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DEVELOPMENT

To: Todd Stern, Staff Secretary

From: Martha Wofford ^{mw}
U.S. Agency for International Development (USAID)

Subject: USAID Climate Change Initiative

As requested, enclosed are copies of the draft USAID Climate Change Action Plan which was released on October 6th, and the revised version of the Action Plan (now referred to as the "Climate Change Initiative") which will be prepared in time for release at the Third Conference of the Parties to the Framework Convention on Climate Change. No decision has been reached as to whether an actual release in Kyoto would be desirable; your input is requested. Please be aware that the enclosed revised version still needs to receive light editing and proofreading before being sent for design and layout Monday.

As you are aware, the President launched the USAID Climate Change Initiative during his June 1997 remarks in New York to the United Nations General Assembly Special Session. In addition to including a letter signed by the President, we would like to refer to the Initiative as "fulfilling the President's commitment" on the cover of the document, and would seek your clearance to do so.

If you need any additional information, please do not hesitate to call me [(202)647-0307] or Carla Koppell [(202)712-41697901].

Climate Change Initiative

December 1997

Letter from the President and Vice President of the United States of America

Climate change poses a series problem for developed and developing nations alike. The United States is committed to taking responsible action to confront this threat. We will support international agreements that establish realistic commitments and that require participation by all countries. We support flexible, market-based policies based upon a simple common sense principle: vigorous economic growth and environmental protection can go hand in hand. We support broad global cooperation with all nations actively engaged to reduce the climate change threat.

In June of this year at the United Nations General Assembly Special Session on Environment, the United States announced its intent to provide \$1 billion in assistance to developing nations and countries with economies in transition to reduce the threat of climate change. The U.S. Agency for International Development's Climate Change Initiative begins to define the approach the United States will use in providing this assistance. The initiative outlines a framework for encouraging the transfer of environmentally-sound technology that will not only help developing nations mitigate climate change but will provide tremendous opportunity for U.S. firms to do business abroad.

We offer this initiative as further demonstration of our commitment to working in partnership with the global community to reduce the threat of climate change. America's best interests demand that we do so.

President William J. Clinton

Vice President Albert Gore

Foreword

Coping with climate change is an issue that cuts across science, politics, public policy, economics, finance and health. It will necessitate a partnership among all nations. In democracies such as ours, wrestling with these issues is particularly complex. Americans have grown used to a vigorous economy as we demand a clean environment and a positive outlook for the future. Addressing climate change will require international innovation and collaboration. It will require that nations focus on developing global solutions today in order to avoid the costs of inaction tomorrow. While reaching global agreement on climate change will be a major challenge, USAID looks forward to working in partnership with the global community to take on a public policy issue that simply cannot be ignored.

Current levels of carbon dioxide are the highest in 200,000 years and will soon reach double the concentrations of the pre-industrial age. If this trend continues, scientists expect that global temperatures will rise by 1 to 3.5 degrees centigrade over the next century. Among the effects of this rise in temperature, sea levels could rise one-and-a-half feet, putting 100 million people around the world at risk from flooding and storm surges. Coastal areas and island nations could be devastated. Incidents of malaria, dengue fever and other diseases could rise dramatically. Crop yields and forest productivity could decline causing considerable social and political dislocation.

Mark Twain once observed that "everyone talks about the weather, but nobody does anything about it." That is no longer the case. Collectively, we are changing the weather. As President Clinton noted at the United Nations in June 1997, the science on climate change is clear and compelling. Two thousand eminent scientists serving on the Intergovernmental Panel on Climate Change concluded in 1995 that human activity is having a "discernible impact on global climate."

The potential to work with developing nations to reduce the threat of climate change is as great as the implications of climate change for those countries. Developing countries and the poorest members of their societies are most at risk, and will be the least able to cope with change. At the same time, greenhouse gas emissions from those developing nations are rising most rapidly. Critical in promoting long-term sustainable development will be a comprehensive program to combat the threat of climate change. The U.S. Agency for International Development presents this Climate Change Initiative as part of the Clinton Administration's efforts to help mitigate global climate change.

J. Brian Atwood
Administrator
U.S. Agency for International Development

Acronyms

AC/SI	Activity Code/Special Interest
AEC	Ahmedabad Electric Company
AMC	Ahmedabad Municipal Corporation
ANE	Asia and Near East
ASEI	Asia Sustainable Energy Initiative
BNC	Binational Commission
CAR	Central Asian Republics
CARPE	Central Africa Regional Program for the Environment
CEFDHAC	Conference on the Ecosystems of Dense, Humid Forests in Central Africa
CGIAR	Consultative Group on International Agricultural Research
CFC	Chlorofluorocarbon
CIFOR	Center for International Forestry
CONCAUSA	Declaracion Conjunta Centroamerica-USA
CONAE	Mexican Natural Commission for Energy Savings
CSP	U.S. Country Studies Program
CTI	Climate Technology Initiative
DAC	Development Assistance Committee
DSM	Demand-Side Management
DOE	United States Department of Energy
EBRD	European Bank for Reconstruction and Development
EPA	United States Environmental Protection Agency
ENI	Europe and New Independent States
ESCO	Energy Service Company
EU	European Union
FAO	United Nations Food and Agriculture Organization
FCCC	United Nations Framework Convention on Climate Change
G-7	Group of Seven
GDP	Gross Domestic Product
G\ENV	Global Bureau Center for Environment
GEF	Global Environment Facility
GEP	Greenhouse Gas Pollution Prevention Project
GIS	Geographic Information System
GOI	Government of Indonesia
GOM	Government of Mexico
GOP	Government of the Philippines
GOU	Government of Ukraine
HVAC	Heating, Ventilation, and Air-Conditioning Systems
ICM	Integrated Coastal Management
ICRAF	International Center for Research in Agroforestry
ICCP	Interagency Climate Change Program
IEA	International Energy Agency
IFC	International Finance Corporation
IGAD	Intergovernmental Authority on Development
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
JI	Joint Implementation
Km	Kilometer
LAC	Latin America and Caribbean
LGPP	Local Government Partnership Program

MDBs	Multilateral Development Banks
MEPNS	Minister of Environmental Protection and Nuclear Safety
NOAA	National Oceanic and Atmospheric Administration
OECD	Organization for Economic Cooperation and Development
OPIC	Overseas Private Investment Corporation
PDOE	Philippines Department of Energy
PPC	Program and Policy Coordination
PPG-7	G-7 Pilot Program to Conserve the Brazilian Amazon
RIH	Reduced-impact Harvesting
SADC	Southern Africa Development Cooperation
SCI	Sustainable Cities Initiative
TFF	Tropical Forestry Foundation
U.N.	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
USEA	United States Energy Association
USIJI	United States Initiative on Joint Implementation
U.S.	United States
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WEC	World Energy Council
WRI	World Resources Institute
WWF	World Wildlife Fund

Introduction

Global climate change poses profound threats to international economic development and ecological balance. If greenhouse gas emissions continue to grow unabated, all sectors of the global economy, all realms of the natural environment and all countries of the world will be affected. The greatest costs, however, will be felt by developing and transition countries, the countries least able to cope with crisis and adapt to change.

As the foreign assistance arm of the U.S. Government, the U.S. Agency for International Development (USAID) advances U.S. national interests by working in collaboration with developing nations to promote sustainable development and provide humanitarian relief. Helping developing and transition countries balance economic growth with environmentally sustainable development protects the global environment and serves the United States' national interest.

For many years USAID has implemented environmental programs that, though targeted on other goals (eg. energy efficiency, forestry and biodiversity conservation), have had a direct impact on greenhouse gas emissions. USAID also has supported efforts that implicitly help decrease the threat climate change poses by reducing population growth, promoting economic development, and improving human health and nutrition.

In 1990 when the Agency published its report, "Greenhouse Gas Emissions in Developing Countries: The USAID Response," USAID began explicitly to address the threat of climate change. Since then, the Agency has actively managed a portfolio of climate change-related programs focused on decreasing emissions from the energy sector and increasing carbon sequestration in forests. USAID progress in this regard was documented in a report to Congress in 1994, "Global Climate Change: The USAID Response," which outlined the portfolio of climate change-related programs and reviewed the Agency strategy.

Speaking at the United Nations in June of this year, President Clinton announced that the U.S. would provide at least \$1 billion dollars over the next five years to collaborate with developing nations and countries in transition reduce the threat of climate change. That announcement signaled a renewed U.S. Government commitment to facilitate technology transfer and collaborate with developing and transition countries to achieve the goals of the Framework Convention on Climate Change (FCCC).

USAID has been given the lead on behalf of the Federal Government in implementing the President's Initiative. This Climate Change Action Plan focuses on how USAID will make the President's commitment a. USAID will promote sustainable development that minimizes the associated growth in greenhouse gas emissions and reduces vulnerability to climate change. The Agency will focus on activities that are "win-win" — simultaneously promote sustainable development and combat climate change. Using the Climate Change Action Plan as a starting point, USAID will strive to integrate fully climate change-related concerns into its range of programs in order to ensure an awareness of how development may affect and be affected by climate change, and foster recognition that reducing the climate change threat will be centrally important to successfully promoting sustainable development.

The President's Initiative includes three components: a minimum \$750 million in grant assistance over the next five years, up to \$250 million in "climate-friendly" investment stimulated through the use of credit instruments, and a \$25 million inter-agency climate change program. This Action Plan outlines a strategy for the first two components. It was developed in a highly participatory process that involved technical and geographic experts from throughout the Agency, Federal Government,

and private and non-governmental sectors. The first section summarizes the state of knowledge regarding climate change and its likely impact on developing and transition countries. The second section discusses the relationships between global climate change and sustainable development, and outlines the major issues posed by these relationships. It is followed by a description of the approach USAID will use to implement the President's commitment. For USAID, the Action Plan is a starting point. It provides a framework for moving forward, identifies priorities and highlights a few planned programs. Elucidation of the broader range of specific programs and activities will follow.

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Executive Summary

Global climate change poses profound threats to international economic development and ecological balance. The greatest costs will be borne by poor nations least able to cope with crisis and adapt to change.

Speaking at the United Nations (U.N.) General Assembly Special Session on Environment on June 27, 1997, President Clinton announced that the U.S. would provide \$1 billion over the next five years to collaborate with developing nations and countries in transition reduce the threat of climate change. That announcement signaled the United States' renewed commitment to facilitate technology transfer and help developing and transition countries to meet the spirit and obligations of the United Nations Framework Convention on Climate Change (FCCC). The Initiative announced by President Clinton includes three components: a minimum \$750 million in grant assistance over the next five years, up to \$250 million in "climate-friendly" investment stimulated through the use of credit instruments, and a \$25 million inter-agency climate change program. This Action Plan focuses on how USAID will work to make the President's commitment a reality.

Climate Change and Developing Nations

Changes in the climate will affect all sectors of the global economy and all realms of the natural environment. The impact will vary from country to country and region to region; different sections of nations will be affected differently and at different times. It is expected that the impacts of climate change will, however, be felt most by many of the countries that are least responsible for the problem. Developing nations and transition countries will face the greatest risks for a variety of reasons, including the fact that many of these nations are low-lying or island states, have limited water resources, have economies that are highly dependent upon natural resources and agriculture, or have limited capacity to adapt and cope with change.

At the same time that developing nations are most vulnerable to climate change, their contribution to emissions is growing. While annual emissions from industrialized countries represent over half of global greenhouse gas emissions, the growth in emissions from developing nations is accelerating. If current growth trends continue, developing countries will account for almost half of annual emissions from industrial sources in 2035.

Strategies for addressing climate change must strive to reconcile social and economic aspirations with the need to address local and global environmental threats. At the same time, efforts to promote development need to incorporate programs to help nations decrease vulnerability to the threats climate change poses.

Climate change will almost certainly increase the need for international collaboration and humanitarian relief around the world. The challenge will be to ensure that efforts to mitigate and adapt to climate change are not overwhelmed by the demands for emergency relief. As more and more resources are expended to deal with the human costs of climate change, the ability of societies and the international community to address root causes of emissions and foster long-term adaptation may be compromised.

The Role of USAID and the Objectives of the Climate Change Action Plan

As the development assistance arm of the U.S. Government, USAID has a critical role to play in working with developing nations to reduce the rate of growth in emissions of greenhouse gases and decrease the threat climate change poses to sustainable development. This Climate Change Action Plan outlines the strategy USAID will use to address comprehensively the climate change

threat.

The underlying principle of the action plan is that efforts to reduce greenhouse gas emissions and vulnerability to climate change will be critical if USAID is to promote development that is sustainable. In the long-term, economic development will be enhanced, not compromised, by efforts to reduce greenhouse gas emissions. In the immediate term, there is a vast array of activities that can promote economic development, reduce the rate of growth in greenhouse gas emissions and decrease vulnerability to climate change.

Using the Climate Change Action Plan as a starting point, USAID will promote sustainable development that minimizes the associated growth in greenhouse gas emissions and vulnerability to climate change. The Agency will undertake activities that are "win-win" — simultaneously promote sustainable development and combat climate change. USAID will examine its full range of programs to see how efforts to promote development may affect and be affected by climate change. By applying a climate change "filter" when developing and implementing programs, USAID hopes to be able to better promote development that is truly sustainable.

While the dedication of \$1 billion is significant, USAID recognizes that those resources are far less than what will be required to eliminate the climate change threat. The Agency therefore will focus on leveraging and fostering the involvement of other bilateral and multilateral donors, international financiers, the public and private sectors and non-governmental organizations. USAID will strive to serve as an effective catalyst. The Agency's success partly will be measured by the extent to which others engage actively.

An Overview of the Action Plan

USAID will concentrate resources and attention on a set of countries and regions selected because of their contribution (and predicted future contribution) to net global greenhouse gas emissions and/or their governments' receptivity to taking concrete action. Nine countries and three regions will receive priority: Brazil, Central Africa (Cameroon, the Central African Republic, the Republic of Congo, the Democratic Republic of Congo, Equatorial Guinea and Gabon), Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama), Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan), India, Indonesia, Mexico, Philippines, Poland, Russia, South Africa and Ukraine. Although China is another large emitter of greenhouse gases, USAID does not operate in China.

All of the USAID "key" countries and regions will maintain a significant portfolio of climate change-related activities for the duration of the Initiative.

The Action Plan specifies three areas of emphasis:

- Decreasing the rate of growth in net greenhouse gas emissions by decreasing greenhouse gas sources and maintaining or increasing greenhouse gas sinks
- Increasing developing and transition country success in achieving the goals of the United Nations' Framework Convention on Climate Change (FCCC)
- Decreasing developing and transitional country vulnerability to the threats posed by climate change

1. Decreasing the rate of growth in net emissions

In the energy sector, USAID will focus on activities that result in the following improvements in the energy sector:

- Substitution of less carbon emitting fuel sources
- Use of non-fossil renewable energy sources
- Increased efficiency in power generation, transmission and distribution
- Increased end-use energy efficiency
- Decreased use or increased combustion efficiency of
- Substitution of less carbon-emitting fuels in transportation
- Reduced market barriers to and increased incentives for less carbon-intense energy use

In the land use sector, USAID will pursue activities that either increase the storage of carbon in ecosystems or land use systems (act as carbon “sinks”), or decrease the release of carbon stored in biomass due to human activities, including the following:

- The preservation, re-establishment or more sustainable management and use of forests, trees and denuded lands
- The maintenance and preservation of wetlands and mangroves
- Decreased burning of savanna, rangeland, forest and brushland
- Increased agricultural productivity to stabilize the agricultural frontier
- Increased soil organic matter and decreased soil erosion
- Increased use of biofuels
- Improved animal husbandry

In urban areas and industry, USAID will complement efforts to reduce emissions that result from energy supply and use with programs that result in:

- Increased capture of methane from urban sewage and solid waste
- Increased industrial and municipal adoption of environmental management systems
- The creation of regulatory frameworks and credit mechanisms to facilitate environmental investments
- Increased industrial and municipal investments in clean technologies
- More environmentally sound infrastructure
- More environmentally sound urban transportation systems

2. Increasing developing and transition country success in achieving the goals of the FCCC

Participation in the negotiation and implementation of the terms and spirit of the FCCC will be fundamental to finding a global solution to climate change. The U.S. Country Studies Program and the U.S. Initiative on Joint Implementation (JI), two inter-agency U.S. government climate change programs, are important vehicles for collaborating with developing nations. Working with these programs USAID will seek to enhance further developing country capacity to achieve the goals of the FCCC through:

- Creation of national emissions inventories, baselines and budgets, national action plans and national communications
- Enhanced capacity to track, monitor, report and verify greenhouse gas emissions
- Enhanced capacity to monitor and project vulnerability to climate change
- Agreements to cooperate in facilitating public-private partnership that transfer environmentally sound technology that mitigates climate change
- Acceptance of greater developing country commitments under the FCCC
- Stimulation of JI projects and participation in JI regimes
- Establishment of legislative, regulatory and market structures, and local capacity to participate in emissions trading regimes
- Integration of climate change concerns into national sustainable development strategies

3. Decreasing vulnerability to the threats posed by climate change

Given its broad experience in development, USAID is uniquely positioned to help increase the capacity of developing countries and countries in transition to adapt to change and cope with the predicted impacts of climate change. Programs that have the following results will be an integral part of the Agency's Climate Action Plan:

- Increased preparedness for natural disasters
- Increased adaptability and efficiency of agricultural systems, municipal management, water resources management and public health systems
- Improved domestic and international capacities for conflict-resolution regarding shared resources, such as water

To achieve the results outlined above USAID will use a range of tools and approaches, including policy reform, institutional capacity building, education and outreach, and information collection and dissemination. USAID also will place particular emphasis on four additional tools: technology cooperation; partnerships with the private sector; collaboration and coordination with other bilateral and multilateral donors; and the use of loans and loan guarantees to foster private trade and investment in environmentally sound technologies and projects that mitigate climate change.

USAID will have a wide range of public, private and non-government partners in implementing the Action Plan. Collaborators will include other agencies and departments of the U.S. Government, multilateral development banks, other multilateral and bilateral donors, beneficiary nations, and public, private and non-governmental organizations throughout the world.

Through the Action Plan, several new areas of emphasis including the following will be highlighted:

- USAID will quantify the health and productivity costs associated with local air pollution that fossil fuel combustion generates in an effort to expand the definition of "win-win" efforts to decrease greenhouse gas emissions.
- USAID will undertake an analysis of the specific regional and local vulnerabilities climate change poses. This study will be used to identify "hot spots," areas of particular vulnerability that USAID needs to address.
- USAID will facilitate private sector transfer of clean energy technology to key countries and regions; a first step in this direction is the promulgation of model "Global Climate Change Technology Cooperation Agreements" with key countries.
- USAID will focus on reducing the vulnerability of urban populations, property and infrastructure to the threats posed by climate change.
- USAID will enhance environmental education and outreach to involve non-governmental organizations, the private sector and governments in efforts to promote development while reducing the rate of growth in net greenhouse gas emissions.
- USAID will work with the donor community to more effectively promote development that minimizes the growth in greenhouse gas emissions.

The private sector will be a key strategic partner in the Agency's Action Plan. While the commitment of \$1 billion over five years is significant for the U.S. government, it will not be sufficient to make an appreciable difference on climate issues in developing and transition

countries. It will be critical to engage the far greater resources—human, technological and financial—of the business community.

