



U.S. - INDIA COOPERATION ON GLOBAL CLIMATE CHANGE

A COMPENDIUM OF ACTIVITIES



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U.S.-India Cooperation on Global Climate Change

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Sponsored by



The United States Agency for International Development (USAID)

On behalf of the U.S. Government

As part of the

**Eighth Conference of the Parties (COP 8) to the
United Nations Framework Convention on Climate Change (UNFCCC)
New Delhi, India
23 October – 1 November 2002**

Compiled and edited by



WINROCK
INTERNATIONAL
INDIA

Winrock International India (WII)

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Messages from the United States

U.S. Ambassador to India



This compendium documents the many accomplishments of U.S.-India collaboration on climate change. The past year has seen a dramatic acceleration in the positive transformation of the U.S.-India bilateral relationship, including cooperation in the strategically important areas of energy and the global environment. In February 2002, President George W. Bush announced a new approach to the complex challenge of climate change. President Bush has made a long-term commitment to climate change. His approach ensures economic growth and works to harness the power of markets to reduce emissions.

The climate change activities promoted by the United States in India reflect President Bush's approach to climate change and have been quite successful. India was among the first to respond to President Bush's new policy. As the United States and India agreed in May 2002, tackling climate change offers an unprecedented opportunity for our nations to demonstrate how countries can work in partnership to address environmental issues.

The achievement in greenhouse gas mitigation in India has been possible due to broad-based support from government, industry, electric utilities, regulators, NGOs, and academia. The Eighth Conference of the Parties to the United Nations Framework Convention on Climate Change provides an important forum for the U.S. and India to showcase bilateral cooperation on climate change. As we move forward in transforming the U.S.-India relationship, future activities will engage new partners, particularly those in the private sector, to promote approaches that drive economic development while protecting the environment.

ROBERT D. BLACKWILL

U.S. Under Secretary of State for Global Affairs



The United States and India have a rich history of cooperation in the pursuit of sustainable development. Building on this legacy, our two countries are moving forward together to address one of the world's most important challenges: climate change.

Through the common goals of ensuring economic growth, investing in social development and promoting effective environmental stewardship, India and the United States are working to help people improve the quality of their lives. These shared objectives also enable our countries to make progress in countering the long-term problem of global climate change.

I am pleased to be leading the U.S. delegation to the eighth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change in New Delhi. We greatly appreciate the leadership role that the Government of India is playing in hosting this Conference.

Through the UNFCCC — and under our own bilateral partnership on climate change — our two nations share a commitment to the development and diffusion of technologies that address greenhouse gas emissions in energy, agriculture, and other important sectors. This is a complex task that will benefit from our continued collaboration. I am confident that India and the United States, working together, will help produce results that harness the promise of the future.

PAULA DOBRIANSKY

Messages from India

Honorable Minister of Power



The forthcoming Eighth Conference of the Parties to the United Nations Framework Convention on Climate Change holds out promises for developing a global consensus to combat the threats of climate change and ensure global sustainable development. In this regard, the issue of sustainable energy as a key factor governing the impacts on climate change is expected to be discussed and deliberated at length.

The Indian Ministry of Power has mandated to provide power to all by the year 2012. Our Ministry is committed to the cause of sustainable energy, which is at the core of both poverty alleviation as well as environmental protection. From the country's perspective, these are central to the realization of our sustainable development goals and objectives.

The Ministry of Power has adopted various initiatives to ensure that energy production and consumption take place in a sustainable manner. These initiatives range from ensuring cleaner energy generation through the application of advanced technologies in thermal power generation, to the introduction of various energy efficiency improvements for better resource utilization. In this regard, the U.S. Government through its Agency for International Development (USAID) is supporting energy efficiency initiatives in India, which will help improve the performance of the power sector and reduce greenhouse gas emissions. It gives me great pleasure to mention that these initiatives have resulted in increased sensitivity of the power sector to environmental concerns. We look forward to the continuation of this U.S.-India partnership in the years ahead.

ANANT G. GEETE

Honorable Minister of Non-conventional Energy Sources



The current year has been marked by the hosting of the World Summit on Sustainable Development at Johannesburg (WSSD) during August – September. The conclusions at the WSSD Conference have pointed out the need to harness renewable sources of energy to reduce global dependence on fossil fuel-based power generation on the one hand, and check the depletion of forest cover on the other. This is even more important considering the fact that human-induced climate change, caused due to the emission of greenhouse gases in the atmosphere, emerges as the most potent environmental challenge to mankind and the ecosystem.

The forthcoming Eighth Conference of the Parties (COP 8) to the United Nations Framework Convention on Climate Change would provide a powerful platform for global leaders to discuss and deliberate upon the various ways and means to protect the global environment. India will look forward to promoting sustainable development, which is mentioned as the first and overriding priority of the Convention on Climate Change.

The United States and India enjoy a long tradition of co-operation in the field of renewable energy technology promotion for sustainable development. The U.S. Agency for International Development (USAID) has promoted the development of renewable energy initiatives in India through its various ongoing programs and projects. We look forward to continuation of such efforts and increased Indo-U.S. cooperation in this area.

