see Appendix C). USAID alone implemented over 70 capacity-building activities designed to strengthen participation in the Convention in 1999. This included promoting efforts to integrate climate change into national development strategies; establishing emission inventories; developing national climate change action plans; promoting procedures for receiving, evaluating, and approving joint implementation proposals; and establishing baselines for linking greenhouse gas emissions to economic growth.

For example, through its Climate Change Center in Ukraine, established in 1999, USAID provided support to the Ukrainian government to establish national administrative structures, develop a national climate change inventory program, and prepare investment projects. USAID assistance in Mexico supported the national government's establishment of an Interagency Commission on Global Climate Change. In connection with those

efforts, the Mexican Congress considered a global climate change bill outlining how Mexico could integrate climate change considerations into national strategic, energy, and sustainable development goals.

#### *Crosscutting Activities*

The United States spent over \$298.4 million on crosscutting climate change activities in developing and transition economies from 1997 to 2000 (Figure 7-5). Many of these activities have simultaneously addressed climate change mitigation and/or adaptation issues. For example, the Rockefeller Foundation awarded the Pacific Environment and Resources Center a \$300,000 grant in 2000 to address threats to critical marine and forest ecosystems in the Russian Far East. Similarly, many USAID activities contributed to mitigation of, and adaptation to, climate change.