USAID activities related to global climate change already involve collaboration and close partnership with a variety of actors, including multilateral and bilateral donors, international organizations, and other agencies and departments of the U.S. Government. USAID will have dual goals in intensifying coordination on climate change issues, multiplying the impact of its programs by joining forces with other U.S. government agencies, donor nations and the private sector, and increasing the pace and durability of policy reforms in partner nations.

USAID Action Plan Management

USAID programs are designed and implemented in collaboration with developing nations to target local priorities and develop locally-appropriate solutions. The Climate Change Action Plan provides a framework and a set of priorities based upon which activities will be designed and implemented. Programs under the Action Plan will combine an emphasis on meeting local needs with a greater focus on the global goals and objectives described in the action plan. Activities will be developed in partnership with beneficiaries to address local priorities while combating the rate of growth in net emissions of greenhouse gases.

USAID will form a Climate Change Committee to make proposals and decisions over issues of policy related to implementation of the USAID Climate Change Action Plan. The Committee will include representatives from each bureau within USAID. An Agency-wide Climate Change Team will continue to serve as the locus for information sharing on programming, current events, results reporting and USAID collaboration with other Agencies and development partners.

Consistent with its role as Agency technical representative on climate change, the USAID Global Bureau Center for Environment will continue to facilitate the Climate Change Team, and serve as USAID representative to all inter-agency climate change programs. The USAID Policy and Program Coordination Bureau will continue to oversee the consistent application of USAID policy on climate change Agency-wide, ensure that climate change receives a high level of attention on the Agency's development partnering agenda, and facilitate the involvement of other USAID actors in this area. The USAID Management Bureau will ensure that obligations are commensurate with fulfilling the President's commitment.

Budget

The obligation of resources under the USAID Climate Change Action Plan will be focused on mitigating net greenhouse gas emissions, and fostering developing and transition country success in achieving the goals of the FCCC. USAID obligations as part of the Initiative will include at least \$750 million in grant assistance over the next five years, and the use of credit tools to leverage at least \$250 million in additional climate change-related trade and investment. A minimum of \$150 million per year will be obligated by the Agency for climate change-related activities in each of the next five years. Of the total \$750 million in climate change-related grant assistance, at least forty percent will be obligated to programs in the Agency's key climate change countries and regions. A significant additional percentage will be obligated to the Agency's program in Egypt. Climate change-related programs in other USAID-assisted countries will comprise the remainder of obligations as part of the action plan. Assuming Congressional approval for the use of credit, at least two thirds of the investment USAID stimulates through the use of credit instruments as part of the action plan will also be focused on USAID key climate change countries and regions.

Monitoring and Measuring Results

Monitoring and measuring the results achieved will be among the Agency's highest priorities. Under

the Action Plan a concerted effort will be made to measure the impact of programs, assess the most effective strategies for combating the threat of climate change, and hone and focus the Agency's approach. An Agency Special Objective for climate is being established, and will be used to track programs and obligations. By April 1998, USAID will develop its climate change performance monitoring plan. Reporting will begin at the end of FY 1998.

Organization of the Report

The first section of this Action Plan summarizes the state of knowledge regarding climate change, its underlying causes and likely impact on developing and transition countries. It identifies population growth, economic development, urbanization and technology as contributors to growing net greenhouse gas emissions, and reviews the predicted impact of a warmer world on human health, freshwater resources, biodiversity, coastal zones, infrastructure and political systems. The second section discusses the relationships between global climate change and development assistance. The third section describes the Agency's strategy to combat the threat of climate change and the approach USAID will use to implement the President's commitment. The final chapter outlines USAID's proposed management plan for the Action Plan.

What We Know About Climate Change

The Science

Global warming, the primary result of climate change, is caused by an increase in the concentration of greenhouse gases in the atmosphere. As emissions of greenhouse gases rise, so do the concentrations in the atmosphere; it is this increase in the concentration of greenhouse gases that can lead to an enhanced greenhouse effect. The primary greenhouse gases are carbon dioxide, methane, nitrous oxide, ozone and chlorofluorocarbons.

Atmospheric concentrations of carbon dioxide, the most predominant greenhouse gas, have increased 30 percent from 280 to 360 parts per million since 1860. Over the same period, average global temperature has risen by one degree centigrade. The current rate of increase in carbon dioxide is 1.8 parts per million or 0.5 percent per year and is accelerating. In 1995, the Intergovernmental Panel on Climate Change (IPCC) found that the "pattern of global warming is unlikely to be entirely natural in origin," and "the balance of evidence suggests a discernible human influence on global climate."

With a future doubling of carbon dioxide concentrations in the atmosphere—perhaps the most optimistic of the realistic scenarios for the next century— average global temperature will rise by 1.5 to 3.5 degrees centigrade by 2100, exceeding observed climatic variation over the past 10,000 years. In general, the increase will be greater in areas closer to the earth's poles and lesser toward the equator, but considerable regional variation in temperature will even impact areas at the same latitude. Changes will affect not only ambient temperatures for people, plants and animals, but also the degree and timing of climatic extremes, the length of growing seasons and soil moisture.

Along with the increase in global temperature, the earth's precipitation regimes also will be affected. In general, it is expected that the additional energy in the atmosphere will accelerate the hydrologic cycle, increasing average precipitation. This will, in turn, increase the danger of floods and high winds. Changes are expected to occur in the seasonal pattern and variability of precipitation as well. Increased total precipitation may not always mean a wetter environment; in many regions, the net result will be drying because evaporation will more than compensate for increased precipitation. Again, regional differences in impacts will be considerable; some regions may be much warmer and dryer, while others may be wetter and cooler. In drier regions, and even in regions with no change in annual rainfall level, but with changes in distribution and variation of precipitation, food production may be reduced, and the risk of fire and atmospheric pollution such as smoke, may increase.

Although the scientific evidence is not conclusive, there is concern that extreme climatic events—such as tropical cyclones, tornadoes and El Niño effects— may become more frequent and more severe because of climate change. Changes may occur in storm tracks, exposing different areas to the impacts and risks associated with severe storms. It is expected that regional climate will become more variable and less predictable.

As a result of global warming, the earth's sea level is expected to rise by about 50 centimeters by the year 2100. Combined with storm surges and tides, especially if storms are more frequent or more severe, this could mean episodic incursions of seawater into coastal and freshwater areas, and significant erosion.

The Causes of Emissions Growth

Greenhouse gas emissions—like many other forms of pollution— are the result of four inter-related factors: population, economic activity, urbanization and technology.

Population Growth. Population growth is one of the most profound drivers in the rapid expansion of greenhouse gas emissions. The United Nations projects that in the next half century, world population — currently at 5.9 billion people — will increase by between 1.8 and 4.7 billion people. Over 95 percent of that growth will take place in the developing world. By the end of the next century, population growth could account for almost one-half of the growth in carbon dioxide emissions from developing countries as the demand for energy and other services grows. The increase in population will place further pressure on natural resources (which are critical to the carbon cycle), and divert scarce investment capacity from other sectors. A recent study found that stabilizing world population sooner would significantly reduce the growth in emissions.

Economic Growth. Economic growth is another underlying cause of increased emissions of greenhouse gases. Economic growth and development fuel industrialization; provide the financial resources to deliver services, such as energy; and provide the private sector and citizens with the income to increase the demand for energy and other resources. If current economic growth rates in developing and transition countries continue without a significant change in technology or approach to development, by 2035 nearly half of all emissions will come from developing countries. The World Energy Council's analysis linking economic growth to greenhouse gas emissions predicted that robust economic growth in developing and transition countries could result in a 93 percent increase in greenhouse gas emissions by 2020.

While economic growth fuels emissions growth, it also is critical in building the adaptive capacity of nations and ultimately helps curb population growth. With economic development comes increased human and institutional skills, an ability to absorb and manage crises, and a larger pool of financial resources to devote to longer-term challenges and needs. Economic growth also brings with it a decrease in birth rates. The key is to promote less carbon-intensive economic growth and development that minimizes the associated emissions while equipping nations to manage change.

Urbanization. The accelerating growth in carbon emissions corresponds, in large part, to rapid urbanization. According to USAID projections, 60 percent of the world's total population of seven billion people in the year 2025 will be concentrated in urban areas. It is estimated that 150,000 people are added to urban populations in developing and transition countries every day. Given the size of current urban populations in these countries, high rates of urbanization mean exponential increases in emissions from major urban sources— transportation, buildings, industry and landfills. In most cities the transport sector is the single largest source of urban carbon dioxide emissions.

Urbanization also contributes to the destruction of land-based carbon sinks. The link is both direct, when forests and agricultural lands are cleared and wetlands drained to make way for urban settlements, and indirect, when markets are created for timber and other products. Furthermore, urban areas are concentrated sources of other pollutants that facilitate the destruction of carbon sinks in urban and non-urban areas. Sulfur dioxide emissions, for example, contribute to acid rain which stresses forest ecosystems, reducing rates of carbon sequestration.

Technology. The growth in atmospheric concentrations of carbon dioxide is tied directly to the emergence in the 1800s of a carbon-based industrial economy. The use of coal, oil and gas for power generation and transportation has fueled increased standards of living over the last two hundred years. But continued reliance on high carbon-emitting technologies in a rapidly expanding global economy will almost certainly contribute to a more than doubling of atmospheric carbon dioxide concentrations in the next century. The application of new technologies and practices

offers the prospect for continued economic growth with a reduced climate penalty. These include a range of already proven commercial renewable energy technologies (eg. solar, wind, geothermal, mini- and micro- hydropower and biomass); less carbon-intensive fossil fuels such as natural gas; more energy efficient end-use applications (eg. appliances and building materials); cleaner industrial technologies; and new energy technologies, such as fuel cells.

Greenhouse Gas Sources and Sinks

Carbon is cycled between various reservoirs— atmosphere, oceans, land biota, marine biota, sediments and rocks. The largest natural fluxes occur between the atmosphere and the surface of the oceans, the largest carbon dioxide sink. Human-induced emissions of carbon dioxide into the atmosphere currently average over seven gigatons per year. Fossil fuel combustion currently contributes five gigatons per year while deforestation contributes two gigatons per year. While these anthropogenic levels are much smaller than total emissions, they are large enough to modify the natural balance. As annual inputs from deforestation and combustion grow, the impact on average global temperature will be greater than the 1 degree increase that has been observed over the past 100 years.

Industrialized nations currently contribute approximately 53 percent of net emissions of carbon dioxide

Countries in transition contribute 18 percent. Developing nations contribute 29 percent. Industrialized countries produce five tons per capita while developing nations

Top Emitters of Carbon Dioxide from fossil fuel combustion and cement manufacture (1995 emissions in millions of metric tons of carbon)

	Rank	Country	Emissions
1	USA	1498	
2	China	879	
3	Russia	497	
4	Japan	309	
5	India	250	
6	Germany	227	
7	UK	149	
8	Ukraine	120	
9	Canada	119	
10	Italy	112	
11	South Korea	102	
12	Mexico	98	
13	France	93	
14	Poland	93	
15	South Africa	84	
16	Indonesia	81	
17	Australia	79	
18	Iran	72	
19	North Korea	70	
20	Saudi Arabia	69	

produce between 0.2 and 0.6 tons per capita. Despite the current disparity, the growth in emissions from developing nations is accelerating. The current rate of increase in carbon dioxide

emissions from developing nations is approximately six percent per year. If current growth trends continue, developing nations will account for half of annual greenhouse gas by 2035; China and India, both coal-rich developing economies, will be responsible for a large share of the growth.

Energy. Combustion of fossil fuels accounts for 76 percent of the world's energy use and 70 percent of the annual anthropogenic emissions of carbon dioxide. Hydro, nuclear and biomass power account for the remaining 24 percent of energy supplies and to varying extents, their use can have negative impacts on sensitive ecosystems as well.

According to World Energy Council estimates, developing countries will require additional power generation over the next 20 years of more than twice the current installed capacity in the U.S. Much of this capacity will come in the form of coal-fired power, the use of which has grown dramatically as a result of economic growth. Between 1980 and 1992, coal combustion more than doubled, and is expected to double yet again by the year 2000. Increased demand for motor vehicles will compound the problem. The transportation sector currently accounts for approximately 25 percent of global greenhouse gas emissions, second only to the industrial sector. As the number of motor vehicles balloons from 600 million today to 1 billion by 2015, related greenhouse gas emissions will rise. The largest increase will take place in developing nations.

Inefficiencies in the generation, transmission and use of energy, especially electricity, add to developing and transition countries' emissions of greenhouse gases without any economic payback. Developing country economies currently require 40 percent more energy than developed nations to produce the same value of goods and services. For example, in developing nations the production of steel and ammonia fertilizer often requires twice as much energy per unit of output; pulp and paper production often requires three times as much. Similarly, power plants in the developing world use an average of 15 to 30 percent more fuel per unit of electricity than efficiently operated plants in developed countries, and an estimated 20 percent of electric generation is often lost during transmission (Sanghvi, 1991; Schramm, 1993). Compounding the problem, state-owned utility monopolies and subsidized energy prices create little incentive to replace inefficient equipment and thus discourage conservation.

Though energy production and use result in greenhouse gas emissions, the provision of sufficient energy services is critical for economic growth and development. Insufficient access to energy remains a critical constraint to development. An estimated 1.5 to 2 billion people currently lack access to electricity and two billion cook using fuelwood and animal wastes. Some experts have estimated that the economic losses associated with power shortages in developing and transition countries are as high as one to two percent of their income (UNDP, 1997). In addition, the absence of reliable energy supplies has negative implications for health, the environment, job creation, food availability and clean water.

Forestry. Forests serve as a major store of carbon and thus play an important role in the planet's carbon cycle. As they grow, forests withdraw carbon dioxide from the atmosphere and store it in trees and soil, acting as large "sinks" for carbon. Forests cover about 28 percent of the earth's land area. Other wooded land, such as forest fallow and shrubland, cover another approximate 13 percent (WRI, 1992). Forests contain 80 percent of all the carbon stored in vegetation and 40 percent of the carbon in soils (WWF, 1996). The destruction of forests is a primary source of carbon emissions. Scientists estimate that 1.6 ± 1.0 billion tons of carbon are released into the atmosphere every year from deforestation and land use changes, which represents up to 20 percent of the net annual increase in atmospheric carbon dioxide, making deforestation a direct source of carbon second only to fossil fuels. Conversion of tropical forests to agricultural land is a major source of these emissions. Rising demand for fuelwood in many countries also has led to

deforestation in areas adjacent to cities. Once gone, forested land often converts to marginal agricultural production or urban land uses, and the carbon sequestration value is lost.

Since 1950, the great majority of emissions due to deforestation have been from tropical countries where forests are rapidly being cleared and degraded. When forests are destroyed, carbon stored in trees and soils is oxidized and released into the atmosphere—either slowly through the decay of organic matter or very quickly through fires. Recent studies confirm that the greatest contribution to emissions is the clearing and burning of up to 10 million hectares of forest per year by 200 to 500 million slash-and-burn farmers. Exacerbating the problem are often fiscal and trade policies and related market factors (i.e. high interest rates and trade barriers) which can create incentives to clear forests unsustainably. Unclear or conflicting land tenure, land use and environmental policies also foster unsustainable exploitation and settlement as well as conflicts between local users and larger industrial interests.

The immediate threat to tropical forests from deforestation and direct human impacts is considered higher than global warming's potential impacts on forests. Nevertheless, scientists predict that climate changes associated with carbon dioxide concentrations above 700 parts per million would alter at least one third of the vegetation, structure and function of the Earth's forests; degradation of watersheds and other indirect forces may then amplify such changes. Particularly vulnerable are northern boreal forests in Siberia, Canada and Europe. If the atmospheric carbon dioxide level doubled, models predict these forests could suffer a 30 to 50 percent increase in fires, with an additional seven to 12 million hectares burning annually in Siberia alone.

Agriculture and Animal Husbandry. The agriculture sector (crops, fertilizer, irrigation and livestock) accounts for one-fifth of human-induced greenhouse gas emissions. Most of this is due to methane and nitrous oxide; agriculture produces respectively, 50 percent and 70 percent of anthropogenic emissions (IPCC, 1995). Emissions are caused by the: clearing of forests, woody ecosystems or wetlands for agriculture; disturbing of soil for land preparation; poor application of petroleum-based agro-chemicals such as herbicides, pesticides and fertilizers; and the transportation and processing that support the sector. Emissions from the agriculture sector could be significantly reduced by promoting the use of biofuels, increasing agricultural and livestock productivity, utilizing new technologies to reduce methane emissions from livestock and paddy rice cultivation, and reducing and optimizing chemical use. Emissions also could be reduced by replacing slash-and-burn cultivation with more sustainable agriculture.

As the agriculture sector in developing countries advances, it also will have the potential to increase carbon sequestration. The IPCC has found that the potential for carbon sequestration in agriculture is between 700 and 2100 metric tons of carbon (including soils and biomass). Several agricultural techniques such as no-till cultivation, timed release of fertilizers, the use of certain fertilizers, grazing land management and agroforestry all could significantly increase carbon sequestration. The introduction of improved agricultural systems also would enhance carbon sequestration by incorporating perennial crops (e.g., trees, forages, etc.) which sequester significant amounts of carbon. Based upon continuous measures of carbon dioxide fluxes, a Geographic Information System (GIS) model of forage production in the major ecological regions of transition countries is being developed to construct scenarios of seasonal range production, and assess the role of rangelands in the global carbon budget and climate change.

The Impact of Climate Change

Changes in the climate will affect the global economy and the natural environment. The impact will vary from country to country and region to region; different sections of nations will be affected

differently and at different times. The economic damage associated with an increase of 2.5 degrees centigrade would, according to some analyses, lower developed nations' gross domestic product (GDP) by 1 to 1.5 percent per year and decrease developing and transition countries GDP by two to nine percent. The estimated costs for island states would be higher (Cline, 1992; IPCC, 1995). While these estimates are uncertain, the impacts of climate change are expected to be greatest for developing nations and transition countries. Some of the sectoral impacts associated with climate change are reviewed below.

Agriculture. While the IPCC Second Assessment Report concluded that global agricultural production will be sustainable in the face of a doubling of carbon dioxide concentrations, it is projected that climate change will have a significant regional impact on agriculture. Producers and consumers in the U.S. and abroad will feel the impact of those changes.

In some areas, a carbon dioxide concentration of 550 parts per million will likely increase crop yields by up to 30-40 percent. Developing country agriculture will, however, be vulnerable to the negative impacts of climate change as the potential benefits of increased carbon dioxide concentrations are mitigated by changes in temperature, water availability, agroclimatic zones and sea level. In various parts of the world, the potential agricultural consequences of climate change will include increased food insecurity and corresponding increases in poverty, land degradation, dislocation and migration, nutritional and health emergencies, and levels of violent civil conflict. Based upon current estimates, grain yields will go down as much as 16 percent in developing and transition countries, and these countries may not adapt because they lack resources and the institutional structures to drive the adaptation process.

The risk for the poorer, more arid parts of the developing world may arise more from changes in precipitation than from temperature changes. Increased variability from year to year as well as seasonal distribution can significantly increase the risk of starvation and stagnant economic growth, especially for the poorest members of society. Poor farmers in water-scarce regions, such as the Sahel, would be highly vulnerable because of high population growth, low adaptive capacity and scarce economic alternatives. These impacts will compound the difficulties countries face in keeping pace with population growth.