M. KANNAPPAN

Introduction

Worldwide, the United States has been a leading promoter of research, technology transfer, and market-based approaches to address global climate change. The U.S. Agency for International Development (USAID) has led the U.S. cooperation on greenhouse gas mitigation activities in India. In addition, many other U.S. government agencies have sponsored activities related to energy efficiency, renewable energy, forestry and projects related to global climate change.

For several years, in cooperation with the Government of India, the United States has helped India to cost-effectively avoid millions of metric tons of greenhouse gas emissions, largely through efficiency gains in the thermal power sector and through investments in biomass energy. The U.S. is committed to continued partnership with India to promote market-based approaches, technology transfer, and research related to greenhouse gas emissions reductions.

On behalf of the U.S. Government, USAID has published this compendium to highlight U.S.-India cooperation to address global climate change. The compendium is meant to serve as a resource for policy makers, researchers, development agencies, NGOs, the private sector, and the general public. Using information collected from a wide range of partners within the public and private sectors, USAID worked in close collaboration with the U.S. Department of Energy's (USDOE) National Energy Technology Laboratory (NETL) and Winrock International India (WII) to compile and publish this document.



The U.S. Approach to Climate Change

During February 2002, President George W. Bush laid out the following broad parameters to address climate change. The U.S. approach:

- Represents a long-term commitment to addressing climate change
- Is based on scientific research and technology transfer
- Ensures economic growth and spurs creative solutions
- Harnesses the power of markets
- Seeks global participation

The U.S. and the Government of India have an excellent track record of cooperation on global climate change. President Bush's climate change policy offers an unprecedented opportunity for the United States and India to show the rest of the world how countries can work together in partnership to address climate change.

Overview of USAID's Program in India

USAID has been collaborating for several years with public and private partners from both India and the United States to address global climate change. Activities have focused on energy efficiency and conservation in power plants, industry, the transport sector, and end use. USAID has promoted technical cooperation recognizing the critical link between environmental protection and sustainable development. The work in the energy sector dates back to the 1960s and has consistently focused on promoting partnerships to carry out and sustain activities. Current major USAID/India activities addressing climate change include the Greenhouse Gas Pollution Prevention Project (GEP), the Energy Conservation and Commercialization Project (ECO), the South Asia Regional Initiative for Energy (SARI/Energy), and the Water-Energy Nexus in Agriculture (WENEXA).

USAID has worked in partnership with India to promote renewable energy, energy efficiency, and demand-side management. This has been helpful in introducing renewable energy technologies in rural areas, as well as clean technologies and voluntary environmental management systems to Indian industry. An example is the ISO:14001 certification, now actively sought by Indian industry given its positive impact on corporate image, as well as on the bottom line. Renewable energy has helped improve economic and social conditions in rural areas that previously lacked access to electricity.

Successful U.S.-India joint ventures have resulted in India's first commercial electric car, Reva, and important progress in the development of electric two- and three-wheelers. The U.S. Asia Environmental Partnership has brought hundreds of environmental experts together from both countries to tackle common environmental challenges and promote trade in environmental goods and services.

In the future, USAID looks to support the Ministry of Power's Accelerated Power Development and Reform Program, particularly

its power distribution reform features. Improved electric metering, billing and collections will lead to reduced transmission and distribution losses, improved financial viability, and wiser power use. Enhanced efficiency will temper the growth of new coal-fired power generation, thus reducing GHG emissions. USAID also looks forward to providing additional support to the Bureau of Energy Efficiency (BEE), recently established under the new Energy Conservation Act.

Finally, the South Asia Regional Initiative for Energy (SARI/Energy), which the Government of India supports, encourages trade in both hydropower and natural gas within the South Asia region. These are cleaner sources of energy that will help meet the region's growth needs, while mitigating possible climate change impacts.



USAID's Greenhouse Gas Pollution Prevention Project (GEP)

USAID's largest climate change activity is titled the Greenhouse Gas Pollution Prevention Project (GEP). GEP is a 10-year (1995-2005), \$39 million activity specifically targeted at greenhouse gas emissions reductions. The GEP currently strives to expand the efforts of the National Thermal Power Corporation (NTPC) in efficient power generation, increase the use of clean energy technology, build local institutional capacity and increase public/private partnerships for Global Climate Change (GCC) mitigation, and design and demonstrate GCC mitigation in cities.

Through an agreement with the USDOE's NETL, the GEP has provided technical assistance and training to the NTPC and state electricity board (SEB) coal-based power plants through Center for Power Efficiency and Environmental Protection (CENPEEP). This has also resulted in saving millions of dollars in coal costs. Two regional CENPEEP offices have been established to disseminate and replicate the lessons learned. U.S.-India collaboration is under way to promote new, cutting-edge technologies to more efficiently utilize coal in power plants using the Integrated Gasification Combined Cycle (IGCC), in a USAID-supported effort between the USDOE and the NTPC. Further support is being provided to NTPC on clean coal technologies in the form of feasibility studies for an IGCC power plant, a coal washery, and large volume ash utilization.

USAID, through NETL and WII, provided technical assistance and training, as well as grant funds to private sugar industries to set up advanced cogeneration facilities using bagasse (sugarcane waste) as fuel for power generation. Using this renewable resource fuel instead of coal or oil reduces pollution and cuts costs. To date, nine such projects have been commissioned with an aggregate installed capacity of about 200 MW. They generate power for more than 270 days in a calendar year and sell it to the grid.

The GEP has also sponsored roundtables on a diverse range of topics including clean coal technology, energy efficiency in the steel, aluminum, and cement industries, renewable energy, and solid waste management, including waste-to-energy discussions. Partnerships with Bangalore and

Hyderabad have led to strategies for methane flaring from landfills and air quality improvements in the transport sector, respectively.

Finally, the GEP has a small grants component which is helping to forge partnerships between educational and research institutions in the U.S. and India to study climate change issues in India and, thus help to identify local policies that could mitigate possible impacts. The Ohio Supercomputer Center (OSC) of the Ohio State University and National Physical Laboratory in India have received funding to develop a model for the characterization of GHG emission sources from energy generating activities in India. The study will eventually lead to the development of management strategies for pollution abatement. Support was granted to the Indian Institute of Management, Ahmedabad and Stanford University to study the impacts of power sector reforms on global climate change through improvements in power generation efficiencies.

Results of USAID Greenhouse Gas Mitigation Activities

USAID reports a cumulative total of approximately 9.5 million tons of CO₂ equivalents of GHG emissions avoided through climate and energy related activities. This figure is growing, as more power plants adopt improved heat rate efficiency guidelines and other mitigation strategies are implemented.

Carbon Dioxide equivalent (CO ₂ e) of GHG emissions avoided (million metric tons)		
Year	Annual	Cumulative
1997	0.02	0.02
1998	1.07	1.09
1999	2.47	3.56
2000	3.82	7.38
2001	2.10	9.48

These results were obtained through the CENPEEP heat rate improvement program in NTPC and Maharashtra State Electricity Board owned power plants, sugar cane bagasse cogeneration and energy efficiency improvements in the Kolhapur municipality and operation of the Bilaspur coal washery.



Section I

ENERGY

Energy Partnership Program (EPP)

Objective

Developing countries are in need of information about the structure, finance, management, and regulation of power generation, transmission, and distribution under free-market economic conditions. Partnerships with established and successful U.S. utilities and regulatory bodies facilitate the transfer of best technologies and practices, improve the management and financial performance of the power sector, and increase energy efficiency in USAID-assisted countries in Asia, Africa, and Latin America.

The Energy Partnership Program (EPP) establishes practitioner-to-practitioner, multiyear partnerships between the U.S. and developing country utilities and regulatory agencies.

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Partner Organizations and their Roles

- The United States Energy Association (USEA)
USAID is providing funding the USEA to develop the Energy Partnership Program (EPP).

Locations

- Maharashtra
- Andhra Pradesh
- Karnataka
- West Bengal
- Orissa



Details

Working with USAID, USEA identifies and matches utilities or regulatory agencies in the U.S. and overseas according to the compatibility of their needs and capabilities, the similarity of their energy systems, potential common business interest, and other criteria. Benefits to the foreign partners include the opportunity for senior executives of overseas utilities and regulatory agencies to observe how their U.S. counterparts are structured, financed, managed, and regulated under free-market economic conditions. The program also offers U.S. energy executives the opportunity to understand the dynamics of non-U.S. energy markets and to forge strategic international alliances. Once selected, the participating organizations execute partnership agreements and commit to cooperate for a 2-year period.

Technologies/Approaches Promoted

Focus areas include petroleum exploration, production and transportation; natural gas distribution; and electric power production, transmission, distribution and utilization.

Period

1994 - Present

Status

- The Andhra Pradesh State Electricity Board, through its partnership with the Pennsylvania Power & Light Company, is replacing inefficient irrigation pumps with more efficient new pumps, which will reduce technical distribution losses by 14%.

- The Calcutta Electric Supply Corporation, Ltd. has adopted a simpler, one-piece connector between the distribution lines and transformers, using Gulf Power's low-voltage bushing and cable connector design. These direct connectors reduce line losses from oxidation, breakage, and inefficiently bolted connections.
- The Bombay Suburban Electric Supply, Ltd. has established the National Institute for Power Systems Distribution Management based on a model provided by Plum Street Enterprises (an affiliate of the Niagara Mohawk Power Corporation).
- Karnataka Electricity Board, the Karnataka Power Corp. Ltd., and Duquesne are considering possible joint venture power projects.
- The Orissa Electricity Regulatory Commission has adopted rate case hearing procedures from the District of Columbia Public Service Commission and the Colorado Public Utilities Commission.

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

Energy partnerships promote a more efficient, sustainable, and environmentally sound supply and use of energy through use of:

- Market-based approaches and best practices for energy system operation and regulation
- Measures to avoid, reduce and mitigate possible impacts on climate of activities in the energy sector

In India, benefits include corporate restructuring, increased energy efficiency by reducing distribution losses, transmission and distribution improvement, improved plant operations, and development of India's National Institute for Power Systems and Distribution Management.

Collaborative Labeling and Appliance Standards Program (CLASP)

Objective

The Collaborative Labeling and Appliance Standards Program (CLASP) has undertaken technical support and capacity building to assist the Indian Ministry of Power, the Bureau of Energy Efficiency (BEE) and the Bureau of Indian Standards who are implementing energy efficiency standards and labeling programs, a high priority under the new legislation.