The threats climate change poses to agriculture are significant. Traditionally, the development trajectory of countries has been shaped by their ability to modernize their agricultural sectors (thereby triggering demographic transition), which provides the platform for broad-based economic growth. Where there are significant barriers to agricultural development, critical social and economic problems often are manifest (eg. poverty, food insecurity and civil conflict). Over the next twenty years, food production levels will need to rise enough to feed an additional 90 million people per year. Much of that new food will need to come from yield increases thereby putting an emphasis on developing and disseminating new varieties and methods. Agricultural productivity will have to rise to compensate for the dwindling stock of arable land result from competition or degradation (mostly from nutrient depletion, erosion and salinization). Climate change may diminish the potential for agriculture to drive broad-based economic growth.

Freshwater Resources. While changes in precipitation levels may benefit some areas, developing countries are likely to feel the negative effect of global warming. Increased floods and droughts are among the predicted impacts of climate change in the coming century, both of which will alter the availability of fresh water resources. Lakes, streams and groundwater would all be affected, potentially compromising the ability of these resources to provide adequate water for domestic needs, industry, navigation, hydropower, agriculture and biological communities.

Global climate change will intensify the hydrological cycle: it will rain more in some areas because of greater evaporation from warmer surface waters and greater transpiration, and less in other regions. Greater flooding may result from increased convective precipitation, increased snow melt and more intensive tropical storms. Increasingly large or frequent flooding may well exceed safety parameters designed into dams and levees. A shift from snow, in which water is typically stored for weeks or months, to rain, which runs off immediately, will shift periods of high flow from spring to winter, away from the growing season.

Other potential disruptions could include impoundments of river systems, groundwater depletion, and increased flooding as a result of land-use changes, such as deforestation and soil erosion. Stream hydrology will change with climate, but uncertainties discourage quantification. More frequent or more severe droughts would disrupt transportation, decrease municipal and industrial water supplies, and threaten aquatic biodiversity. Rivers in arid regions, such as the Nile, will be particularly sensitive to climate change, while those in the humid tropics, such as the Mekong, will be relatively insensitive.

Freshwater wetlands, such as flood plains, are extraordinarily valuable ecosystems because of their role in flood control, water storage, water purification and natural habitat. Wetlands will generally shrink in a warmer climate because of increased evapotranspiration. Loss of wetland habitats would risk the extinction of diverse plants and animals around the world, and would threaten pastoral societies, such as those in the Sahel, which depend on marshes during summer droughts. The loss of large peatlands in Indonesia, Russia and Canada may release large amounts of stored carbon to the atmosphere.

Biodiversity. Climate change will almost certainly decrease biological diversity over the next century. Many species will have to migrate or shift their ranges in response to changes in climate. Species will shift either toward the poles or to higher elevations to avoid increasing temperatures. If the entire range occupied by a species becomes unsuitable due to climate change, species will have to either colonize a new, more suitable habitat or become extinct locally. To survive these changes and avoid local extinction, the species will need to be able to shift ranges quickly enough to keep pace with the changes limiting their survival and find suitable areas to colonize. Even if there are corridors of natural habitat available for migration, species will migrate at different rates, fundamentally changing the structure of natural communities.

Ultimately, many species may not be able to keep pace. Current models suggest that terrestrial ecosystems are likely to experience a warming-induced poleward shift of roughly 250 km over the next century. While animal and insect species may migrate, they depend upon healthy communities of specific plants and trees for their survival. For tree species, migration will be more difficult. While light-seeded tree species may be able to colonize new territory at the rate of up to two kilometers per year, heavy-seeded species may disperse only 100 meters per year. Under current climate change models, even the most "mobile" trees will have trouble keeping up with forecasted rates of change. High latitude ecosystems, such as Siberian forests, will be particularly at risk, since temperatures at high latitudes are expected to experience greater temperature increases.

Climate change may also lead to an increase in new diseases and geographic expansion of old ones. The last few years alone have seen outbreaks of disease in wild bird populations. Increasing concentrations of waterfowl, due to decreased wetlands availability and changed climatic conditions will facilitate disease transmission.

Finally, certain groups of species and ecosystems will face special risks from climate changes.

Migrating species, such as Neotropical-Nearctic migrant birds (eg. warblers and thrushes) or African ungulate species (eg. zebra and wildebeest), depend upon environmental cues to signal their migration and seasonal resources to survive migration. If cues are no longer synchronized due to climate change, these species may face population declines. Dramatic declines in North American shorebird populations already have been documented, perhaps in response to climate changes. Similarly, species in high montaine ecosystems, such as the paramo of Ecuador, will be particularly vulnerable; species in the highest elevations will have nowhere to retreat to avoid rising temperatures. Coral reefs and their associated high biodiversity, will face risks as severe storms increase and corals suffer from bleaching due to pigment loss as ocean temperatures rise.

Coastal Zones. Coastal zones are among the most economically valuable ecosystems on earth. Sixty percent of the world's population lives within 80 miles of an ocean or seashore. Two-thirds of the world's cities with populations of 2.5 million or more are near tidal estuaries. Many of the world's poor are crowded into low-lying coastal areas in countries such as Egypt and Bangladesh. Oceans provide a significant source of protein. Climate change could severely affect coastal ecosystems and human settlements.

Flooding and storm damage of coastal regions would be one of the most direct and graphic consequences of global climate change and higher sea levels. Gradual inundation, salinization of soils and water supplies, and rapid erosion would result from encroaching seas. Catastrophic death and damage might occur as storms reach further inland and over-run protective barriers. Millions of displaced people, billions of dollars in lost and damaged property infrastructure, and humanitarian crises could be expected.

Sea level is rising at a rate that is two to five times greater than recent averages and is predicted to rise about one-half meter in the next century. Ecosystems that have generally migrated landward, such as mangrove forests, salt marshes and barrier islands may now be caught between rising seas and extensive infrastructure. Further sea level rise would impact fisheries, human health, tourism, biological communities, freshwater supplies and industries around the world. If sea level was 50 cm higher today, the number of people flooded by storm surges in a typical year would increase from 40 million to 80 million.

Impact will vary from region to region. Higher sea levels will directly affect or actually displace every citizen of island states such as the Marshall Islands and Kiribati. Bangladesh is predicted to lose 18 percent of its land area, directly affecting 60 percent of its population, unless one billion dollars worth of protective measures are undertaken and maintained for threatened developed areas. Food scarcity could result from the loss of current farming practices. Six million people in Egypt, the primary recipient of U.S. development assistance, would be directly affected by rising sea levels. It is estimated that the cost of programs to protect and develop soundly all coastal areas would be \$6 billion annually.

Health and Nutrition. While there is uncertainty about the impacts climate change will have on health, it is clear that the potential for large direct and indirect effects exists. Direct effects will include increased heat-related mortality and increases in deaths related to extreme weather events (with the greatest consequences for vulnerable coastal populations). The potential indirect effects on health and nutrition are of even greater concern. These could include changes in the range of vectors and associated vector-borne diseases (eg. malaria); changes in the prevalence of non-vector borne infectious diseases (eg. cholera, especially in the absence of adequate sanitation); changes in food production and consequently nutritional health; and changes in water quantity and quality. The Intergovernmental Panel on Climate Change (IPCC) has estimated that malaria cases could increase by 50 to 80 million per year from a current annual level of 500 million globally.

Furthermore, the demonstrated links between child survival and fertility suggests that these health and nutrition impacts would have repercussions for efforts to reduce population growth.

In developing countries, food security, access to potable water and adequate sanitation are among the cornerstones of public health. Currently, 1.3 billion people lack access to safe water, 1.9 billion lack access to sanitation, and about 800 million people are chronically malnourished. As already discussed, the probable effects of global climate change would be to make food and water supplies more tenuous, increasing the risks for over two billion of the world's vulnerable populations. Large-scale migration might occur in response to these changes, and to flooding, drought and other natural disasters. Limited access to water, sanitation and food for those involved might severely compromise their nutritional and health status. In addition, urban air pollution, a by-product of fossil fuel use, could increase as a result of warmer temperatures, causing respiratory illnesses.

Typically, development efforts in the health and nutrition areas are not designed to address climate change issues directly. Rather, these efforts focus on enabling people and societies to adapt and respond to epidemiologic and demographic changes. Climate change may considerably stress the systems and institutions through which health and nutrition programs are implemented, such as through the emergence or re-emergence of health and nutrition problems in regions or countries. Thus, climate change could make current efforts in health and nutrition less effective simply by stretching limited resources across a broader set of more numerous health problems. The combination of worsened food security, decreased access to potable water, increased migration, range expansion and possible intensification of infectious diseases, and more frequent natural disasters could stress populations, as well as the capacity of the health systems and institutions that support them. The health and nutrition interventions that are already the cornerstones of development assistance in these sectors — such as improved capacity for surveillance, improved access to and quality of health services, micro-nutrient interventions, promotion of breast feeding and improved child feeding, health policy reform, and environmental health improvements — also strengthen the systems that are the front line defense for the well-being of vulnerable populations facing these threats.

Governance. The need to respond to the causes and the effects of climate change will create unique problems for effective governance. Developing countries are periodically taxed by refugees of drought and rural economic stagnation, but the effects of climate change will expand the numbers of dislocated persons and magnify institutional demands and sociological pressures. A new and potentially enormous "environmental refugee" population may arise from agricultural areas suffering from prolonged drought and desertification and from coastal areas where fish stocks decline, and agricultural lands are being lost to rising seas.

Governance systems will be challenged first by the increasing numbers of immigrants from other countries and other regions within nations. Feeding, housing, educating, providing health care and otherwise integrating these new urban residents will pressure existing infrastructure, and the political system will be expected to respond. Democratically elected leaders will need to adjust to the demands of new constituents with potentially divergent demands and political views. The leadership of nations may shift as migration alters the composition of voters and their priorities. Residents may find themselves politically and physically dispossessed. The problem will be compounded as urban residents feel the effects of economic shifts and assume a dependent rather than a productive role, and as the impacts of climate change directly threaten urban areas.

As resources become more scarce, particularly where depletion is rapid, political and sociological conflict will result. History is replete with examples of political and armed conflict over natural

resource scarcity. In countries where land tenure is unclear, resource allocation lacks legal definition, and judicial systems need financing and capacity-building, conflicts over resource allocation will be difficult to resolve. In regions where water is scarce, decreased precipitation and sea water incursion may heighten tensions. Climate change will exacerbate these trends and make coping solutions increasingly difficult to implement.

Climate Change and Development

The threat environmental degradation poses for sustained long-term growth and development is well-accepted. Until now, however, the international development community has focused predominantly on local environmental issues — concerns that have a visible and immediate affect on human health, agricultural productivity, national income or other local priorities. There is a natural predisposition to focus on compelling local problems, especially in communities where basic human needs are often unmet. While climate change may be one of the most profound threats to sustainable development, it is rarely seen as a local priority. Changes in climate are not immediately visible, and the greatest impacts are not felt in the short-term.

Strategies for addressing climate change, therefore, must strive to reconcile social and economic aspirations with the need to address local and global environmental threats. At the same time, efforts to promote development need to incorporate programs to decrease vulnerability to climate change-related threats.

The nature and extent of developing country vulnerability to climate change will ultimately depend not only on physical environmental changes, but also on the capacity of nations, regions and localities to adapt to those changes. Adaptability will partly be a function of the rate of change. Gradual changes will be easier to cope with than rapid ones. It will also be a function of human resources, investment resources and institutional structures. Skilled and well-managed nations, regions and communities will cope better than others, primarily because of their ability to attract investment by offering a lower risk of failure.

This chapter explores the links between climate change and the development agenda. It discusses how climate change will affect efforts to foster sustainable development and how programs to promote development could impact greenhouse gas emissions.

Implications for development assistance

USAID's efforts already explicitly or implicitly strive to achieve climate-related goals. Working with local partners, business and non-governmental organizations, USAID has been working with countries to combat the threat of climate change since 1990. USAID's strategy has focused on decreasing net emissions of greenhouse gases through interventions in the energy and land use sectors. As a result of that long-term emphasis, land use and energy sector programs are actively promoting more "climate-friendly" economic development. At the same time, natural resource management efforts, economic growth programs, and population, health, nutrition and governance programs are collaborating with developing countries to reduce vulnerability and increase the capacity to adapt to change.

The predicted impacts of climate change will almost certainly increase the need for humanitarian relief around the world. Not only might more severe weather events create sudden crises, the impact on political stability and governance could increase the number and frequency of "man-made" humanitarian crises resulting from natural causes. Humanitarian relief efforts today focus in part on trying to predict and prepare for severe events. For example, USAID is supporting monitoring of the current El Niño event and preparing for potential drought in southern Africa and southeast Asia, as well as increased flooding in Asia and Latin America.

The challenge in the coming century will be to ensure that efforts to mitigate and adapt to climate change are not overwhelmed by the demands for emergency relief. As more and more resources are expended to deal with the human costs of climate change, the ability of societies and the

international community to address root causes of emissions and foster long-term adaptation will be compromised. Additionally, as climate change-related challenges mount, the negative impact on long-term efforts to promote sustainable development will grow. For example, the 1991-1992 drought in South Africa caused approximately \$7 billion in economic losses, a significant setback to efforts promoting long-term development. The U.S. government contributed \$700 million for relief.

An opportunity exists for the U.S. to work in partnership with developing nations and transition countries to reduce the threats posed by climate change. It is a chance to collaborate on an agenda that will serve the interests of the global community. USAID programs in a range of sectors already work with countries to mitigate emissions and decrease vulnerability to climate change-related threats.

Energy. USAID programs promote renewable energy; energy efficiency; and clean transportation and energy generation and distribution. Programs have focused on three areas in the energy sector: demand for energy services, choice of fuels for those services, and efficiency in energy production. The Agency uses a variety of approaches to achieve those goals— training and education, public-private partnerships, technology cooperation, market transformation, sector restructuring, demonstration projects and voluntary programs.

Many USAID-assisted countries have severe market barriers to the implementation of sustainable energy policies, such as significant subsidies for energy use and inadequate market-based incentives for efficiency. These market imperfections inhibit efficient generation and use of power. USAID provides technical and analytical assistance to develop model power purchase agreements, facilitate power sector restructuring and privatization, and pertinent energy sector legislation and regulations. The goal is to help structure a power sector that incorporates incentives for cleaner energy production and use. Voluntary programs also have played an important role in encouraging investment in energy efficient products and services in nascent markets. These programs also can play an important role in helping to surmount the market barriers to the use of environmentally sound technologies.

Through demonstration and pilot projects, USAID is able to promote low- or non-carbon emitting energy sources and technologies to developing and transition countries. USAID works with public and private sector counterparts in the U.S. and abroad to select appropriate clean technologies. The Agency also jointly funds pilot projects to demonstrate the benefits in terms of pollution prevention and energy savings. Examples of USAID demonstration activities include a pilot pollution control program at a Mexican power plant, an electric vehicles project in India, thermal power plant efficiency and bagasse cogeneration sites in India, and a comprehensive industrial demand-side management program in the Philippines.

Complementing the range of USAID activities to promote environmentally sound energy technologies is a comprehensive effort to build human and institutional capacity using U.S.-based courses, field training, workshops, information systems development, exchange visits, databases and alumni networks. The Agency supports a range of activities designed to provide information and training regarding the economic, environmental and development benefits of environmental policies and technologies. Efforts also focus on building the capacity of technicians and managers to select, implement, operate and monitor equipment.

Forestry. USAID's forestry and climate change program involves promoting sustainable management of natural forests and tree systems in key countries and regions by fostering the development and dissemination of sustainable forest management policies and practices; improving management, monitoring and control of forest fires; developing and disseminating reforestation,

agroforestry and sustainable agriculture practices; increasing the participation of local constituencies in sustainable forest management and policy development; and establishing integrated assessment and monitoring systems to better understand changes in forest health, biodiversity conservation and carbon sequestration.

To help protect existing carbon sinks and reduce emissions from destructive forestry practices, USAID has promoted technologies that greatly reduce environmental damage to soils and trees thereby maintaining the economic value of forests. In Brazil, to curb destructive timber extraction while increasing economic benefits to local logging companies, USAID has supported the development of a model for reduced-impact harvesting (RIH) using research and demonstration plots at eight forest sites in the Brazilian Amazon. Here, environmentally sound timber extraction techniques are demonstrated and promoted for adoption by private timber association members to reduce forest damage and carbon loss through improved forest management. To address the risk of forest fires, a major source of carbon emissions, USAID is supporting fire management training and examining sources of conflict that may be an underlying cause of fire. In recent years, USAID increased the political visibility of extensive fires that emit greenhouse gases and destroy carbon sinks in the Amazon. USAID also has helped to monitor forest burning through the use of satellite imagery in partnership with the governments and non-governmental organizations.

Urbanization. USAID is working with cities and industrial facilities worldwide to reduce pollution from urban-based activities, including the emission of greenhouse gases. For example, in India and Mexico, USAID has supported the use of energy efficiency and pollution prevention audits to lower energy consumption in the textile, electroplating and foundry industries. In Tunisia, Morocco, Botswana, and Jamaica, USAID works with local governments to improve the management of municipal landfills and control the emission of methane gas. More broadly, USAID administers a credit program that provides cities with access to capital markets to finance investments in infrastructure and technologies to protect human health and environmental quality, including investments that will reduce greenhouse gas emissions.

Agriculture. USAID efforts in the agriculture sector build human and institutional capacity, and support the development of agricultural institutions worldwide. USAID promotes the proper use of agricultural chemicals, works to harmonize environmental regulations and practices, promotes more efficient water use, trains agronomists, plant health inspectors and soil scientists, and develops GIS systems for monitoring and verifying quality and environmental control standards. All of these facilitate "climate friendly" agriculture sector development. At the same time USAID promotes a range of different agricultural research efforts that will facilitate adaptation to climate change and increase carbon sequestration in agriculture. USAID supports research on the: use of biotechnology to increase the adaptability of crops to abiotic stress; formulation of agroforestry systems; development of sustainable management practices for tropical forest crops; conservation of genetic diversity; evolution of management practices for acid savannas that increase the productive capacity of the soil (and increase retention of soil nutrients and water); adaptation of no-till farming practices to more areas worldwide; creation of decision support systems to better manage agricultural land use in the face of climate variability and long-term change; and development of strategies for sustainable range management.

Biodiversity. USAID promotes the conservation of biological diversity on more than 40 million hectares of land in more than 25 countries. The focus of the program is the conservation of the natural ecosystems in which biodiversity occurs. Since most of this area is forested, these efforts protect existing carbon sinks and mitigate climate change.

The Agency supports initiatives that help manage biologically important areas, identify conservation

priorities, strengthen policies to promote conservation, conduct applied research to inform conservation efforts, increase public awareness of biodiversity's role and conservation, and identify sustainable means of financing conservation efforts. USAID primarily focuses on building local capacity for biodiversity conservation and supporting the conservation of corridors of natural areas. These natural corridors will help decrease the vulnerability of natural communities to climate change by facilitating species migration.

Coastal Zones. USAID is promoting Integrated Coastal Management (ICM) in the Philippines, Indonesia, East Africa, Mexico, Central America and the Caribbean in an effort to promote sustainable use of coastal resources by developing the information, skills and socioeconomic relationships necessary to implement these plans. In Africa, work is focused on major coastal cities where resources already are degraded and significant infrastructure already is at risk. In Mexico, efforts are focused on maintaining healthy ecosystems in a relatively pristine setting while supporting the tourism industry.