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Partner Organizations and their Roles

- Alliance to Save Energy
- International Institute for Energy Conservation
- Lawrence Berkeley National Laboratory
- The Ministry of Power, India and the Indian Bureau of Energy Efficiency (BEE)
- Bureau of Indian Standards (BIS)

In 1999, the International Institute for Energy Conservation, Lawrence Berkeley National Laboratory, and the Alliance to Save Energy, formed the Collaborative Labeling and Appliance Standards Program (CLASP).

Location

New Delhi, India

The project is supporting capacity development at the national level to implement national minimum energy efficiency standards.

Details

The Indian government passed a landmark Energy Conservation Bill (EC Bill) which came into effect in October 2001. This important Bill will facilitate implementing energy efficiency policies, programs and projects more effectively in the future. CLASP assists the Indian Ministry of Power, BEE and the Bureau of Indian Standards in their efficiency standards and labeling programs.

Specifically, four tasks of a multi-task, multi-year program was initiated in the year 2002. High priority near-term tasks are:

- Develop a five-year comprehensive strategy for energy efficiency standards and labels
- Prepare a preliminary baseline assessment
- Estimate the impact of existing refrigerator and air conditioning standards and recommend improvements
- Assess testing facilities and prepare recommendations for improvements.

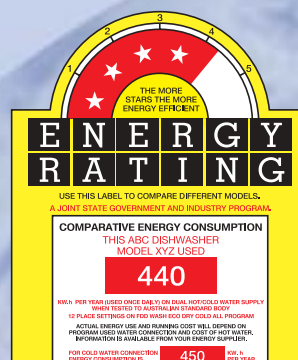
USAID, USEPA, USDOE, the United Nations Foundation (UNF), the Energy Foundation, and the International Copper Association are major partners and sponsors.

Period

2002-2006

Status

- In 2002, CLASP supported two technical assistance team visits to work with partners in India and a study tour for key Indian officials to the U.S.
- A draft five-year implementation plan was prepared jointly with BEE and is currently under review.
- Working with CLASP in India, BIS officials have drafted a new standard for storage water heaters and an accompanying label.



Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

Energy standards and labels for appliances, equipment and lighting are the most cost-effective means to help countries limit energy demand while stimulating economic growth. The overall result of energy efficiency standards is to reduce the required investment in power plants and reduce their fuel consumption with powerful economic gains (e.g., freeing up capital for investment in non-energy social infrastructure such as schools, roads or hospitals) and environmental benefits (e.g., avoiding carbon emissions).

In addition the CLASP five-year partnership with India will develop Indian capacity for technical analysis, business outreach and testing/certification to support continued expansion and improvement of standards and labeling programs for the future.

Looking Ahead

Near-Term Project Activities

Over the next 6 to 9 months the CLASP India partnership is expected to produce:

- A preliminary baseline assessment of current status and priority opportunities for appliance standards and labels
- A comparison of Indian refrigerator and air conditioner standards and manufacturing capabilities relative to other countries
- A white paper on Indian current testing infrastructure, future needs and near-term opportunities for enhancement

Over a five-year period, a series of new standards and labeling programs will be produced for the most important categories of appliances and equipment.

Performance targets include a reduction in the ratio of energy consumption to gross domestic product in national residential energy consumption, and a reduction in urban pollutants and GHG emissions. Benefits from a standards and labeling program can start to accrue in as little as three years, but 6 to 10 years are generally needed to build institutional capability, conduct rulemakings for each product, and modify production lines to produce the products that will meet the new standards.

Clean Technology Initiatives (CTI)

Objective

The project aims to sustainably increase environmental protection while enhancing industrial productivity and competitiveness in industries throughout the country.

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Details

Specific Objectives

The CTI project encourages and promotes industrial initiatives towards the adoption of clean, climate – friendly technologies and certifiable environmental management systems (EMS). The initiative (in collaboration with ICICI Limited) offered financial and technical assistance to Indian industries in select sectors.

Partner Organizations and their Roles

- Battelle Memorial Institute
- Confederation of Indian Industry (CII)
- Development Alternatives (DA)
- ICICI Limited
- Tetra Tech India Limited (TTIL)

Partial funding was provided by the companies (limited support was mainly for the EMS program). Funding was provided to the Orchid Hotel, Shree Cement and Morarjee Mills.

Location

All India

Type of Activities

The project focuses on greenhouse gas (GHG) emission reduction initiatives and related energy efficiency improvements. To date CTI has provided four types of assistance to the industry.

- Environment information
- Advisory and technical services
- Business exchanges
- Financing for demonstration projects

Outreach program – One of the main objectives of the CTI project was to disseminate information on cleaner technologies and provide participants with information regarding resources in the U.S. that can help fulfill trade or technological needs. The tools adopted for an effective outreach initiative were quarterly reports and newsletters, active media relations, workshops, and web sites.





Period

September 1999 to September 2002

Status

The projects focused on GHG emissions reductions and related energy efficiency improvements. The industrial sector was divided among the team partners (CII, DA and Battelle Memorial Institute) for advisory and technical services.

- Environment Information – CTI worked with the Federation of Indian Chambers of Commerce and Industry (FICCI) and other business associations to implement a co-ordinated environmental outreach program. CTI has also established a dedicated Environmental Information Centre at FICCI’s head office and its regional centres. These units compile and distribute information on energy efficiency and clean technologies, environmental policies, regulations, and company success stories.
- Advisory and Technical Services – CTI provided advisory and technical services in EMS (ISO:14001), benchmarking and rating environmental performance, green supply chain management (SCM), product design using life cycle assessment, and carbon emissions accounting.
- Business Exchanges – CTI presented opportunities to the Indian companies to study the effectiveness and benefits of introducing clean, climate-friendly technologies and best practices through customized business exchanges with U.S.-based institutions.
- Financing Mechanisms for Demonstration Projects – CTI provided funding through ICICI Limited in the form of concessional loans. CTI targeted companies in the rapidly growing, energy intensive industrial sector, helping to improve their environmental performance through onsite facility demonstration projects.
- Outreach Program – To date, CTI has come out with 26 newsletters, nine quarterly reports and has organized nine press releases in mainstream publications. In addition, workshops have been conducted for the major sectors of industry highlighting the benefits attained by the companies under this project.



Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

The main benefits accrued from the project are as follows:

- Internal EMS: The project supported 62 industries for EMS as per the ISO:14001 guidelines.
 - One major automotive company achieved a savings of Rs 2.6 million in resource conservation and optimization.
 - One major five star hotel saved Rs 10 million in resource conservation/optimization. The payback period for the investment was eight months.
- Sector-wide Environmental Benchmarking Efforts: Seven paint companies and six hotel companies participated in this initiative. The main objective of the benchmarking project was to help the units gauge their performance against others within their sector and to identify GHG and energy efficiency improvement opportunities.
- Green SCM Practices: The concept was initiated in the automotive and electronics sector and provided support to around 130 organizations.
- Product Design for the Environment: Case studies were compiled from the automotive, textile, paint, and steel sectors.
- Funding Mechanism under the Demonstration Project: Funding was provided to the Orchid Hotel, Shree Cement and Morarjee Mills. In the case of Morarjee Mills, the project led to a reduction in energy costs by 20 percent, through savings in the use of furnace oil. The purpose of funding in the Orchid Hotel was funded to acquire eco-friendly and energy efficient equipment for the ozone system for indoor air quality and condenser system, STP, AC Plant, etc. In the case of Shree Cement the project funded demonstration of heat recovery from dust-laden flue gases.

Training and Capacity Building Initiatives

Under the CTI project, approximately 300 training programs have been conducted under various technical and advisory service segments.

The Greenhouse Gas Pollution Prevention Project's Alternative Bagasse Cogeneration Component (GEP-ABC)

Objective

The objective is to reduce the emission of greenhouse gases per unit of electricity generated by encouraging increased and efficient use of biomass fuels at sugar mill cogeneration facilities. Cogeneration (production of process steam and electricity) in high efficiency boiler-turbine systems under high temperature/pressure conditions using renewable fuels, such as bagasse, facilitates offsetting carbon dioxide emissions from coal-fired power generation.



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IDBI manages the project's investment-related activities and the sugar mills provide the majority of the funding and install the cogeneration units. Under a Participating Agency Service Agreement (PASA) with USAID, USDOE's NETL provides technical assistance for training, outreach, and performance evaluation through WII and SAIC. The partners work together not only to overcome barriers in implementing project and power purchase agreements, but also in setting a precedent by demonstrating high efficiency, 270-day cogeneration operation using biomass fuels in India.

From a private investment perspective, the ABC component has been a phenomenal success in India. USAID contributed in the form of grants and technical assistance, and the private sugar mills invested to establish nine cogeneration projects.

Partner Organizations and their Roles

- Industrial Development Bank of India (IDBI)
- Industrial and Technical Consultancy Organization of Tamil Nadu Limited (ITCOT)
- Ministry of Non-conventional Energy Sources (MNES)
- National Energy Technology Laboratory, U.S. Department of Energy (NETL/USDOE)
- Science Applications International Corporation (SAIC)
- U.S. Agency for International Development (Project Sponsor)



Locations

USAID provided financial assistance to the following nine sugar mills under a competitive selection process:

- EID Parry (I) Ltd., Nellikuppam, Tamil Nadu
- Dhampur Sugar Mills, Razagon, Barabanki, Uttar Pradesh
- Rana Sugars, Buttar Seviyan, Punjab
- The Godavari Sugars Ltd., Sameervadi, Karnataka
- Ugar Sugar Works Ltd., Ugarkhurd, Karnataka
- Dharani Sugars & Chemicals Ltd., Karaipoondi, Tamil Nadu
- Thiru Arooran Sugars Ltd., Kollumangudi, Tamil Nadu
- Shamanur Sugars Ltd. , Davangere , Karnataka
- Sagar Sugars & Allied Products Ltd., Chittoor, Andhra Pradesh

USAID also provided matching grants for demonstrating cane trash utilization for cogeneration at three of these sugar mills.



Details

Specific Objectives

The ABC component activities were initiated under the GEP project in 1995 to promote increased and efficient use of biomass fuels at sugar mills for electricity generation and reduce carbon dioxide emissions per kWh generated in the country. These were to be accomplished by:

- Providing financial assistance and matching grants to implementing sugar mills
- Providing technical assistance by conducting training programs, workshops

- Disseminating technical information through newsletters and conferences

Type of Activities

This project gave financial assistance and matching grants for technology demonstration, training, capacity building, and outreach for GHG emissions reductions through increased use of biomass fuels for electricity generation.