In several nations USAID also is making special efforts to protect mangrove wetlands, which protect against erosion and storm surges while providing habitat to diverse biological communities and commercial fish stocks. Pressures from shrimp and fish mariculture to clear mangroves are balanced against long-term community needs through the ICM process. Successful economic development may draw more people and infrastructure to the crowded and vulnerable coastal zone, but planned growth will offer profound advantages over the current situation. Communities, non-governmental organizations, university partners, and the private sector are working to develop guidelines and tools for conservation and planning.

Population. USAID's population assistance program, by supporting voluntary family planning and reproductive health services, is helping slow population growth— a major factor in the growth of greenhouse gas emissions and a potential burden on nations' abilities to adapt to climate change-related threats. Assistance is provided in over sixty developing nations and transition countries. Five of USAID's key climate change countries— Indonesia, Philippines, Mexico, India and Brazil— are among the top 20 recipients of USAID population assistance.

More than 50 million couples use family planning as a direct result of USAID efforts. In the 28 countries with the largest USAID-supported family planning programs, the average number of children per family has declined by one-third— from more than six in the 1960s to four. Due to these efforts, dozens of nations and millions of families are better able to feed, educate and provide health care for their children. By helping stabilize population sooner, USAID will help lower the rate of growth in greenhouse gas emissions, diminish pressure on ecosystems that are critical to a clean and stable atmosphere, and reduce vulnerability to the impacts of climate change.

The Road Ahead

Reducing greenhouse gas emissions and vulnerability to climate change are critical components of a true sustainable development agenda. In the long-term, economic development will be enhanced, not compromised, by efforts to reduce greenhouse gas emissions. In the immediate term, there is a vast array of activities that can promote economic development while reducing the rate of growth in greenhouse gas emissions and decreasing vulnerability to climate change.

A great deal can be done to maximize opportunities for a less carbon-intensive path to development. Chief among them is to focus on "win-win" opportunities to enhance economic development potential while reducing environmental risks. More efficient use of energy is the classic example of a "no regrets" approach that can yield increased economic efficiency and less

pollution as it reduces the growth in greenhouse gas emissions. It also is critical to focus on the subset of climate change threats that simultaneously contribute to local air pollution. Efforts to decrease greenhouse gas emissions also can improve urban air quality, increasingly a local priority in a rapidly urbanizing and more democratic developing world.

Nonetheless, no matter how effectively the development assistance community integrates climate change-related concerns into its efforts to promote sustainable development, some conflicts with the climate change agenda will remain in the short-term. Efforts to foster economic growth and industrial development will increase energy consumption. In turn, providing sufficient energy for industrial, commercial and residential use in a growing economy will increase greenhouse gas emissions. Developing country emissions will continue to grow to meet burgeoning demand. Key to meeting the climate challenge will be ensuring that growth occurs in the most efficient and least polluting manner possible, and recognizing that in the long-term climate change will undermine development efforts.

USAID's climate change objective is to minimize the threat of climate change while serving other development objectives. This offers opportunities to strive for economic and social development while reducing the threats posed by climate change. Where win-win alternatives are limited, the central challenge will be to resolve trade-offs between climate change mitigation and development assistance priorities.

The USAID Climate Action Plan

Summary

USAID will implement the President's commitment to assist developing nations and countries in transition through a comprehensive program that serves U.S. interests as it meets developing and transition country needs. The program will build on USAID strengths—its local presence, focus on local priorities, and experience in reconciling economic development and environmental management goals—as it helps lead the development assistance community toward greater cooperation in promoting an environmentally sound approach to sustainable development.

Designed to address the links between climate change and development, the USAID Climate Action Plan will focus particularly on three objectives:

- Decreasing the rate of growth in net greenhouse gas emissions by decreasing greenhouse gas sources and maintaining or increasing greenhouse gas sinks
- Increasing developing and transition country success in achieving the goals of the United Nations' Framework Convention on Climate Change (FCCC)
- Decreasing developing and transitional country vulnerability to the threats posed by climate change

USAID will promote sustainable development that minimizes the associated growth in greenhouse gas emissions and vulnerability to climate change. The Agency will undertake activities that are "win-win" — simultaneously promote sustainable development and combat climate change. USAID will review its full range of programs to see how programs to promote development may affect and be affected by climate change. By applying a climate change "filter" when developing and implementing programs, USAID will be able to better promote development that is truly sustainable.

The \$1 billion committed by President Clinton at the U.N. will be used decrease the rate of growth in net emissions from developing nations and transition countries, and increase successful achievement of the goals of the FCCC. Efforts to decrease vulnerability to the threats posed by climate change will complement this commitment. Programs that reduce vulnerability will be integrated into sector programs that already have as their mandates improving coastal zone management, decreasing the threats posed by emerging diseases, strengthening human and institutional capacity, and fostering improved agricultural and natural resource management methods.

A number of central tenets will underlay USAID efforts in each of these areas. USAID will:

- Build upon a large array of past and ongoing activities that promote technology cooperation, create partnerships with the private sector, and develop human and institutional capacity
- Collaborate more closely with other international institutions to leverage a larger pool of resources, and ensure that bilateral, multilateral and private resources are targeted to foster environmentally sound development
- Strengthen efforts to attract and channel private financing into clean technology markets
- Work with developing and transition countries to address fundamental policy and institutional constraints

The core of the Action Plan will be programs that promote "climate-friendly" development. USAID will strengthen its efforts in the energy sector that create markets for renewable energy, promote energy efficiency, foster the removal of energy price distortions and introduce market forces in the

power sector. The Agency will also build on programs to facilitate more effective forest protection and management, and improved agriculture by promoting forest conservation and plantation efforts, encouraging local forest management, improving land tenure legislation and promoting improved agricultural methods. It will maintain its commitment to habitat protection, especially in forested areas. USAID also will focus on reducing urban and industrial greenhouse gas emissions by improving infrastructure and technology, and promoting increased productivity and efficiency.

An important part of the Initiative will be to more closely manage, track and evaluate the range of climate-related programs to ensure that they are effectively decreasing emissions of greenhouse gases from USAID-assisted countries. The greater emphasis on monitoring and evaluation will guarantee that over the course of the Initiative, strategic emphasis will be sharpened to focus on those efforts that have the greatest impact. USAID will strive to identify and use those tools and approaches that are most effective in combating climate change. Every effort will be made to ensure that programs directly lead to reductions in emissions that are significant and real.

Through the Action Plan, several new areas of emphasis will be added to the USAID portfolio. Examples of these are:

- USAID will quantify health and productivity costs associated with the local air pollution in an effort to expand the definition of “win-win” efforts to decrease greenhouse gas emissions.
- USAID will undertake an analysis of the specific regional and local vulnerabilities posed by climate change. This analysis will be used to identify “hot spots”— areas of particular vulnerability that USAID needs to address.
- USAID will facilitate private sector transfer of clean energy technology to key countries and regions; a first step in this direction is the promulgation of model “Global Climate Change Technology Cooperation Agreements” with key countries.
- USAID will focus on reducing the vulnerability of urban populations, property and infrastructure (i.e. transportation systems and utilities) to the threats posed by climate change.
- USAID will enhance environmental education and outreach to involve non-governmental organizations, the private sector and governments in efforts to promote development while reducing the rate of growth in net greenhouse gas emissions.
- USAID will work with the donor community and beneficiary countries to more effectively screen and promote development efforts that minimize the growth in greenhouse gas emissions.

The Agency Focus

The USAID Climate Change Action Plan will emphasize three areas for collaboration with developing nations and transition countries: mitigating greenhouse gas, increasing success in achieving the goals of the FCCC, and reducing vulnerability to climate change. Through a concerted effort in those three areas USAID will strive to work in partnership with countries to balance the need to raise standards of living with the imperative to reduce the rate of growth in net greenhouse gas emissions. USAID’s investment, while substantial in terms of the U.S. Government’s development program, will be modest in terms of the problem at hand. Therefore, a strong emphasis will be placed on leveraging the impact of other donors, the private sector and non-governmental organizations, as well as ensuring that the technical, institutional and policy environment is conducive to decreasing the rate of growth in emissions.

In fulfilling the President’s commitment, USAID will ensure that at least \$1 billion in assistance is

devoted to collaboration with countries over the next five years to decrease the rate of growth in net emissions of greenhouse gases and to facilitate achievement of the goals of the FCCC. In addition to that \$1 billion commitment, USAID will continue to devote substantial resources to working with nations to decrease the threats that climatic shifts will pose. Efforts to decrease vulnerability will be firmly grounded in programs to combat disease, protect coastal zones, reduce desertification, increase agricultural productivity, and diminish other threats that may be exacerbated by climate change.

1. Decreasing the net rate of growth in emissions

Central to any comprehensive strategy that integrates climate change-related goals into the development assistance agenda is a focus on reducing the rate of growth in greenhouse gas emissions. USAID efforts to reduce emissions will strive to promote economic and social development that is more "climate-friendly." The USAID approach will emphasize the transfer of technologies, policy and regulatory reform, and human and institutional development that promotes development as it reduces the rate of growth in emissions.

In the energy sector, the focus of the Initiative will be on activities that result in the following improvements:

- The substitution of less carbon-emitting fuel sources for more carbon-intense fuel sources in the generation of heat
- The use of renewable energy sources (eg. solar, wind, biomass, mini and micro hydro or geothermal) instead of coal, oil, natural gas or unsustainably harvested fuelwood
- Increased efficiency and environmental soundness of fossil fuel-based power generation (eg. through plant rehabilitation, operations and maintenance improvements, modernization, cleaner coal-combustion technologies and re-powering with advanced boiler technologies)
- Improved transmission and distribution efficiencies in power systems
- Increased end-use energy efficiency (eg. industrial processes, buildings, water supply, wastewater treatment, lighting, appliances, HVAC [Heating, Ventilating, and Air Conditioning] systems, cookstoves)
- Decreased use and increased efficiency of carbon-emitting fuels in transportation
- Substitution of less carbon-emitting fuels in transportation systems
- Reduced market barriers and increased incentives for environmentally sound power sector investment (eg. power sector restructuring, elimination of price subsidies and monopolies, and introduction of standards)

USAID will have a wide range of public, private and non-government partners in implementing the strategy. Primary collaborators in the energy sector will include the U.S. Department of Energy and its national laboratories; the U.S. Environmental Protection Agency; multilateral development banks; international institutions and energy sector partners from the public, private and non-governmental sectors throughout the world.

In the land use sector, supported activities will either increase the storage of carbon in ecosystems or land-use systems, or decrease the release of carbon stored in biomass due to human activities. As part of the Initiative USAID will implement and manage programs that result in the following:

- The preservation, re-establishment or more sustainable management and use of forests, trees and denuded lands
- The maintenance and preservation of wetlands and mangroves
- Decreased burning of savanna, rangeland, forest and brushland

- Increased agricultural productivity to stabilize the agricultural frontier
- Increased soil organic matter and decreased soil erosion
- Increased use of biofuels
- Improved animal husbandry

Among USAID's primary partners in the land use sector will be the U.S. Department of Agriculture, U.S. Department of the Interior, the Peace Corps, a wide range of local and international non-governmental organizations, and the Centers for Genetic and International Agricultural Research (CGIAR) including the International Center for Research in Agroforestry (ICRAF) and the Center for International Forestry (CIFOR). Internationally, USAID will continue to work closely with a wide range of international, regional, national, and local partners.

USAID will also focus on reducing emissions of greenhouse gases from urban areas and industry. In addition to efforts that reduce emissions from urban and industrial energy supply and use, USAID will undertake programs that result in:

- Decreased emissions and increased capture of methane from urban sewage and solid waste
- Increased industrial and municipal adoption of environmental management systems
- The creation of regulatory frameworks and credit mechanisms to facilitate environmental investments
- Increased industrial and municipal productivity and investments in clean technologies
- More environmentally sound infrastructure (buildings, water systems, transport systems)
- More environmentally sound urban transportation systems

USAID will use a range of partners to carry out these activities including the International Council for Local Environmental Initiatives (ICLEI), the U.S. Environmental Protection Agency, the International City/County Management Association (ICMA), the Asian Institute of Technology (AIT), the Latin American Center for Urban Management (LACUM), and selected municipalities and financial institutions.

Several approaches will be used to achieve the objectives identified for the land use, energy, urban and industrial sectors. Some will directly affect emissions including pilot and demonstration projects, development and implementation of management plans and technology cooperation. Other interventions will have an indirect impact, such as power sector restructuring, elimination of price subsidies, introduction of improved land tenure legislation, incorporation of natural resource endowments in national income accounting, institution of building and appliance standards or the promotion of sustainable forest industries.

2. Increasing developing country success in achieving the goals of the FCCC

Action by all nations, developed and developing, will be required to truly stave-off the threat of climate change. Participation in the implementation of the terms and spirit of the FCCC will be fundamental to finding a global solution. A portion of the resources under the Action Plan will be used to increase developing nation success in achieving the goals of the FCCC. In the case of USAID-assisted countries that are included in Annex I of the FCCC (eg. Russia), USAID will work with countries to meet specific emissions reduction obligations under the FCCC, and facilitate participation in JI and emissions trading regimes.

The most critical element in assisting developing countries to take on binding commitments under the FCCC will be their ability to reconcile climate objectives with their economic and social development goals. In support of that objective, USAID will work in collaboration with other U.S.

departments and agencies as well as international organizations to promote "Global Climate Change Technology Cooperation Agreements" with key countries. These agreements will help overcome barriers to promoting "climate-friendly" development by creating a collaborative process through which the combined efforts of governments, the private sector and non-governmental organizations can be focused on promoting market-based transfer of cleaner technologies and infrastructure.

The U.S. Country Studies Program and the U.S. Initiative on Joint Implementation have been important vehicles for collaborating with developing nations. USAID programs will seek to enhance further developing country capacity to implement the FCCC. In addition to assistance to decrease the rate of growth in net greenhouse gas emissions, the following efforts will be considered components of the President's \$1 billion commitment:

- Creation of national emissions inventories and baselines, national emissions budgets, national climate change action plans, and national communications
- Enhanced capacity to track, monitor, report and verify greenhouse gas emissions
- Enhanced capacity to monitor and project vulnerability to climate change
- Agreements to cooperate in facilitating public-private partnership that transfer environmentally sound technology that mitigates climate change
- Acceptance of greater developing country commitments under the FCCC
- Stimulation of joint implementation/activities implemented jointly (JI/AIJ) projects and participation in JI regimes
- Establishment of legislative, regulatory and market structures, and local capacity to participate in emissions trading regimes
- Integration of climate change concerns in national sustainable development strategies, including those that work to achieve the goal of other conventions, such as those to preserve biodiversity and forests, and halt desertification

Among USAID's primary partners will be the U.S. Department of State, U.S. Environmental Protection Agency, U.S. Department of Energy, U.S. Country Studies Program, U.S. Initiative on Joint Implementation, the U.S. National Oceanic and Atmospheric Administration, the Intergovernmental Panel on Climate Change, the U.N. Environment Program (UNEP), the U.N. Conference on Trade and Development and the Earth Council as well as government, public and private sector representatives in the U.S. and abroad. Once created, the Inter-Agency Climate Change Program will be an important collaborator.

3. Decreasing developing country vulnerability

Among U.S. government agencies, USAID is uniquely positioned to work with developing and transition countries to reduce vulnerability to impacts of climate change. This suggests a special role for USAID in the vulnerability area as a part of the portfolio of developing country assistance related to climate change.

USAID has a substantial portfolio of programs funded outside the initiative that increase the ability of nations to manage crises and adapt to environmental, social and political change. These programs are grounded in local needs and priorities. While these programs are not necessarily focused on combating climate change-related threats; they decrease the vulnerability to climate change as they meet other local needs. For example, most efforts to increase capacity to cope with one type of crisis (such as the outbreak of a disease epidemic, or the need to improve planning for extreme climatic events such as El Niño) also increase capacity to cope with other crises.

To ensure that the specific threats associated with climate change are being considered in planning

and programming, USAID will undertake an analysis of the specific regional and local vulnerabilities climate change creates. That study will be used to identify “hot spots” — areas of particular vulnerability that USAID needs to address. The findings will be used to inform countries and help focus USAID efforts.

USAID efforts to reduce vulnerability will complement the \$1 billion in support that will go toward the Initiative’s two other foci. Programs that have the following results will be an integral part of the Agency’s Action Plan:

- Increased preparedness for natural disasters (eg. floods, droughts and tropical cyclones)
- Increased adaptability and efficiency of agricultural systems, municipal management, water resources and coastal zone management, and public health systems
- Maintenance of healthy, resilient ecosystems, especially those that provide protection against threats of climatic change (eg. grasslands, forests, wetlands and coral reefs)
- Improved domestic and international capacities for conflict-resolution regarding shared resources (eg. water and arable land)

Strategies to improve the ability to cope with stresses resulting from global climate change will include information and education campaigns, physical infrastructure investments (for example in coastal areas), regulatory initiatives, and research and development (eg. to develop crop varieties adapted to changed environmental conditions).

Partners with USAID will include the World Bank; regional banks; the United Nations Development Program (UNDP); United Nations’ Food and Agriculture Organization (FAO); Global Environment Facility (GEF); United Nations Environment Program (UNEP); U.S. Department of Agriculture, U.S. Department of the Interior, International Union for the Conservation of Nature (IUCN), the National Oceanic and Atmospheric Administration; a wide range of bilateral donors, host country institutions and non-governmental organizations and private voluntary organizations.

Tools and Techniques

To achieve the results above, USAID will use policy reform, institutional capacity building, technology cooperation and transfer, education and outreach, and information collection and dissemination to combat climate change. USAID also will place particular emphasis on: partnerships with the private sector, collaboration and coordination with other bilateral and multilateral donors, and the use of credit to foster trade and investment in clean technologies and projects. Each tool will be part of an integrated strategy to promote development while reducing the rate of growth in greenhouse gas emissions. Over time, USAID will focus on those interventions that are proven most effective.

Policy Reform. Fundamental in reducing the long-term threats to environment and development from global climate change will be the role of policy reform. Economic restructuring and democratic decision-making are critical in creating a policy and regulatory environment that ensures fairness and equity while introducing incentives for environmentally and socially sound trade and investment. Policy reform is a way to encourage decentralized decision-making, while demonstrating a change in priorities, needs and directions. By creating incentives, it mobilizes resources through voluntary action in the national and global interest.

Public policy-making is a prerequisite if progress is to be achieved in reducing emissions and vulnerability, as well as fostering international collaboration. A range of policy reform efforts can and are undertaken because they promote economic and social development; often they are critical

means by which to decrease the threat of climate change. Energy sector restructuring, improvements in land tenure regulations, the removal of price subsidies and distortions, and the establishment of building and appliance standards are all policy reform efforts that promote less carbon-intensive development. For example, developing countries as a whole have reduced energy subsidies by 40 percent since 1990; this has led to significant reductions in the rate of growth in carbon emissions. USAID will facilitate policy and regulatory reform to hasten economic and social development in a less carbon-intensive manner.

Private Sector Partnerships. Private companies will be a key partner in the Agency's climate action plan. While the commitment of \$1 billion over five years is significant for the U.S. government, it will not be sufficient to make an appreciable difference on climate issues in developing and transition countries. It will be critical to engage the far greater resources—human, technological and financial—of the business community.

Already private capital flows vastly outstrip public flows to developing nations and transition countries. In 1996, private capital to these nations totaled \$243 billion while official development assistance was \$40 billion. Private capital today accounts for 86 percent of total long-term capital flows to developing nations and transition countries. As markets open to permit greater private sector trade and investment, the dominant role of the private sector will continue to increase.