Technologies/Approaches Promoted

Typical sugar mill cogeneration units in India use a low temperature (380°C or less), low pressure (35 kg/sq.cm) boiler-turbine configuration, which has a low electricity generation efficiency per kg of bagasse burned. Since the mid-1990s, USAID and the MNES have been promoting the use of high temperature (480°C), high pressure (60 kg/sq. cm or higher) configurations which would significantly increase the electricity generation per kg of bagasse burned. The net power on cane fiber increased significantly from about 60 kWh/metric ton to 370-510 kWh/metric ton under the new configuration supported by USAID.

Period

1995-2003

Status

The bagasse cogeneration component of the GEP project has been successfully implemented in nine sugar mill cogeneration projects over about seven years. These sugar mills have operated for 270 days in a one-year period using biomass fuels for electricity generation and export.

Performance and GHG Mitigation

The total installed cogeneration capacity in these projects is approximately 200 MW. These sugar mills are currently to generate and estimated 500 million kWh of electricity valued at \$25 million, offsetting 550,000 metric tons of GHG emissions annually. The GHG emissions reductions benefit of the ABC component will be fully realized in 2003 when

all aforementioned cogeneration projects operate at full capacity.

The GHG emission offsets in sugar mill cogeneration can be readily quantified and verified because the amount of cane crushed, bagasse generated from subsequent cane, electricity generated and exported to grid, and revenue received from the sale of electricity are all documented.

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

- Because both steam and electricity are utilized in the sugar mill, the thermal efficiency of cogeneration is significantly higher than centralized fossil fuel-based power generation systems.
- This cogeneration is considered distributed generation because it has small-capacity units, which can provide an uninterrupted supply to nearby rural areas (farmers and residents), thereby minimizing transmission and distribution losses. Because of the improved reliability of the supply, the farmers can plan their use of electricity.
- Biomass cogeneration projects, which use renewable fuels, are environmentally friendly, in contrast to coal-fired power generation, which causes large-scale pollution by the emission of particulates, sulfur dioxide, nitrogen oxide, and GHGs.
- Both sugar mill and cogeneration plants provide employment and regular income in rural areas to hundreds of farmers and laborers. Sugar mills are the second largest agro-processing industry providing employment to over 500,000 people in rural areas across India.
- New opportunities are in the offing for biomass-based cogeneration projects to develop as sustainable, more economical projects for emissions trading and GHG reduction.

Training and Capacity Building Initiatives

This project has conducted over 20 training programs, regional and national workshops, conferences, and study tours during the last five years to promote high efficiency cogeneration in sugar mills in India. The outreach through 15 issues of the Cane Cogen India newsletter was very successful (see www.renewingindia.org).

Looking Ahead

Near-Term Project Activities

Three of the sugar mills funded under the ABC component are expected to complete the implementation of the project by March 2003. In collaboration with the World Alliance for Decentralized Energy and Cogeneration Association of India, WII is conducting the 3rd International CHP and Decentralized Energy Symposium, and USAID International Conference and exhibition on Bagasse Cogeneration on October 24-26, 2002 in New Delhi. This conference will be held parallel to the UNFCCC's Eighth Conference of the Parties (COP 8), to highlight the significance of biomass-based cogeneration in climate change mitigation.

Potential for the Sector

The estimated potential for sugar mill cogeneration in India is about 5,000 MW. However, the existing and planned capacity of high efficiency cogeneration is less than 500 MW indicating a significant potential for capacity installation. The Indian government is planning to increase the share of distributed generation from renewables in the electricity mix in the near future. The use of other biomass fuels in cogeneration units can facilitate an additional 15,000 MW new capacity installation. Therefore, a continued, active government role is essential for identifying the barriers limiting cogeneration from reaching its full potential for promoting this sector by identifying and quantifying the benefits from reduced transmission and distribution (T&D) losses, and improved integration with the agricultural sector.

Greenhouse Gas Pollution Prevention Project's Efficient Power Generation (GEP-EPG) Component

Objective

The GEP-EPG component seeks to reduce greenhouse gas (GHG) emissions per unit of electricity generated by optimizing the performance of thermal power stations.

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Partner Organizations and their Roles

- Electric Power Research Institute (EPRI)
- Tennessee Valley Authority (TVA)
- Southern Research Institute (SRI)
- USAID
- USDOE's National Energy Technology Laboratory (NETL)
- National Mine Land Reclamation Center (NMLRC)

The U.S. partners are providing faculty for training/seminars, helping in organizing technology demonstrations in Indian power



plants and arranging for the training of nominated engineers from NTPC in U.S. utilities. Training on Efficiency and Heat Rate Improvement is provided through TVA, on Monitoring & Diagnostics techniques through EPRI, Electrostatic Precipitators Performance Improvement through the SRI and on Ash Utilization through the National Mine Land Reclamation Center (NMLRC).

Technical assistance and training (TAT) is part of the GEP-Efficient Coal Conversion (ECC) component, and NTPC engineers from CENPEEP and its plants have been trained with USAID assistance. Sophisticated testing equipment has been provided to the CENPEEP corporate office and each of the two regional centers at Patna and Lucknow by USAID.

Locations

- State electricity boards (SEBs) of
 - Gujarat
 - Maharashtra
 - Uttar Pradesh (UP)
 - Andhra Pradesh (AP)
 - Delhi
 - Jharkhand
- NTPC Sites -
 - Singrauli/Rihand/Unchahar/Dadri (UP)
 - Farakka (West Bengal)
 - Ramagundam (AP)
 - Kahalgaon (Bihar)
 - Badarpur (Delhi)
 - Vindhyachal/BCPP-Korba/Korba (Madhya Pradesh)

Details

Specific Objectives

The main objective of the project is to reduce GHG emissions per unit of energy generated, while increasing energy productivity/efficiency, and the plant availability factor.

CENPEEP was established by the NTPC in July 1994 to implement the GEP Project in accordance with the Protocol of Intent signed between the Governments of India and the U.S.



Type of Activities

CENPEEP is working as a resource center for acquisition, demonstration, and dissemination of advanced, efficient technologies in the power sector. The project objectives are being achieved by optimizing the performance of existing power plants by introducing new techniques and practices. The focus is mainly on improving operational efficiency, availability, and environmental performance.

Activities undertaken to demonstrate and disseminate the latest technologies include workshops/seminars, technology demonstration at sites, visits of experts, publication of newsletters, performance optimizers, publication of heat rate guidelines, etc.

Technologies/Approaches Promoted

CENPEEP's approach involves low cost and high benefits technology acquisition, assimilation and demonstration of adopted technologies at selected stations, and their widespread dissemination through training programs/workshops/seminars/newsletters (performance optimizers), etc. CENPEEP has:

- Demonstrated the use of new technologies for performance optimization of plants at several NTPC- and SEB-owned power stations
- Organized numerous workshops and seminars at thermal power stations with the help of experts drawn from U.S.-based utilities

- Developed performance optimizers and newsletters on some of the demonstrated technologies. This information has been widely disseminated to NTPC stations, domestic power utilities, and authorities connected with the Indian power sector. This information has also been put on the NTPC's web site
- Issued *Heat Rate Improvement Guidelines* (two volumes). These were prepared jointly with the TVA
- Issued test procedures and various instrumentation requirements for the performance optimization tests

Some of the techniques and practices introduced are:

- Boiler and turbine performance testing and optimization techniques using off-line instruments
- Mill performance testing
- Condenser tube cleaning by water-powered cleaners for improving performance
- Helium leak detection technique to check air ingress into the condenser
- Water fogging of flue gases by installing spray nozzles for reducing particulate emissions
- Infrared thermography applications in wide areas of plant equipment to detect

incipient faults thereby improving the availability of equipment for operation

Period

1999-2005

Status

In its task of acquisition, demonstration and dissemination, the current status of activities accomplished is given below:

- Workshops/seminars – about 70
- Demonstrations/tests – more than 200 at SEB – and NTPC-owned power stations
- About 18 visits by experts/teams from the U.S.
- Publication of newsletters/performance optimizers
- Publication of Heat Rate Guidelines

CENPEEP was selected for the Climate Technology Institute's CTI 2002 Award for its accomplishments in climate change activities in a developing country. This award will be presented during the Eighth Conference of Parties (COP 8) in New Delhi in October 2002. This award is given to an organization that has demonstrated exceptional performance in promoting more rapid development and diffusion of climate-friendly technologies and practices in developing countries. The total number of applicants was more than 40.





Performance and GHG Mitigation

GHG emissions have been significantly reduced in NTPC and some SEB stations as a result of activities undertaken by CENPEEP. NTPC took the initiative to increase efficiency by introducing state-of-the-art techniques to optimize power plant performance.

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

CENPEEP has adopted a *win-win* strategy through the performance optimization route, whereby it is successfully balancing the dual objective of reducing GHG emissions, and encouraging sustainable economic growth in the country. To accomplish this multiple objective, CENPEEP has acquired and demonstrated best practices for the improvement of operational efficiency, plant availability and environmental performance in NTPC's coal-fired power plants.

By successfully bringing about a reduction in emissions in a majority of power stations, significant progress has been made in developing a culture for improvement in efficiency across the power generation sector. As a direct result of this effort, Performance Optimization Groups have been formed in all NTPC-operated thermal power plants to sustain the improvement in performance and emission reductions.

Training and Capacity Building Initiatives

The training program organized through USAID/USDOE has helped in technology transfer and hands-on training.

Looking Ahead

Near-Term Project Activities

- Explore the possibility of expanding CENPEEP activities to the South Asian region
- Discover options of expanding activities of monitoring and diagnostics techniques in the transmission and distribution area
- Conduct a feasibility study (coal beneficiation) for setting up coal washeries at pit head power stations
- Carry out a feasibility study by the NTPC to introduce IGCC technology in India
- Conduct studies on large-scale utilization of coal ash through backfilling of ash in mines
- Organize workshops, seminars and training programs aimed at improving efficiency thereby reducing GHG emissions

Energy Conservation & Commercialization (ECO)

Objective

The primary objective of the ECO Project is widespread commercialization of energy efficiency technologies and services within the context of India's power sector.



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Jaipur, Jodhpur, and the Ajmer Distribution Companies of the Rajasthan Electricity Board.

Locations

ECO is not a location-specific project, and thus has activities spanning the whole of India. State-level activities under the Policy Component, however, are location-specific, and are being carried out in the state of Rajasthan.