The focus of efforts to create private sector partnerships will be on promoting cleaner urban development, industrial development and energy sector expansion. In urban settings, USAID will foster private sector investment to reduce emissions from the transportation sector, industry and infrastructure. The goal will be to improve local air quality and health while reducing net greenhouse gas emissions. In the energy sector, USAID will promote more environmentally sound expansion of the power sector, and overcome market barriers to commercialization of renewable energy and energy efficiency. The approach will involve removing barriers to private sector entry, promoting private trade and investment, helping develop innovative financing mechanisms for environmental investments, and fostering the creation of local enterprises, such as energy service companies, to drive investments in clean energy technologies. Finally, in fostering cleaner industrial development, USAID will build on the successful model of the U.S.-Asia Environmental Partnership to create regulatory and non-regulatory incentives that will encourage the use of clean industrial technologies and practices.

Technology Cooperation. Technology cooperation will play a critical role in determining the extent to which developing countries are able to achieve the goals of the FCCC. To help them pursue less carbon-intensive economic development (and "leap-frog" the polluting carbon-rich industrialization phase developed countries experienced), developing country governments expect commitments to transfer technology from developed countries.

The vast majority of technology transfers will not take place through government-to-government grants. It will come about through the marketplace. USAID will help countries shape those markets through policy reform and capacity building, so that they work to benefit the global environment by accelerating the commercialization and dissemination of environmentally sound technologies.

To focus this effort, USAID will help develop model technology cooperation agreements to help catalyze and channel private trade and investment in clean technologies. These agreements will serve as vehicles for government and business dialogue. The intent is to create a mechanism by which public resources and private capital focused on climate impacts can be highlighted and promoted in key developing countries and regions. These agreements will expedite the flow of investment and technology to developing countries and assist in meeting emissions reduction goals.

Institution Strengthening. Sufficient human and institutional capacity are prerequisites to the successful implementation of any strategy for promoting sustainable development. In working to reduce the threat of climate change, decision-makers, managers, scientists, technicians, operations and maintenance personnel and others must have the necessary skills and know-how to make informed decisions and carry out appropriate actions. Local institutions must be staffed with a critical mass of qualified personnel, and efforts must be made to ensure that this significant resource base is retained and developed. In some cases, USAID uses training to enhance developing country capacity to combat climate change specifically. More often, training is a tool for facilitating improvements that will drive development in a sector; a climate change-related benefit will be an added benefit. In each of its institution-building programs that are part of its energy training program, USAID will seek to overview the links between climate change, and technical, managerial and policy issues in an effort to raise awareness of opportunities to promote cleaner energy sector development and its associated benefits.

Education and Outreach. To ensure the success of new environmental policies and programs, target populations need to be involved in decision-making. Early work on global climate change suggests that most people and businesses do not believe that they make a significant contribution to the problem— whether they believe there is a problem or not. Undertaking assessments of attitudes and behaviors can provide a basis upon which to build communications and education programs that target select audiences. Almost any effort to reduce greenhouse gas emissions will have benefits that are more immediate than the impact on global climate change— cost savings in energy bills, less air pollution and more trees. All of these short-term benefits are far more visible. “Selling” the changes necessary to make a real difference in the mitigation of greenhouse gases will necessitate tying desired changes in behavior to results people feel more immediately. Similarly, promoting the necessary societal changes will require inclusive approaches to decision-making that involve broad participation and outreach.

Information Collection and Dissemination. Data and information are critical to climate change-related programs. They provide a basis upon which to measure the environmental performance of those sectors of the economy affecting global climate change. They provide an essential means by which to measure progress and assess the success of programs and activities. They help inform policy and decision-making. Finally, they enable countries and regions to track changes in climate, water temperature, sea level and other critical variables enabling greater preparedness for change and decreasing vulnerability. The sharing of environmental information between community stakeholders—urban and rural communities, civic groups, industry leaders and government officials—is an important addition to traditional environmental policy tools. It can help focus attention and resources on the most successful interventions, increase public awareness of environmental issues and serve as an important agent of change. Information dissemination is critical to the proper selection and successful implementation of policies that use market-based approaches to promote environmentally sound development. As incentives are put in place to encourage cleaner investment, the need for information about alternative technologies and opportunities for expansion and investment grows.

Research, Development and Demonstration. Research will be important in developing and demonstrating technologies that will enable less carbon-intensive development and reduce the risks associated with climate change. For developing nations and countries in transition, research will be necessary to adapt and apply technologies that will provide cleaner forms of transportation and cleaner sources of power. Research also will be critical in developing and disseminating improved agricultural varieties, breeds and practices that will decrease the stress of climatic shifts on

agricultural practices, and reduce emissions from animal husbandry and cultivation. A critical component of USAID efforts to promote climate-related research will be efforts to foster the commercialization of new technologies and to promote the adoption of technologies and approaches by extension services and other educational institutions. Finally, complementing efforts to support research, development and dissemination of new technologies will be programs to build the capacity of the local institutions that will generate the innovations, disseminate information about new technologies, and facilitate adoption of new resource management tools and techniques.

USAID will focus on collaborating with institutions that are already undertaking climate change-related research or have developed useful technologies. The Agency will continue and enhance efforts to collaborate with CIFOR, ICRAF and others on carbon sequestration in forests, and encourage CGIAR centers to focus more explicitly on climate change adaptation in crop breeding and other agricultural research efforts. The Agency will also work with the Board on International Food and Agriculture Development (BIFAD) to develop a full 'no regrets,' climate friendly, research agenda.

Partnerships with Bilateral and Multilateral Donors. USAID activities related to global climate change already involve collaboration and partnership with multilateral and bilateral donors, international organizations, and other agencies and departments of the U.S. Government. USAID will intensify coordination on climate change issues in order to: multiply the impact of its programs by joining forces with other donor nations and the private sector, and increase the pace and durability of needed policy reforms in host countries. Coordination will take place at all levels—within countries, among technical experts, and in policy-level meetings involving USAID officials and bilateral and multilateral counterparts.

Multilateral Collaboration. Maintaining a close working relationship with the World Bank Group will be critically important to the success of USAID's efforts. USAID will seek additional opportunities for project work with the GEF and the International Finance Corporation (IFC). USAID also will work to deepen relationships with other multilateral lenders. USAID has a history of collaboration on climate change-related lending operations with the Inter-American Development Bank and the Asian Development Bank; both already are instrumental in USAID climate change work in key countries and regions. The European Bank for Reconstruction and Development (EBRD), which has a considerable resource base for direct lending to the private sector in Eastern Europe and the former Soviet Union, has the potential to be a closer partner, particularly in addressing energy efficiency improvements in the region.

USAID will continue to strengthen the relationship with the main institutions of the U.N. and other international organizations whose mandate includes climate change. In addition, USAID will seek increased opportunities for leveraging U.N. activities in monitoring and in capacity building in developing and transition countries. Potential opportunities exist for collaboration with a range of U.N. agencies, such as Food and Agriculture Organization of the U.N., the World Health Organization and UNEP.

Perhaps one of the most important venues in which USAID would like to play a leadership role is in the OECD/Development Assistance Committee (DAC). USAID will use the DAC partnership strategy as a foundation for working with developing nations to encourage a coherent response from donors on climate change issues. USAID also will use the DAC Working Party on Development Assistance and Environment as a forum for addressing problems of donor policy on climate change and for promoting quality standards in the provision of assistance. USAID will endeavor to lead the development of DAC guidelines for "climate-friendly" development.

USAID also will strengthen its links with the OECD Climate Technology Initiative (CTI). USAID will work with CTI task forces to identify areas of mutual cooperation in the promotion of technology dissemination and institutional capacity building. In addition, USAID will use its network of in-country missions and regional bureaus to assist the design of activities that enhance the commercialization of clean technologies.

Leadership is also possible in other regional fora, such as the Club du Sahel, Southern Africa Development Cooperation (SADC), and Intergovernmental Authority on Development (IGAD) in Africa, as well as with specialized scientific and expert bodies through which USAID could expand the participation of its development partners, such as the IUCN's Sustainable Use Initiative and the Multi-donor Secretariat of the World Bank.

Bilateral Cooperation. USAID will focus efforts to promote bilateral cooperation on large bilateral actors. The European Union and the Governments of Japan and Germany are among the most important partners.

Though collaboration between the U.S. and the European Commission under the U.S./EU New Transatlantic Agenda primarily has focused on regional issues, both parties are increasingly interested in addressing global issues. USAID will pursue global climate change issues as a regular part of these consultations.

Cooperation with Japan under the U.S./Japan Common Agenda is already well-established; it involves not only USAID but also other agencies and departments of the U.S. Government. Protecting the global environment is one of four major foci of the Common Agenda. Beyond the Common Agenda, the development assistance programs of the Government of Japan are likely to continue to devote substantial resources to the environment and energy sectors, and larger amounts to global climate change, even in the face of major aid budget cuts. It is also likely that Japanese loan resources for the environment will be more widely available to poor countries in the future. USAID will look for opportunities to work in partnership with the Japanese lending programs.

Germany could potentially be an important partner for the U.S. in the climate change arena. The German Government is the largest bilateral source of resources (official and private) to the countries of Central and Eastern Europe and the former Soviet Union, and has demonstrated a commitment to addressing climate change-related issues.

Credit. The Initiative announced by President Clinton included up to \$250 million in the use of credit for climate-related projects and activities. Two conditions will have to be met if USAID is to be able to use credit to advance its climate change program. Congress will have to grant USAID the authority to engage in credit programs (beyond the micro-enterprise and urban environmental credit program authorities), and the Agency will have to demonstrate its ability to implement needed credit management reforms.

Credit would facilitate the creation of new markets for environmentally sound technologies. Clean energy technology, energy efficiency and renewable energy represent important methods by which to decrease the growth in greenhouse gas emissions. Yet significant market barriers exist. Many renewable energy and energy efficiency projects tend to be small, creating relatively high transaction costs. Most commercial financiers are unfamiliar with lending in these sectors and these countries. Therefore, clean energy project developers in emerging and transition economies must turn to international financial institutions for help. But the transaction costs for such small projects are an obstacle for multilateral lenders.

A USAID credit program for environmentally sound technology that mitigates climate change would fill a specific need. It would not compete with the commercial markets because it would provide financing for projects that are too risky or too small to garner commercial financing. Additionally, it would not replicate the efforts of the U.S. Export-Import Bank or the Overseas Private Investment Corporation because it would neither finance the export of material nor provide insurance to buy down risk. The use of credit would allow USAID to complement its grant activities where appropriate with partial loan guarantees or loans. USAID could mitigate the risk in projects where a developmental and environmental purpose was being served and where market barriers would otherwise imperil the investment. Finally, the use of credit would allow USAID to leverage private investment for every dollar of USAID assistance. USAID will seek to leverage ten dollars for each dollar the Agency uses in loans or loan guarantees.

Country and Regional Programs

USAID currently has climate change-related activities in 44 countries throughout the world. These programs are important components of a comprehensive strategy to meet local needs and decrease the threats posed by climate change. USAID will continue to support a wide range of environmental programs in countries throughout the world. The Agency will, however, use the Initiative to focus on achieving specific, concrete results that will decrease the threat of climate change.

USAID will concentrate resources and attention under the Action Plan on a set of key climate change countries and regions. These countries were selected because of their contribution to net global greenhouse gas emissions and their receptivity to take action to decrease net emissions of greenhouse gas emissions. Twelve key countries and regions will receive priority: Brazil, Central Africa (Cameroon, the Central African Republic, the Congo, the Republic of Congo, Equatorial Guinea and Gabon), Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama), Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan), India, Indonesia, Mexico, Philippines, Poland, Russia, South Africa and Ukraine. Although China is another large emitter of greenhouse gases, USAID does not operate in China.

All of the USAID key countries and regions will maintain a significant portfolio of climate change-related activities for the duration of the five-year Initiative. At least 40 percent of grant assistance over the course of the five-year Initiative will be devoted to key countries and regions. Additionally, assuming credit authority is approved, at least two-thirds of USAID's use of credit instruments to combat climate change will be undertaken in key countries and regions. The climate change program in each country will be designed to meet local needs and priorities. (An overview of each country strategy is included below.) Although USAID missions will have the lead in designing and implementing national programs, they will collaborate closely with USAID staff in the United States. In the absence of a local USAID office, staff in the United States or in regional offices will manage programs, as appropriate.

USAID may decide to discontinue a climate change program in a key country or region if the Agency determines that USAID climate change objectives for that country have been achieved, it is not in the interest of the United States Government to maintain a USAID-supported climate change program in that country, USAID efforts in that country would likely be ineffective, wasteful or have a negative impact, or climate change-related needs in that country are being met either independently or by other donor(s).

USAID also will continue to be an active participant in the inter-agency climate change programs. The Agency will continue to support the U.S. Country Studies Program and the U.S. Initiative on Joint Implementation as they support programs in developing countries that test the potential for

joint implementation, and help develop and implement national climate change action plans. Additionally, USAID will play an active role in the design and creation of the Inter-Agency Climate Change Program the President called for in June.

Critical to success will be the implementation of strategies for combating climate change that are based upon local needs and interests. USAID emphasizes different priorities in each of its key climate change countries and regions. While those strategies will undoubtedly evolve as the Initiative moves forward, the current suite of programs planned or ongoing in these twelve countries demonstrates the approach USAID intends to use in combating climate change.

Africa

USAID has one key region and one key country in Africa. The region, Central Africa/Congo Basin, was identified as key in 1994 by the Agency's Global Climate Change Strategy and the Africa Bureau's approved Supplemental Climate Change Strategy. South Africa is currently the largest African emitter of greenhouse gases.

Africa is unique from a climate change perspective because it is particularly vulnerable to the threats posed by global warming. African economies are especially dependent on agriculture and the majority of African's live in areas that are prone to drought or flooding. As an essential part of its strategy in Africa, USAID is monitoring the vulnerability of African countries to the threats posed by climate change. This includes evaluating the impact that climatic changes, including increased weather variability, could have on sustainable development plans, particularly related to agriculture. The primary goal of USAID's efforts will be to increase the development planners' awareness of the potential risk climate change poses, building such considerations where feasible into National Environmental Action Plans, planning related to the Desertification and Biodiversity Conventions and other activities. Short-term impacts of climate change events, such as El Niño, will be used to model impacts locally, nationally and regionally.

Over time, USAID will examine the potential to reduce emissions from gas flaring in petroleum and natural gas facilities, currently concentrated in Nigeria. Africa accounts for 21 percent of world gas flaring, which in absolute terms still represents a modest level of emissions. USAID will, however, pay increasing attention to new petroleum investments in Angola, Equatorial Guinea and elsewhere, which may magnify this source.

Central Africa. Central Africa, with its vast forest reserves, is the most important sub-region of Africa for storing carbon and mitigating greenhouse gas emissions. Maintaining the carbon "sink" potential of the region is the focus of a four-year forest conservation project in the Republic of Congo that is just being completed as well as the five-year Central African Regional Program for the Environment (CARPE), which is in the early stages of implementation.

CARPE's objective is to work with African partners to identify and help establish conditions and practices that will reduce deforestation and biodiversity loss in the Congo Basin. CARPE attempts to use local knowledge to identify ways to limit deforestation and retain the forest as a significant global carbon sink. CARPE's specific activities include remote sensing and Geographic Information System (GIS) analysis to improve forest cover data, coordination with scientists studying biomass and developing carbon inventories for various forest types, and coordination with scientists monitoring atmospheric chemistry, testing predictive models of forest degradation and deforestation, and identifying policies that improve forest management.

CARPE's intended goals are to ensure that indigenous forest resource management and

conservation practices are better understood and strengthened, identify and pilot strategies for assessing and reducing the negative environmental consequences of logging, identify and test strategies to promote and evaluate smallholder agricultural practices that reduce deforestation and biodiversity loss, develop infrastructure reconstruction strategies that maximize social and economic benefits while minimizing adverse environmental impacts, pilot test promising strategies for using non-timber forest products to contribute to forest conservation, assess consumptive and non-consumptive uses of wildlife and pilot test conservation strategies, enhance the conservation of biodiversity within protected areas, and map areas of high biodiversity and identify gaps in the protected area system. As the CARPE partners gain a greater understanding of the problems and opportunities, specific activities to mitigate emissions will arise. Once CARPE is completed, the understanding of the conditions and practices required to reduce deforestation and biodiversity loss in the Congo Basin will be greatly enhanced.

CARPE is supporting a new organization "Conference on the Ecosystems of Dense, Humid Forests in Central Africa" (CEFDHAC), which is the only African organization dealing with environmental issues of forest management in the Congo basin. As a result of CEFDHAC, Africans are showing a willingness to collaborate with donors on technical issues requiring regional resolution. USAID will continue to nurture the CEFDHAC process. By the end of five years, CEFDHAC will be a significantly better organization, representing the aspirations of its members regarding the issues of the forest environment in the Congo Basin.

South Africa. South Africa ratified the FCCC in August of this year. It is currently the fifteenth largest industrial emitter of greenhouse gases worldwide and the seventh largest developing country emitter. The Republic of South Africa (RSA) is pursuing several impressive programs to reduce the growth in greenhouse gas emissions, including a joint USAID/DOE effort to promote renewable energy in South Africa.

USAID is developing a climate change program that will dovetail with the climate change agenda of the Republic of South Africa. It is anticipated that the principal South African Government partner in developing the climate change program will be the Department of Mineral and Energy Affairs, in close coordination with the Departments of Environment and Tourism, and Water Affairs and Forestry. These departments comprise the working committee addressing the FCCC and already have close links to the U.S. Government through the U.S./South Africa Binational Commission (BNC).

The USAID climate change program will be developed to support the environmental component of the Agency's current strategy in South Africa. Preliminary discussions indicate that the USAID program will include strategic interventions supporting policy development, technical assistance and training. During the design process, specific plans for collaboration with other U.S. Government agencies will be outlined.

Strong linkages to the BNC are envisioned. A critical element of BNC support to date has been energy sector collaboration. Vice President Gore and Deputy President Mbeki are very interested in expanding cooperation on climate change issues. USAID hopes that its climate change activities will be undertaken in collaboration with the BNC's Energy Committee and, to a lesser extent, the Conservation, Environment and Water Committee.

Asia and the Near East

Reducing greenhouse gases is one of USAID's top environmental priorities in the Asia and Near East region. USAID has three key countries in the region— India, Indonesia and the Philippines—

which each have a significant climate change-related portfolio of activities. In 1995, USAID launched the two-year \$11.5 million Asia Sustainable Energy Initiative (ASEI) to foster the development and implementation of energy production and distribution strategies that reduce greenhouse gas emissions while promoting economic development in these three key countries.

USAID also has climate change-related activities in Egypt and Nepal. In Egypt, USAID is working to improve the efficiency of the power and transportation sectors to reduce air pollution (greenhouse gases in addition to local pollutants) and to improve economic efficiency. In Nepal, USAID has relatively small programs focused on forest restoration and increasing Nepal's capacity to develop small- and medium-scale hydropower resources in an environmentally and socially sound manner. The hydropower programs will enable Nepal to develop in a "climate-friendly" manner, with the side benefit of building Nepal's capacity to eventually sell hydropower to India, thereby reducing India's dependence on carbon-intensive coal for power.

The Agency also has helped support the climate change-related efforts of multilateral development banks in Sri Lanka. The portfolio of programs in Asia reflects the need to focus on the rapid growth in energy demand that these countries are facing as well as the loss of important forest resources in India, Indonesia and the Philippines.

India. India is the world's fifth largest source of greenhouse gas emissions and the second fastest growing source of emissions after China. Electric power generation is the largest source of greenhouse gases and is responsible for 71 million tons of emitted carbon or 48 percent of the carbon emitted from fossil fuels. The second largest contributor is the transportation sector, excluding railways, which contributes 11.3 percent of total Indian carbon dioxide emissions from fossil fuels. Carbon dioxide emissions from land use changes are also a concern in India, as rapid deforestation degrades more than 50 percent of India's land area.

India's continued growth will depend upon extensive investments in infrastructure: ports, highways, and most importantly, power generation capacity. It is estimated that more than 140,000 megawatts of additional power, requiring approximately \$200 billion in investment, will be needed over the next 15 years. The Indian power sector will continue to be largely coal-based, given India's abundant, inexpensive coal resources. Therefore the dissemination of cleaner coal technologies and the development of renewable and clean alternate sources of energy are all priorities. Serious institutional barriers and resource limitations will have to be addressed.

Reducing greenhouse gas emissions in India requires the active involvement and participation of the private sector. Private capital flows to India already outstrip foreign assistance, and the growth in emissions in the future will result primarily from growth in the private sector. USAID activities to promote private sector participation in combating climate change will foster the development of projects that increase profitability while decreasing greenhouse gas emissions.

USAID has a broad and comprehensive program to increase the environmental soundness of the power sector. The program includes substantial efforts to promote energy efficiency and the commercialization of renewable energy. Additionally, USAID supports a specific climate change program, the Greenhouse Gas Pollution Prevention Project (GEP). As GEP moves forward, the program will be expanded. Its goal will be to facilitate a more "climate-friendly" path to development through a program focused on fostering technology transfer to industries and sectors that are major Indian greenhouse gas emitters. GEP currently promotes more efficient coal conversion to reduce the carbon dioxide emitted per unit of power generated in existing coal-based power plants and investments in the production of year-round grid-quality power from the waste associated with sugar production (bagasse) and alternative biomass. GEP will now have a more

extensive range of activities to increase the generation efficiency of existing thermal power plants and ensure that new power generation capacity is more environmentally sound. Two additional program components may be added to foster technology transfer by stimulating project financing, and combat climate change through action in cities to improve transportation, energy efficiency and solid waste management.

USAID will work with a wide range of Indian partner organizations in implementing climate change activities. Collaboration with the Indian National Thermal Power Corporation and the Industrial Development Bank of India will continue. It will be supplemented by links to non-governmental organizations such as Development Alternatives and the Tata Energy Research Institute; academic institutes such as the Jawaharlal Nehru University and the Indira Gandhi Institute for Developmental Research; industry associations such as the Confederation of Indian Industry and the Federation of Indian Chambers of Commerce and Industry; and others involved in transportation, city planning and waste management.

Forest covers approximately 23 percent of India's land area, and USAID has long been involved in improving the health of degraded forest lands in India. In the mid-1980s, India's natural forests were degrading rapidly under immense pressure from the estimated 50 to 200 million forest users who unsustainably gathered biomass in the form of timber, leaves and grasses. USAID helped develop policies to shift forest management from the state to local communities. By late 1996, more than 20,000 villages had formed forest protection groups that oversee protection and rehabilitation of more than two million hectares. Working with the support of USAID, local communities are devising plans to fit their community. In addition, with USAID support, the Asia Forest Network is supporting organizational reforms at the state level to facilitate decentralization of management.

USAID projects that its efforts in the energy sector in India will avoid four million tons of carbon dioxide emissions per year. Additionally, the Agency hopes to increase the percentage of total installed power capacity from clean technologies from 0.2 percent in 1994 to 2 percent in 1998, 3 percent in 1999, and 6 percent in 2000. USAID activities will also accelerate institutional, policy and legal changes to increase efficiency in energy supply and end-use.

Indonesia. Indonesia is the fourth most populous nation in the world, with more than 200 million inhabitants. As a result of burgeoning economic growth, power demand in Indonesia is growing at a rate of 16 percent per year. At the same time, Indonesia's extensive tropical forest reserves, which constitute about half of Asia's remaining forests, are being deforested at rates estimated to be one million hectares per year. USAID has a portfolio of programs focused on ensuring environmentally sound development of the power sector and more sustainable management of forest resources.

While power sector restructuring will help create a financially viable power sector that will help attract the private investment needed to meet Indonesia's rapidly growing demand for power, it will be critical to ensure that the incentives for use of renewable energy technologies and energy efficiency are not lost. USAID is assisting the Government of Indonesia to protect and promote the application of renewable energy and energy efficiency, particularly through private sector investment. Government of Indonesia (GOI) policies encouraging renewable energy and energy efficiency are in place but supporting regulations are needed. USAID is providing substantial assistance to the Ministry of Mines and Energy. The Agency is helping support decision-making throughout the regulatory and restructuring process to foster restructuring and ensure that the Indonesian Government takes full advantage of the national potential for renewable energy and energy efficiency.

USAID also is focused on fostering energy efficiency in the immediate term. Implemented in partnership with the U.S. Department of Energy, USAID's energy efficiency program in Indonesia focuses on increasing the efficiency of power generation by improving fuels, burner efficiency and steam efficiency. Increases in efficiency translate into enormous reductions in emissions. For example, a 1 percent improvement in overall power plant efficiency of a 400 megawatt coal-fired power plant would avoid emission of about 100,000 metric tons of carbon dioxide per year. USAID also is exploring the potential impact improved motor efficiency would have on energy consumption.

USAID also is providing support to several non-governmental organizations, particularly to promote renewable energy project development. YBUL, an Indonesian non-governmental organization specializing in promoting private sector investment in renewable energy, is coordinating the Renewable Energy Network Indonesia, which fosters U.S. private sector investment in the Indonesian renewable energy sector. USAID also is working with Winrock International to demonstrate the commercial feasibility of wind power systems in Indonesia's eastern islands. The project will demonstrate the potential applications for wind energy in rural Indonesia and teach local people how to operate and maintain self-sustaining, wind-powered enterprises. Finally, in partnership with the World Bank and Winrock, USAID is developing several biomass energy projects.

The goal of the USAID energy sector effort in Indonesia is to avoid the emission of one million tons of greenhouse gases and local pollutants per year over the next three to five years. The projected energy savings over the next five years is 140,000 megawatt hours in 1989/1999, increasing every year until after five years (in 2002) the savings will have reached an estimated 420,000 megawatt hours.

USAID's program in Indonesia couples energy sector activities with an effort to decrease deforestation. Currently, about 70 percent of Indonesia's carbon dioxide emissions result from land use changes. The introduction of sustainable forest management policies and practices, including reduced impact logging techniques, offers significant opportunities to decrease the loss of carbon sinks. Strengthening and decentralizing Indonesian forest management are crucial components of USAID's climate change strategy. USAID's approach to forestry management in Indonesia includes helping the Indonesian Government to replicate natural resource management "best practices" in parks and protected areas; strengthening the roles of local communities and institutions in sustainable forest management; working with Indonesia's logging companies to convince them of the benefits of less damaging logging practices; and documenting lessons learned on sustainable forestry management policies and practices.

The impact of these natural resources management program in Indonesia will be measured in several ways. Direct USAID assistance with the management of parks, protected areas, and community-based forest and coastal resources is expected to impact 700,000 hectares by the year 2003. The broader estimated impact of USAID assistance is expected to be 17 million hectares in the year 2003. USAID also will examine the extent to which "best practices" are employed; it is estimated that they will have been put to use on 720,000 hectares by the year 2003.

Philippines. The demand for energy in the Philippines is growing exponentially. While energy consumption between 1980 and 1990 increased annually by 2.6 percent, it grew by 8.3 percent per year between 1990 and 1994. Over the next decade, per the Philippine energy plan, the Philippine power sector will grow by 350 percent. Coal will be the primary energy source. Deforestation also is a significant problem in the Philippines. In 1991-1992, land use changes accounted for almost 70 percent of carbon dioxide emissions. The rate of growth in net

greenhouse gas emissions will be a critical issue in the Philippines.

The Government of the Philippines is eager to collaborate with USAID in implementing strategies to improve energy efficiency and expand the use of clean fuels for power generation therefore, the most promising area for intervention in the Philippines at this time is the energy sector. The Government of the Philippines is very motivated to secure inexpensive, efficient energy supplies so that the country can sustain its economic growth.

The USAID strategy for work in the Philippine energy sector will include efforts to assist national climate change action planning, foster development of a policy framework to encourage private investment in clean technology and energy efficiency, collaborate with the Government of the Philippines to develop and implement several energy efficiency programs, and promote accelerated development of indigenous natural gas resources.

USAID will continue to provide technical assistance to the Philippine Department of Energy (PDOE), Philippines Department of Environment and Natural Resources, and the Department of Science and Technology in managing the Philippines National Action Plan to mitigate and adapt to changes in global climate. USAID is working with the PDOE to develop economic models that will enable policy makers to compare the financial, economic, environmental and social impacts of natural gas, coal and renewable energy technologies. Using this analysis, USAID will assist the PDOE to revise regulations to "level the playing field" among the various power generation technologies and require that new coal-based power meets the GOP's more stringent 1998 environmental standards.

USAID recently completed an analysis of constraints that impede expanded commercial investment in the development of renewable energy resources. Based on this analysis, USAID has opened discussions with the PDOE and other GOP agencies to amend the policy and regulatory constraints and look at changing institutional procedures that discourage investment. In addition to this work, USAID supports the Renewable Energy Project Support Office in the Philippines, which helps finance pre-feasibility studies of potential renewable energy projects.

USAID is carrying out a wide range of activities to improve energy generation, transmission, distribution and end-use efficiency. For example, USAID is financing a program that is working with the PDOE, the Philippines Energy Regulatory Board, and several industries to pilot industrial demand side management (DSM). USAID is also supporting industrial demand side management through the development of a database on motors, which will enable industry managers to compare life-cycle costs and efficiencies of various motors before making purchases, a national effort to enhance local capacity to test and rate electric motors, lights and appliances for energy efficiency and increase energy code compliance, and a commercial DSM effort focused on shopping malls.

USAID also has an on-going program to bring at least 10 percent (500,000 hectares) of the Philippines' remaining forests under more sustainable management by 1999. To achieve this goal, USAID is working with the Government of the Philippines to transfer management responsibility and use rights to communities that border or are located within public forest lands. In return for protecting and managing the forests, the communities will be given the right to harvest some forest products within the limits of an approved management plan. USAID, working through the Philippine Department of Environment and Natural Resources, is assisting the communities to develop these plans and set-up the management systems to monitor forest management. Since land conversion is a significant source of greenhouse gas emissions, putting in place this "social fence" already has significantly reduced the incidence of slash-and-burn agriculture and fire in areas under community-based forestry management.

The impact of these efforts to reduce greenhouse gases will be measured in terms of metric tons of greenhouse gas emissions avoided. Through efforts in the energy sector, USAID's goal in the Philippines between 1998 and 2002 is to avoid emissions of 40 million metric tons of carbon dioxide through efforts to promote the use of renewable energy technologies and natural gas, and 7 million metric tons through increased energy efficiency.

Central and Eastern Europe, and New Independent States

The transition from centrally planned to market economies in the countries of Central and Eastern Europe and the New Independent States of the former Soviet Union (ENI countries) has important implications for the energy and environmental systems affecting the threat of global climate change. The transition initially resulted in sharp reductions in economic output, energy consumption and greenhouse gas emissions from peak 1990 levels. While economic growth and energy demand have been restored in several countries that have implemented economic reforms, it will be some time before greenhouse gas emissions reach former levels.

The ENI region has significant fossil fuel energy resources as well as forests. Russia dominates production and consumption of fossil fuels and is the principal supplier of energy imports to Central and Eastern Europe and the New Independent States. Other major energy producers are Poland, Kazakhstan, Ukraine, Turkmenistan and Romania. As a heavily industrialized region, these countries are large and highly inefficient energy consumers. Due to an economic system that heavily subsidized energy production and consumption, energy intensity in the ENI economies — measured as the amount of energy consumed per dollar of GNP produced — generally ranges from double to quintuple the energy intensity of Western industrialized countries. For this reason, USAID's approach to mitigating the ENI-based threat of global climate change focuses heavily on energy efficiency and direct emissions reduction, with less emphasis on carbon-absorption and land management.

The four key climate change countries and region in ENI are Russia, Poland, Ukraine and the Central Asian Republics (CAR) of Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan. All use significant quantities of domestic coal and lignite — a major factor in their greenhouse gas emissions. Assessments have confirmed the substantial potential for coal-bed methane production. Nuclear power generation is significant in Russia and Ukraine (and Lithuania, Slovakia, Bulgaria and Romania), but many of the plants are unsafe. It is likely that thermal generation will replace some of these plants (increasing emissions), although potential for increased energy efficiency, if it can be realized would make it possible to defer new capacity in many cases.

With assistance from USAID and the multilateral banks, many ENI countries are undertaking major reforms to improve power-sector efficiency through the development of decentralized competitive power markets. USAID bilateral assistance programs are supporting these reforms by improving the legal and regulatory framework for investment and introducing commercial management systems in utility companies. Foreign investor interest is high in the CAR, Poland and Russia, and major strategic investors have committed to rehabilitation of thermal plants in the CAR and Poland. The creation of these power markets will lead to more rational energy pricing and improved tariff collection, which will provide incentives for energy efficiency investments. Competitive electricity markets also will improve efficiency and reduce emissions in the ENI region by helping foster the substitution of natural gas for coal as an energy source. USAID industrial and municipal energy efficiency programs are demonstrating the large potential for savings in heat and electricity, and supporting the development of local energy service companies (ESCOs) and associations.

In Russia, USAID is an active participant in the Environment Committee of the Gore-Chernomyrdin

Binational Commission, where efforts to introduce emissions trading are a high priority.

The bilateral programs in the key countries are complemented by ENI regional programs that seek to develop regional power pools and further interconnection with Western Europe, establish energy efficiency and environmental business networks and partnership arrangements between local and U.S. organizations, further cooperation among the growing number of ENI countries regarding the regulatory aspects of competitive power market development, and promote environmental trade and investment through U.S.-ENI business and non-governmental organization partnerships.

With respect to increasing carbon absorptive capacity, USAID programs in the ENI Bureau stress reliance on sustainable forestry. Programs in the region have used a multifaceted approach incorporating forest regeneration capability; fire suppression and control; reforestation requirements for logging concessions; efficient downstream processing of domestic timber harvests; conservation efforts aimed at preserving biodiversity; and promotion of ecotourism, non-timber forest products and indigenous cultures.

USAID's sustainable forestry program in the Russian Far East has worked in Primorskii and Khabarovskii Krai to build Russian capacity in all these areas. The program in the Ukraine has worked with local and national authorities to promote ecotourism and biodiversity conservation. USAID programs also build community-based forestry in Albania, and promote national parks and conservation areas in Bulgaria.

As the USAID program in Poland phases out over the next few years, USAID's strategy in ENI will shift to focus increasingly on efforts in the Southern Tier countries such as Romania. As Poland strives to meet European Union standards for accession, Polish efforts to reduce greenhouse gas emissions may only impact the margins of the issue while problems in other nations mount. Limited funding might best be dedicated to other countries.

Many of the ENI countries, as Annex 1 countries under the FCCC, will assume the same obligations under the Convention as the U.S. and other industrialized nations. USAID assistance to these countries will be structured specifically to meet specific emissions reduction obligations under the FCCC and facilitate participation in JI and emissions trading regimes.

Central Asia. Kazakhstan is the twenty-third largest emitter of carbon dioxide worldwide and has the second highest rate of per capita greenhouse gas emissions after the United States. Uzbekistan also is a significant carbon emitter, ranking 27th worldwide in industrial carbon dioxide emissions. The nations of the CAR are highly interdependent when it comes to energy sector resources. All share the same watershed; hence, when Kyrgyzstan absorbs a higher percentage of the available hydroelectric power, Kazakhstan is forced to increase its dependence on coal. All of the Central Asian Republics – Kyrgyzstan, Kazakhstan, Turkmenistan, Uzbekistan and Tajikistan – have significant oil and gas, electric power and natural resources management needs. USAID therefore considers the CAR a key climate change region.

Part of the explanation for the high rate of emissions is the fact that Kazakhstan has large energy-intensive metal, chemical and refining plants within its borders. Kazakhstan also has approximately 24.5 million hectares of forest land, 95 percent of which is protected area. In 1995, there were 1,320 forest fires in Kazakhstan which destroyed thousands of hectares of forest. Pests severely affected another 163,500 hectares. Almost 80 percent of all greenhouse emissions generated in Kazakhstan come from the use of coal in the electrical power sector. Kazakhstan is a major producer, consumer and exporter of coal, and a net importer of electricity. Kazakhstan produces about 125 million tons of coal per year, about 70 percent of which is consumed

domestically. Oil consumption accounts for 40 percent of the carbon dioxide produced from fossil fuels every year. Development of the oil and gas sector in the Caspian Sea is expected to accelerate rapidly and will likely result in greatly expanded refining capacity in the basin. Finally, natural gas resources in Kazakhstan offer the potential to reduce emissions by reducing coal and oil consumption.

USAID will expand its global climate change strategy in the CAR to support power sector restructuring and environmentally sound development of oil and gas resources. After meeting needs in these priority areas USAID will contemplate support for the urban and industrial pollution control activities of the Kazakhstan National Environmental Action Plan being developed in cooperation with the World Bank. Finally, limited agriculture sector interventions to mitigate global climate change also may be undertaken.

Poland. Poland has the largest electric power sector in Central and Eastern Europe, 90 percent of which is coal-based. Sixty percent of Poland's industry relies on coal. Poland is the sixth largest emitter of carbon dioxide in Europe. On a per capita basis, carbon dioxide emissions are slightly above average for OECD/European Union member countries, however, Poland produces twice as much carbon dioxide per unit of GDP as the worst emitter in the OECD. Methane emissions result mainly from animal husbandry and coal extraction (1 million tons each). A relatively small quantity comes from landfills (360,000 tons). In fact, the combined effect of methane emissions may be as large as one-third of the effect of carbon dioxide emissions.

In 1991, the U.S. swapped 10 percent (\$360 million) of Poland's total debt in the region's first debt-for-nature swap aimed at protecting and improving the environment. One year later, the newly established Ecofund received \$26 million in funding from the swap. Projects that reduce greenhouse gas emissions are the fund's top priority. To date, USAID has undertaken more than \$33 million in environmental project activities in Poland, including improvements in district heating, promotion of energy-efficient buildings, and clean coal and low emissions demonstration projects. The GEF project in Poland targets the reduction of emissions through gas conversion, forestry development and biodiversity activities.

The Government of Poland has made environmental considerations prominent in its national Transport Policy (1994) and Industrial Policy (1993). These new laws address the pollution caused by the transport sector, including fuel sources, as Poland rebuilds its infrastructure. The legislation introduces an obligation to: prepare environmental impact assessments for investments related to transport infrastructure; tighten the requirements for reduction of exhaust gases; increase power efficiency; and set new standards for fuels with a lower content of hazardous substances. The dramatic increase in vehicle usage, however, coupled with new road projects, may offset progress.

The National Agency for Efficient Energy Use and the Polish Power Centre were recently established. Parliament has adopted a national energy policy through the year 2010. In addition, a modest fee on carbon dioxide emissions was introduced in 1995 and government subsidies to the coal industry have been reduced. Procedures for "tradeable permits" for emissions are being developed. Energy consumption per unit of GDP during the period 1991-1995 dropped by about 18 percent, and coal use decreased markedly.

USAID will contemplate efforts in Poland focusing on the energy, transport and solid waste sectors. In the energy sector, efforts would focus on improving district heating systems; promoting integrated resource planning; promoting energy efficiency in industry and municipalities through demonstration projects, energy efficiency investment planning and financing; renovation of buildings; and strengthening energy service companies. Efforts in the transport sector would focus

on enhancing the ability of local governments to plan and manage transport infrastructure to improve air quality and reduce greenhouse gas emissions. Activities to improve solid waste management will focus on reducing methane emissions. As part of its Local Government Partnership Program (LGPP), USAID would focus climate change efforts in Poland on selected activities at the local level. USAID would not be involved in policy creation on the central level, except perhaps in response to a specific request from the relevant central administration.

Russia. Russia is responsible for approximately 10 percent of the world's greenhouse gas emissions (which is 22 percent lower than it was in 1990). The energy sector is the major source of emissions (up to 98 percent of carbon dioxide, and over 50 percent of methane and oxides of nitrogen). Russia also contains more than 22 percent of the world's forested area, 50 percent of the world's coniferous forest lands, and 21 percent of its estimated timber volume. Because Russia's forests provide the largest land-based carbon store in the world, the threats posed by logging and inefficient land-use practices pose critical global threats.

The Russian Federation ratified the FCCC in November 1996. In 1995-96, the Russian Federation prepared the Federal Program for Climate Change to focus on policy reform, capacity building, and the introduction of new technologies to transform the Russian energy and forestry sectors into sustainable areas of growth. Building on the commitment of the Russian Federation and the support of the international development community, the primary areas of opportunity for intervention in Russia will be in energy and industry, sustainable land use and forestry, and natural resources management.

The Russian energy sector suffers from overwhelming financial difficulties, extreme inefficiencies, and the difficulties of transition from a large, centrally planned state entity to a modern, efficient provider of energy. The Russian energy sector can reshape itself to support the transition to a market economy while supporting climate change initiatives by rationalizing energy prices and developing sound national energy policies; improving energy efficiency in industry, buildings, electric and municipal heating systems; and restructuring, commercializing and privatizing specific energy sub-sectors.

Forestry and natural resource management also will be critical. Sustainable land-use policies will be needed to balance the demand for valuable natural resources with the desire to protect the environment. Interventions— such as land-use zoning, sustainable agriculture, land-use planning, forest and timber management, and GIS— could have the greatest impact. USAID and the Government of Russia share the goal of strengthening the policy and institutional framework for sustainable natural resource management, promoting environmentally sustainable forest management, and protecting endangered species and critical habitats.

USAID has begun to address global climate change-related issues by providing assistance to Russia in reshaping its energy sector to support the transition to a market economy. The program supports efforts to rationalize energy prices and develop sound national energy policies, and restructure, commercialize and privatize specific energy sub-sectors (power, oil, gas and coal). The project supports cooperation between U.S. and Russian utilities and energy organizations. USAID also support efforts to promote fuel switching and combustion efficiency in district heating boilers and central power plants. Additionally, a housing sector reform program promotes residential energy efficiency in six cities in Russia by installing meters. USAID also provides assistance to strengthen the policy and institutional framework for sustainable natural resource management; promote environmentally sustainable forest management; and enhance the protection of endangered species and critical habitats. USAID is supporting the development of sustainable land-use programs in four of Russia's most pristine areas.

In coordination with the Government of Russia, USAID has identified strategic areas to address climate change-related concerns over the next five years. USAID would build on its current energy and forestry portfolios. On the energy side, the focus will be on energy sector restructuring and tariff reforms, particularly in the electric utility sector to increase power generation, transmission, distribution and end-use efficiency. In forestry, programs will include additional work on fire management, reforestation and forestry policy. USAID will add technical assistance to support emissions trading if consensus in support of emissions trading is obtained at the third Conference of the Parties and Russia agrees to implement a bilateral emissions trading program.

Ukraine. Ukraine is the eighth largest industrial emitter of carbon dioxide. Ukrainian emissions result from the fact that a high proportion of the economy is devoted to manufacturing using energy-intensive equipment and outdated technology. In 1995, emissions of carbon dioxide were 9 percent lower than 1990 levels. This was due to a drop in industrial output and a 13 percent decrease in the supply of fossil fuels. During the same period, however, coal's share of the Ukrainian fuel supply rose by 15 percent. Ukraine's 1995 carbon dioxide was 13 tons per capita—greater than the European Union targets which are 5.4 tons per capita in 2010 and 1.1 tons per capita in 2050. As Ukraine's economy recovers and its industry, agriculture, and energy sectors increase output, emissions of greenhouse gases will rise unless significant interventions are made to restore sinks and minimize sources.

The Government of Ukraine (GOU) is currently planning how to meet its obligations under the FCCC. The GOU signed or ratified more than 20 international agreements pertaining to the environment that require the modification of legislation. The Ministry of Environmental Protection and Nuclear Safety (MEPNS) is undertaking a series of programs to comply with the agreements. MEPNS has identified a series of strategic interventions that will be required to comply with the climate change convention. According to preliminary calculations, Ukraine's emissions of greenhouse gases can be reduced below 1990 levels by implementing the "State Complex Program of Energy Efficiency in Ukraine up to 2010." The GOU estimates it can reduce emissions of greenhouse gases equivalent to 104 million tons of carbon dioxide by the year 2015 through increased energy efficiency in industry, municipalities, transportation, agriculture, gas, and the fuel and power sectors.

The GOU recognizes the need for significant investments and restructuring of its economy, particularly the energy and industrial sectors. With investments of \$300 to \$400 million, the Government estimates that coal bed methane technology could reduce emissions of methane by 3,348 metric tons. An investment of \$4 to 6 million in diagnostics could introduce efficiencies and reduce system losses in the methane production, storage and distribution network by 6138 metric tons. Emissions of nitrogen oxides could be reduced by introducing specialized combustion equipment and technologies for \$15 to 20 million. Investments of \$1.1 billion to establish new waste processing enterprises would enable the Ukraine to reduce the volume of solid wastes at landfills and reduce methane emissions. Installation of purification facilities for wastewater processing would enable the methane recovery and result in significant methane emission reductions.

The GOU is studying the use of economic instruments to achieve its reduction goals and commitments. The reform program in Ukraine has not moved smoothly or predictably. Because of the large manufacturing sector, the heavy reliance on coal, and the Chernobyl issue, USAID has focused on demonstration activities and targeted policy assistance. The current emphases are energy efficiency, waste minimization, environmental auditing, demand side management, coal bed methane, policy reform, sustainable agriculture, sustainable forestry and biodiversity conservation.

USAID's ongoing programs in energy efficiency, waste minimization, alternative energy sources, renewable energy, power and coal sector reform and natural resources conservation provide significant support for the climate change-related priorities of the GOU. Additional resources would enable USAID to leverage international financial institutions and the private sector to institutionalize these programs, fill critical gaps in existing programs, and help Ukraine fulfill the terms and spirit of the FCCC. Activities would be initiated to encourage gas sector reform, promote clean coal technology, increase fuel efficiency and improve transport planning, increase energy efficiency in district heating, improve municipal waste and landfill management, and enhance forest conservation.

Latin America and the Caribbean

USAID has two key climate change countries and one key region in Latin America. For more than seven years, USAID's climate change activities in Brazil, Mexico and Central America have introduced cutting-edge energy technologies and improved land use practices that reduce greenhouse emissions and continue to leverage significant donor resources.

The USAID program in Brazil protects forests covering an area larger than the country of Israel and has introduced pilot activities for protecting forests that have leveraged tens of millions of dollars from the G-7 Pilot Program to Conserve the Brazilian Amazon. In Mexico, USAID's efforts have reduced deforestation rates and have avoided the emission of more than 350,000 tons of carbon dioxide through the promotion of renewable energy and energy efficiency. Many of those energy programs are now being replicated with Government of Mexico and World Bank funding. In Central America, USAID has improved protection of over 20 forested national parks, established trust funds for forest conservation and environmental protection in six countries, supported establishment of joint implementation offices in 2 countries, and launched a region-wide \$10 million environmental enterprises fund with Inter-American Development Bank and bilateral support. USAID intends to build on these successes. USAID also is continuing its programs to protect the forests of the Andean countries by promoting forest conservation and sustainable forest management programs in Ecuador, Peru and Bolivia and the regional Parks in Peril program.

Complementing the core program of activities in Latin America have been initiatives focused on building the portfolio of environmental programs in the region. For example, in 1995, the Environmental Initiative for the Americas devoted \$9.7 million to promoting sustainable energy production and use throughout Latin America; that initiative spurred a greater focus on promotion of renewable energy and energy efficiency in Central America, the Dominican Republic, Brazil and Mexico.

Brazil. Brazil is the largest emitter of greenhouse gases in Latin America, and in 1991 was estimated to be the fifth largest net greenhouse gas emitter worldwide (WRI, 1991). Most of Brazilian emissions result from the loss of Amazonian forests. From 1980-1990, Brazil's annual deforestation rate was 0.6 percent per year. Although this may seem modest compared to other tropical countries, 3,6700,000 hectares of forests were lost over the decade; between 1991 and 1994, the deforestation rate increased to about 0.8 percent per year.

Brazil is also the 22nd largest industrial greenhouse gas emitter. According to a 1997 WorldWatch Institute report, Brazil's industrial carbon dioxide emissions increased 20 percent from 1990 to 1995. Given the recent improvement of Brazil's economy, it is likely that industrial carbon dioxide emissions will continue to increase.

Brazil's poor and overpopulated northeast region is particularly vulnerable to climate change if the

frequency of regional droughts increases, as predicted by some climate change scenarios. Similarly, if the potential for increased El Niño events increased, it would threaten the globally important biological diversity of the Atlantic Coastal Rain Forest ("Mata Atlantica") and the neighboring Cerrado, which harbors Brazil's agricultural heartland.

USAID has robust forestry and energy sector efforts in support of its climate change-related goals. The program works primarily through U.S. non-governmental organizations and a host of partner Brazilian organizations. In the forestry sector, the presence of large, multi-donor efforts in the Brazilian Amazon and Mata Atlantica as well as the proliferation of strong Brazilian environmental non-governmental organizations provide a unique opportunity for successful USAID interventions to reduce greenhouse gas emissions from deforestation. The multilateral G-7 Pilot Program to Conserve the Brazilian Amazon (PPG-7), a \$290 million effort managed by the World Bank, is beginning to implement forest conservation activities, primarily in the Amazon.

To meet its energy needs, Brazil will need more than 6,000 megawatts of additional generation capacity by the year 2000. This increased energy demand does not fully account for the development needs of the poor. Currently, Brazil's electric grid system fails to reach approximately 30 million people. Much of the additional capacity will probably come from fossil fuel power plants. In an effort to avoid constructing some new capacity and deliver energy services to a greater percentage of the population, USAID will promote clean renewable energy technologies and help the Brazilians shape and implement a \$150 million renewable energy loan from the World Bank. To minimize the need for new capacity, USAID also will work with Brazil's rapidly privatizing industrial sector to increase energy use efficiency.

The USAID forestry program in Brazil will continue to promote the development of ecologically and economically sustainable policies and activities to manage forest resources in the Amazonian states. The program's strategic focus will include applied research and demonstration activities with forest communities on harvesting non-timber products from standing forests and plantations; training and institutional strengthening in research, planning and management skills; and policy analyses and environmental impact assessments. USAID will continue to influence the design and implementation of the PPG-7, particularly the Directed Research and Science Centers component; USAID and its Brazilian partners will demonstrate successful alternatives to tropical deforestation and unsustainable land use practices that can be replicated. Smaller activities will conserve key fragments of the Mata Atlantica.

USAID's energy strategy in Brazil will continue to promote the use of renewable energy and energy efficiency technologies, improve private sector participation in the energy services sector, and train key public and private sector personnel in the technologies, approaches and public policies necessary to promote clean energy sector development in Brazil.

Over the next two years, USAID's global climate change program in Brazil will focus more on promoting effectively managed forests and conservation units, especially in the Amazon, and increasing the use of efficient and renewable sources of energy. By the end of 1999, 9 million acres of parks and extractive reserves will be better protected, 600,000 acres of Amazon commercial forests and agroforestry systems will be managed sustainably, 200 megawatts of energy from renewable sources will be produced in northeast Brazil, and the Brazilian industrial sector will save 300 megawatts of energy by adopting energy efficiency technologies.

Central America. Central America is unique in the developing world because of its unequivocal support, at the highest levels of government and industry, for North-South collaboration on climate change initiatives. Central America has been particularly effective among G-77 countries in

promoting approaches which promote climate change mitigation and adaptation. Designating Central America as a priority region will recognize and ensure continuation of its climate change leadership. It also will promote and accelerate a wide range of additional initiatives that will serve as models for the rest of the developing world, including those intended to transcend national boundaries or affect small nations.

Central America also possesses two of the Western Hemisphere's largest contiguous carbon sinks north of the Amazon: the Mayan Forest in Guatemala and Belize (and southern Mexico) and the Mesquitia Region of Honduras and Nicaragua. Unfortunately, Central America's deforestation rate ranks among the world's highest and currently stands at an estimated 2.13 percent loss in forest cover per year.

Central America depends heavily on hydroelectric power for energy. Should climate change impact rainfall patterns or reduce forested watersheds, electricity production and economic development, will be greatly impaired. In addition to changes in rainfall patterns, were the El Niño effect to be exaggerated, it also would lead to increased desertification, crop failure, flooding and landslides with significant losses in national production, infrastructure repairs and human casualties. Coastal zones are especially vulnerable to flooding during storm surges if major climate events, such as hurricanes, increase. In the Caribbean, along the world's second largest barrier reef, the growing ecotourism industry is vulnerable if climate change leads to coral bleaching. In some cases, the coral around keys off the coast of Belize have already suffered.

At the December 1994 Miami Summit of the Americas, the Heads of State of the U.S. and Central America signed the "Declaracion Conjunta Centroamerica-USA" (CONCAUSA)– a joint declaration and Action Plan to protect the region's rich biodiversity, strengthen environmental protection legislation, expand renewable energy use and promote more open trade. CONCAUSA, therefore, demonstrates the region's political will, and U.S. Government's commitment, to confront the critical deforestation and sustainable energy supply problems.

Within the energy sector, recent serious shortages of electricity rocked the region's economies, especially in Honduras. As a result of these shortages, and in concert with worldwide trends, the countries of the region have been shifting toward private sector involvement and investment in the power sub-sector, greater interest in renewable energy sources, and increased desire to acquire U.S.-based energy technologies.

USAID's primary approach to addressing climate change issues in Central America is to ensure the conservation of critical carbon sinks which simultaneously protect biological diversity. Additional key approaches include improving the region's legal and regulatory frameworks to reduce greenhouse gas emissions, such as methane gas from Central America's urban landfills, to encourage rural electrification using renewable energy, and to foster private sector investment in clean energy technologies (renewable energy and energy efficiency) through joint implementation.

USAID will work regionally and bilaterally to address these needs. Regionally, USAID will accelerate work developing and disseminating models for reducing the impacts of climate change, such as regional projects to capture carbon within the Meso-American Biodiversity Corridor; encourage shaded coffee and methane gas recovery; establish a regional monitoring, reporting and feedback systems to facilitate the flow of resources to the most effective mitigation efforts, further develop private sector partnerships and access to U.S. technology, and engage in regional policy dialogue and donor coordination. Bilaterally, USAID will assist host countries to establish and strengthen national climate change offices, clarify institutional responsibilities, identify national climate change priorities, conduct training and provide technical assistance in carbon sequestration

certification and monitoring, develop new joint implementation projects, and facilitate participation in the FCCC.

Mexico. Mexico is the second largest emitter of greenhouse gases in Latin America and the twelfth largest industrial emitter of greenhouse gases worldwide. Significant Mexican greenhouse gas emissions also result from deforestation. Between 1981 and 1990, the Mexican deforestation rate was 1.3 percent per year, meaning that almost 6.8 million hectares of Mexican forest were lost over that time.

Mexico's drylands and coastal areas are especially vulnerable to climate change. Many formerly fertile areas of northwest and Central Mexico are desertifying due to unsustainable land use practices. The increased droughts that are expected under some climate change scenarios would exacerbate the desertification problem, reducing agricultural yields and water supplies, and increasing poverty and migration. Coastal areas— including many tourist zones, such as Cancún, Mazatlán and Puerto Vallarta— would be vulnerable to sea level rise. Coral reefs could experience increased bleaching and death as water temperatures rise. Mexico's Caribbean coast, which is already vulnerable to hurricanes, could suffer severely if the frequency of severe weather events increased.

Currently, more than 80,000 villages, or about 5 percent of households, lack electricity. In response to this need, and a Presidential pledge to electrify every Mexican village of 100 or more people, several Mexican federal and state agencies are promoting renewable energy technologies as a tool for providing electricity to the rural poor. Joint USAID and the U.S. Department of Energy pilot renewable energy projects were instrumental in leading the Mexicans to this strategy. Maquiladora industries, which are growing at 5 percent per year, are starting to profit from energy efficiency and pollution prevention technologies that make them more competitive while reducing greenhouse gas and noxious emissions. In Mexico City, the integration of renewable energy, energy efficiency and pollution prevention activities into Resource Management Systems is occurring through USAID-supported demonstration activities. Mexican energy organizations have been replicating USAID-funded energy efficiency activities.

The Government of Mexico, with support from the GEF and the USAID-supported Mexico Nature Conservation Fund, has committed to conserving Mexico's biological diversity. Much of this biodiversity resides in heavily forested protected areas that also are significant carbon sinks. Additionally, the increasing number and strength of Mexican non-governmental organizations and community-based organizations interested in conservation and natural resource management offer unique opportunities to strengthen local capacity and garner grassroots support for conserving Mexican forests.

The USAID energy sector program in Mexico will reduce greenhouse gas emissions from the energy sector by promoting clean energy technologies (eg. renewable energy, energy efficiency and pollution prevention); fostering the introduction of policies to promote investment in clean energy technologies; and strengthening Mexican institutions involved in promoting, financing and regulating clean energy technologies.

As part of a strategy to protect Mexico's globally important biological diversity while addressing climate change issues, USAID will help protect Mexican carbon sinks by improving the management of forested protected areas and buffer zones. Key interventions will include supporting on-site management of core protected areas; providing alternatives to deforestation and unsustainable land use in the buffer zones around protected areas (eg. agroforestry, organic coffee production, and ecotourism); promoting sustainable, non-destructive resource use in buffer zones and non-protected

areas (eg. sustainable forestry, honey production and marketing and use of medicinal plants); strengthening Mexican organizations devoted to conservation; and improving the policy environment for protected areas management.

Over the next two years, the USAID global climate program in Mexico will reduce carbon dioxide emissions from industrial and household sources and reduce deforestation rates in southern Mexico. By the end of 1999, the adoption of renewable energy and energy efficiency technologies will prevent the emissions of almost 820,000 tons of carbon dioxide and the yearly deforestation rate in targeted areas will be reduced by 33 to 50 percent. In addition, more than 80 industrial firms will adopt cleaner production technologies and practices, more than 6,500 Mexican will benefit from adopting clean energy technologies, and more than 15 million acres of Mexican protected areas and their buffer zones will be adequately managed.

Managing the Action Plan

USAID Management

USAID programs are designed and implemented in collaboration with developing nations to target local priorities and develop locally-appropriate solutions. The Climate Change Action Plan provides a framework and a set of priorities based upon which activities will be designed and implemented. Programs under the Action Plan will combine an emphasis on meeting local needs with a greater focus on the global goals and objectives described in the action plan. Activities will be developed in partnership with beneficiaries to address local priorities while combating the rate of growth in net emissions of greenhouse gases.

A USAID Climate Change Committee will be formed to make decisions over issues of policy related to implementation of the USAID Climate Change Action Plan. The Committee will include representatives nominated by Assistant Administrators from each bureau within USAID.

The Agency-wide Climate Change Team will continue to serve as the locus for information sharing on programming, current events, results reporting and USAID collaboration with other Agencies and development partners. Consistent with its role as Agency technical representative on climate change, the USAID Global Bureau Center for Environment (G/ENV) will continue to facilitate the Climate Change Team.

The USAID Policy and Program Coordination Bureau (PPC) will continue to oversee and ensure the consistent application of USAID policy on climate change Agency-wide. PPC will continue to act as USAID representative on matters of policy. Finally, as the USAID Bureau with the lead for development partnering, PPC will ensure that climate change receives a high level of attention on the Agency's development partnering agenda, and will facilitate the involvement of other USAID actors in this area.

G/ENV will continue to serve as USAID representative to all inter-agency climate change programs. G/ENV will be expected to inform fully other centers within the Global Bureau, regional bureaus and missions of all relevant activities, analyses, workshops and conferences being undertaken by inter-agency programs, and provide ample opportunity for mission and/or regional bureau involvement. G/ENV also will be expected to monitor and report on the results achieved for USAID contributions to inter-agency activities.

The USAID Management Bureau will ensure that obligations are commensurate with fulfilling the President's commitment. The Management Bureau also will provide guidance on closeout plan and non-presence country procedures related to operating in countries moving to non-presence status. PPC and G/ENV Bureau will track attributions of funding for climate change against reporting of results to the Agency-wide Special Objective on climate change. A review and revision of the Activity Code/Special Interest (AC/SI) coding system will be undertaken to ensure that coding facilitates reporting.

Budget

The obligation of resources under the President's Initiative will focus on mitigating net greenhouse gas emissions, and fostering developing and transition country participation in the FCCC. USAID obligations will include at least \$750 million in grant assistance over the next five years, as well as the use of credit instruments to leverage at least \$250 million in additional climate change-related trade and investment.

An annual floor of \$150 million in Agency-wide climate change-related obligations will be created for the next five years. Of the total \$750 million in climate change-related grant assistance, at least 40 percent will be obligated to programs in the Agency's key climate change countries and regions. A significant additional percentage will be obligated to the Agency's program in Egypt. Assuming Congressional approval for the use of credit, at least two thirds of the investment USAID stimulates through the use of credit instruments as part of its climate change strategy also will focus on USAID key climate change countries and regions.

USAID funding for Inter-Agency Climate Change Programs will come from the overall Agency budget. An additional increment will be devoted to climate change from the overall Agency budget for each of the five years of the Action Plan. Those funds will support inter-agency climate change programs.

Monitoring and Measuring Results

Monitoring and measuring the results achieved will be among the Agency's highest priorities. The Agency will complement its extensive suite of indicators of local program success with measures to capture the total climate change-related impact of Agency programs. Reporting will begin at the end of FY 1998.

USAID's climate change indicators will measure the impact of programs, assess the most effective strategies for combating the threat of climate change, and hone and focus the Agency's approach. One proposed measure will track avoided greenhouse gas emissions. The target will be developed by examining total emissions from each relevant nation and region (in particular USAID key countries and regions) and determining a reduction that will be in USAID's manageable interest. The target also will be derived by examining existing related USAID targets to determine the estimated Agency-wide impact on emissions over five years. A measure related to policy reform and human capacity development also is being developed. It will look at the extent to which policies and measures that foster "climate-friendly" development are being adopted in key climate change countries and regions. Targets related to each of these indicators will be developed over the next six months.

In the immediate term, the measure of success for activities to decrease vulnerability to climate change will be based upon mission indicators and targets. Once an analysis of critical areas of vulnerability is completed, objectives for specific sectors and countries may be set. Achievement of local objectives relevant to decreasing vulnerability to climate change also will be tracked.

To the extent possible, USAID will develop its indicators and performance monitoring plan (PMP) to build on existing indicators and information collection resources being used by USAID bureaus and missions. Data and information collection methods that have been created by such organizations as the National Aeronautics and Space Administration, the World Resources Institute, Winrock International, the Woods Hole Research Center, the World Bank and the National Oceanic and Atmospheric Administration will be reviewed for their relevance and utility, and incorporated into the PMP as appropriate.

The Agency-wide climate change PMP will be completed by April 1998. Reporting will begin at the end of FY 1998. USAID will report annually on the status of the Initiative using standard reporting procedures. Reporting on the initiative will be encompassed in the Results Review/Resource Request document for USAID's Bureau for Global Programs, Field Support and Research. The Agency will issue a final report at the end of the five-year period summarizing achievements and lessons learned.

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Text Box 1: Industrial Energy Efficiency in Mexico to Decrease Emissions

In Mexico USAID is working in collaboration with the Mexican National Commission for Energy Savings (CONAE) to improve the operating efficiency of industrial boiler and steam systems. USAID experience with boiler tune-up programs has demonstrated that efficiency improvements of 7-8 percent are achievable with little additional investment. An increase in efficiency of this magnitude reduces hydrocarbon and carbon monoxide emissions by up to 40 percent, resulting in a significant local air quality benefit and reduced greenhouse gas emissions. Additional benefits are attainable with steam system improvements.

The CONAE-USAID program is being carried out on a pilot scale. Thirty representative industrial plants throughout Mexico are participating. The pilot includes detailed audits of the boiler, steam distribution and condensate systems, training of plant staff, offers by equipment suppliers to provide high-efficiency equipment at reduced cost, and support to finance implementation of audit recommendations. The pilot activities also build technical and institutional capacity, and support the local private consulting firms that are carrying out most of the activities.

Audit results to date show a potential savings of up to 10 percent with a payback of 2 years or less. Upon completion of work in all 30 pilot plants, CONAE will have a detailed database of energy savings opportunities and the required investments that will be applicable to the whole industrial sector. On the basis of the pilot project, USAID and CONAE will design a project for implementation nationwide over the next several years.

Text Box 2: Reducing the Destruction of Forest Carbon Sinks: Reduced Impact Harvesting

In many countries around the world, poor logging practices cause severe erosion, damage to trees, loss of biodiversity, and an increase wood waste on the forest floor, increasing the risk of fire. Recent studies show that Reduced Impact Harvesting (RIH) can increase the volume of saleable wood while reducing forest damage by 50 percent, decreasing the release of carbon.

USAID is assisting efforts by the Tropical Forestry Foundation (TFF), the Center for Forestry Research (CIFOR), the U.S. Forest Service, the Brazilian and Indonesian governments, and others to establish RIH demonstration sites in Brazil and Indonesia. These two USAID-assisted countries have vast timber resources that are being rapidly exploited. The objective of the program is to encourage sustainable forest management through improved forest policies and the widespread adoption of RIH techniques.

Even in its earliest stages, the program is showing signs of success. RIH techniques have generated widespread interest at universities and research centers, and among timber trade groups and lending institutions. In Brazil, the World Bank redesigned an \$18.1 million forest management program to incorporate RIH after seeing the benefits of these techniques. The International Tropical Timber Organization recently agreed to fund a series of workshops to expand adoption of RIH in Latin America.

Text Box 3: Biodiversity Conservation and Climate Change

USAID's biodiversity conservation program in Madagascar is a good example of how ongoing biodiversity initiatives help mitigate climate change and its impacts on biodiversity. Madagascar is one of the highest biodiversity conservation priorities in the world. The island currently has less than 15% of its original forest cover, and at current deforestation rates, forest cover will disappear within 25 years.

USAID has implemented an aggressive program to combat deforestation and maintain the remaining large tracts of forest on the island. Already, there is evidence that deforestation in and immediately surrounding key protected areas is halting. This has been accomplished through an integrated program of improved park management and surveillance, combined with outreach and development initiatives designed in partnership with local communities. Without these

interventions, deforestation on the island would likely continue, permanently destroying Madagascar's significant carbon-sequestering forests and reducing the ability of many species to adapt to climate change.

Text Box 4: Combatting Climate Change in an Urban Context

The Sustainable Cities Initiative (SCI) enhances environmentally sound economic growth through broad-based partnerships to promote efficient resource use in cities. The program promotes municipal, non-governmental and private sector investments in energy efficiency and clean energy technology, and leverages funding from international financial institutions and foundations.

In Ahmedabad, India USAID and the U.S. Environmental Protection Agency are supporting an effort to address some of the critical environmental challenges faced by the city. The program has created an alliance involving the Ahmedabad Municipal Corporation (AMC), the Ahmedabad Electricity Company (AEC) and Arvind Mills, one of the largest denim producers in the world which is located in the area.

SCI has helped AEC design and implement three pilot programs to test and install high efficiency equipment. AEC is investing \$700,000 in energy efficiency in FY97, and will scale-up its projects in 1998. AEC expects to reduce demand by 24 megawatts, avoiding emission of 133,000 tons of carbon dioxide.

AMC has created an energy efficiency unit with private foundation support as a result of the program. AMC is studying the potential savings the city might accrue from streetlight upgrades and water pumping improvements. Already AMC has invested to improve power factors, and retrofit water pumps and streetlights to reduce energy costs and consumption.

As a result of SCI, Arvind Mills is developing an environmental management system to meet the requirements for ISO 14001 certification. The company also has identified environmental improvements it will introduce in 1998. Arvind Mills' leadership has lead several other manufacturers to perform environmental audits that will reduce pollution.

It is too early to assess the results of these efforts, but the project is a good example of an integrated and coordinated approach to reducing urban greenhouse gas emissions.

Text Box 5: Decreasing the Climate Change Risk in Coastal Zones

Following devastating floods in 1987 and 1988, USAID developed a program to broaden water resources management in Bangladesh. The objectives were to strengthen local capacity to predict flooding, improve short-term disaster preparedness, and optimize investments in flood control, irrigation, drainage and domestic water systems. As a result, modifications were made to proposed flood control structures that would have interfered with fisheries and agricultural drainage while offering marginal protection. To predict annual flooding, a Geographic Information System using satellite data, cloud-penetrating radar and advanced river survey equipment was introduced. These immediate improvements in Bangladesh's ability to manage flood variability also enhanced Bangladesh's ability to manage the long-term hydrological effects of climate change.

Text Box 6: Decreasing Vulnerability to Climate Change by Improving Shared Resource Management

USAID recently sponsored water policy dialogues in the Central Asian Republics of Kazakhstan, Kyrgyzstan and Uzbekistan in response to a 1996 water allocation crisis that arose along a river the countries share. Faced with diminished heating fuel supplies during the winter of 1995-96, the Kyrgyz Republic accelerated hydropower production, reducing Spring water availability for agricultural production in neighboring Uzbekistan and Kazakhstan.

In May 1996, the three governments signed a declaration agreeing to develop coordinated strategies for water allocation and management for transboundary flow; develop legislation and economic tools for water resource allocation; and use

the Toktogul hydropower dam in conjunction with a program to exchange hydropower for gas, coal and oil products. USAID helped organize high level meetings involving the three governments to develop an implementation strategy. Participants discussed the need to establish an inter-republic water rights policy incorporating a water pricing scheme for end-user payment, quality guidelines, efficiency measures, and a management structure to promote stability and shift production decisions to water users, particularly in the agriculture sector.

This program demonstrates the importance of a deliberative policy-focused approach to allocating natural resources that may be threatened by climate change. USAID helped advance development of a long-term solution to water scarcity by promoting open and constructive dialog using participatory approaches to resource sharing.

Text Box 7: The Role of Partnerships with the Private Sector: The Utility Partnership Program

Over the last five years, in partnership with the U.S. Energy Association (USEA), USAID's *Utility Partnership Program* has paired over 35 utilities in developing and transition countries with sister U.S. utilities. Additional partnerships, including five more in India, are planned in the near future.

Each utility pair has a specific workplan structured to foster such efforts as Demand-Side Management (DSM), increased transmission and distribution efficiency or thermal efficiency. Utilities cover the costs of personnel. USAID covers out-of-pocket expenses. The results are impressive. This practitioner-to-practitioner partnering program has improved operations, mitigated the impact of power generation on the environment, stimulated sales of U.S. technologies and opened the door to emerging markets for U.S. utilities.

U.S. utilities currently involved in the program include: Alabama Power, Boston Edison, Brooklyn Union, Central and South West, Central Maine Power, Cincinnati Gas and Electric, CMS Energy, Columbia Gas, Commonwealth Edison, Entergy, Georgia Power, Houston Lighting and Power, Illinois Power, Kentucky Utilities, Mississippi Power, National Fuel Gas, New England Electric, New York Electric and Gas, Otter Tail Power, Pennsylvania Power and Light, Questar, Sacramento Municipal Utility District, Southern Electric, Tennessee Valley Authority, Washington Water Power and Yankee Gas.

Under the Climate Action Plan, USAID is considering establishment of a project development fund to encourage utility partners to develop specific carbon emissions reduction projects. The fund would be structured to support pre-investment analysis. USAID would support project preparation for funding by the Global Environment Facility (GEF) and others, such as the recently-approved International Finance Corporation's "Renewable Energy and Energy Efficiency Fund".

Text Box 8: Institution Strengthening as a Climate Change Mitigation Strategy: The Case of Energy Sector Training in Indonesia

Training is integral to USAID's extensive energy sector program in Indonesia. In 1996, the USAID Energy Training Program focused on enhancing sugar industry ability to use cogeneration as a power source. Three courses were organized: "Sugar Industry Cogeneration Project Development", "Renewable Energy Project Finance" and "Renewable Project Bid Solicitation." Each course involved experienced U.S. experts as instructors and resource people. As a direct result of the training, Indonesia's national utility has approved two applications for cogeneration power projects, and the first Power Purchase Agreement for a sugar mill cogeneration project in Indonesia has been signed.

In 1996, USAID also provided training to support a World Bank-funded Solar Home System Project in Indonesia. USAID trained local technicians employed by Bank-supported equipment distributors to ensure that the project will be sustainable. In addition, USAID supported review of the Bank's specifications and local products, providing advice as to how products might be improved and specifications streamlined. It is expected that the World Bank loan will support installation of 200,000 solar home systems in Indonesia, bringing environmentally sound power to more than half a million people.

Text Box 9: Using Credit Instruments to Stimulate "Climate-Friendly" Investment

A good example of the potential use of credit can be found in Brazil where one of USAID's objectives is to promote private sector investment in energy efficiency. USAID has been working with a national bank to encourage lending to energy service companies using private demand-side management contracts. Bankers often are reluctant to enter the energy efficiency market because the terms and collateral (saved energy) are unfamiliar. With credit authority, USAID might issue a partial loan guarantee to encourage the bank to enter the market. USAID could, for example, guarantee one-third of a \$15 million revolving fund for energy efficiency for a three-year term to catalyze private sector investment in energy efficiency in Brazil. This modest investment would save energy while stimulating creation of a private market for energy efficiency.

Text Box 10: Promoting Joint Implementation to Foster Sustainable Development

Joint implementation (JI) projects can be important vehicles for reducing greenhouse gas emissions and stimulating environmentally sound investment in developing countries. For JI projects to effectively promote sustainable development, however, it is critical that activities be designed to serve the interests of the host country while providing credit for emissions offsets to the foreign investor. USAID has been working with the Center for Sustainable Development in the Americas (CSDA) and Lawrence Berkeley National Laboratory to build Latin American capacity to foster, assess and monitor JI projects through National Joint Implementation Programs.

Using a multi-sectoral participatory process, USAID and CSDA help countries establish national programs to ensure that JI investments will complement national sustainable development goals. The centerpiece of the program is a bilingual *Guide for Establishing Joint Implementation Programs* that draws on the experience of pioneers in JI such as Costa Rica and overviews the issues a country needs to consider when setting up a JI program. The manual helps countries establish criteria for projects, set-up a JI office or committee, and introduce methodologies for technically evaluating projects. To date, the approach has been used to assist over 250 professionals in Guatemala, El Salvador, Nicaragua, Chile and Bolivia representing the government, non-governmental organizations and the private sector. Additional workshops are planned for 1998.

Text Box 11: Technology Cooperation Agreements for Facilitating Technology Transfer

In August 1997, USAID and EPA initiated a pilot program to evaluate the potential for developing bilateral and multilateral Technology Cooperation Agreements (TCAs) to facilitate technology cooperation that decreases greenhouse gas emissions. TCAs identify barriers to technology transfer including policy and regulatory, human and institutional, financial and project development-related constraints. They also identify strategies for overcoming those constraints.

Working under the pilot program with Brazil, China, Kazakhstan and Indonesia, experts from the National Renewable Energy Laboratory, the International Institute for Energy Conservation and Lawrence Berkeley Laboratory collaborated with local public, private and non-governmental experts to outline a list of priorities for accelerating deployment of environmentally sound energy technologies that mitigate greenhouse gas emissions. When complete, it is hoped that these TCAs will be able to serve as a vehicle for channeling foreign assistance and private sector resources to climate change-related priorities.

The model TCAs, and the participatory process used to develop them were discussed at an international symposium in November 1997, and featured at the Third Conference of the Parties in Kyoto, Japan. The potential for TCAs to serve as a means for fulfilling the technology transfer provisions of the Framework Convention on Climate Change is being considered.

Text Box 12: Channeling and Leveraging Private Investment as Part of the USAID Climate Change Action Plan

As part of the USAID Climate Change Action Plan, USAID will undertake several programs to encourage climate friendly trade and investment. Programs targeted on the energy and industrial sectors will engage the private sector, remove barriers and create incentives to clean investment, and leverage and channel financial sector resources.

The program will have three elements:

- **Partnerships.** Building on existing electric utility partnerships, the work of US-AEP and other programs such as the Sustainable Cities Initiative, this program will stimulate partnerships with energy-intensive and progressive industries (potentially chemicals, steel, pulp and paper, automobiles and agriculture). It will partner private firms with counterparts in host countries to develop strategies for increasing productivity and environmental soundness through improvements in management, production processes and technologies.
- **Financing.** A critical barrier to clean power projects is the inadequacy of financing. Private power developers have the capacity to invest in cleaner generation equipment, but financing to reduce the costs of green investment is limited and the pipeline of projects is insufficient. USAID will help marry projects with financing by leveraging multilateral resources and channeling private investment. A fund to facilitate preparation of projects cost-shared by industry will be used to induce a more environmentally sound approach to private investments in energy generation. The investment fund will be paired with an effort to foster multilateral development bank loans that encourage more environmentally sound energy production and use. Finally, Development Credit Authority will permit USAID to leverage commercial capital for "climate-friendly" investment projects.
- **Incentives.** Market-based incentives are critical to spurring clean investment. Laws and regulations need to introduce market forces, remove price subsidies and foster environmentally sound development. Local financial institutions need to favor environmentally sound investment and value environment costs and risks. USAID will create a program to promote create regulatory and non-regulatory incentives for economic development that is less carbon-intensive. The program will focus on policy and regulatory reform, and engage private financial institutions in the creation of economies that favor clean investment. Collaboration with the United Nations Environment Program's Financial Services Initiative is being contemplated.