Details

Specific Objectives

The Government of India (GoI) and the U.S. Agency for International Development (USAID), signed a joint project agreement on 28 January 2000 for the implementation of the ECO project. This project is a four-year program that targets the reduction of greenhouse gas (GHG) emissions per unit of electricity generated and consumed in India.

ECO is facilitating the commercialization of energy services and technologies through:

Energy Efficient Market Development and Financing (Markets Component):

Objectives

- Increasing the number of energy efficiency projects that achieve financial closure and become operational
- Developing market transformation strategies and programs for key energy

Partner Organizations and their Roles

- Distribution Utility in Jaipur
- ICICI Bank Limited
- The Ministry of Power (MoP) and its Bureau of Energy Efficiency (BEE)

ICICI Bank Limited is the host country partner agency for the Markets Component and is managing the ECO Fund, instituted by USAID. ICICI also provided inputs for developing suitable financial mechanisms for the promotion of EE/ESCO/DSM/Cogen projects. A few such projects have reached financial closure, and several others are in the pipeline.

The Ministry of Power (MoP) and the Bureau of Energy Efficiency (BEE) are partner agencies for the central-level policy reform activities under the Policy Component.

State-level activities under the Policy Component are being coordinated with the

efficient technologies

- Strengthening energy-efficiency service companies (ESCOs)

Activities

- Technical and project structuring services for sponsors
- Development of financial incentives for credit enhancement/risk mitigation
- Support to the energy efficiency services industry
- Efficient technology promotion
- Market conditioning and promotion
- Non-sugar cogeneration market development

Energy Efficiency Policy and Institutional Reforms (Policy Component):

The Policy Component covers policy, regulatory and institutional reform issues at the central and state levels.

Objectives:

- Assisting the MoP and BEE in operationalizing the provisions of the Energy Conservation Act (ECA)
- Assisting the MoP and BEE in introducing energy efficiency in government buildings (central, state and local levels)
- Introducing energy efficiency (T&D loss reduction) and demand side management (DSM) practices within the reforming utilities
- Providing training for state electricity

boards and electricity regulatory commissions

Activities:

- Energy efficiency policy and institutional support
- Energy efficiency improvement in government facilities and private buildings
- Energy efficiency through regulatory reform and restructuring
- Electric utility DSM/energy efficiency capacity building
- DSM/energy efficiency within privatized distribution utilities

Technologies/Approaches Promoted

The implementation of the ECO project involves providing technical assistance (TA) and training. The TA covers a broad range of assistance, including:

- Fact finding and research studies
- Drafting policy, research and white papers, model codes, practices, protocols, and standards
- Providing assistance for project development, facilitating and/or bringing about financial closure and project implementation, and for operationalizing the provisions of the ECA

Other project support includes the administration of a Loan Fund that will be used to finance select demonstration projects.



Period

January 2000 to Dec 2003

Status

The ECO project is now in its third year of implementation and substantial progress continues to be made in implementing the following operational objectives:

- Increasing the number of energy efficiency projects that achieve financial closure and become operational
 - On-going support for energy efficiency projects through financial closure
 - Lenders forum formed to promote and discuss EE lending practices
 - Financial incentive mechanisms to enhance lending for energy efficiency formulated
 - ECO fund established at ICICI
- Developing market transformation strategies and programs for key energy efficient technologies
 - Market assessment prepared for Compact Fluorescent lamps (CFLs), energy efficient motors, and non-sugar cogeneration
 - Strategies and action plans developed for market transformation of CFLs and EE motors
- Strengthening energy efficiency delivery companies
 - Model measurement and verification (M&V) protocols as well as model ESCO performance contracts drafted
 - Training and courses on ESCO business development and M&V conducted
 - ESCO association formed for business exchange between ESCOs, clients and lenders
- Assisting MoP and BEE in operationalizing the provisions of the ECA
 - Energy auditor and energy manager certification program defined and described
 - Curriculum and syllabus prepared for the examination to be conducted for certification of energy auditors and managers
- Assisting the MoP and BEE in introducing energy efficiency in the government (at central, state and local level)
 - Report prepared on benefits of life cycle based procurement in government
- Introducing energy efficiency (T&D loss reduction) and demand side management practices within reforming utilities
 - Established DSM cells in Jaipur, Ajmer and Jodhpur distribution companies in Rajasthan
 - Established load research at Jaipur DISCOM
 - Designed pilot DSM program for Jaipur DISCOM
 - Training in energy efficiency, including U.S. study tours, provided to electricity regulators, utility personnel from Indian states and DSM cell personnel in Rajasthan
 - Projects for reducing T&D losses developed for Noida Power Company and for the Central Power Distributing Company of Andhra Pradesh. One project nearing financial closure.

Performance and GHG Mitigation

The project, as it is envisaged, will save 290 to 300 million kWh of electricity per year on successful implementation. This translates into a reduction of about 0.29 to 0.3 million metric tons of CO₂ emissions per year.



Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

Minimizing the requirements of additional power generation that, in turn, is expected to result in a considerable reduction in the rate of growth of GHG emissions.

Economic benefits in terms of reduced energy costs and enhanced competitive advantage that, in turn, will translate into increased economic activity and attendant social and economic benefits for the country.

Training and Capacity Building Initiatives

Training is being provided by:

- Conducting workshops, essentially for serving as forums for obtaining feedback on innovative and new policy/strategy prescriptions, for discussions, and for brainstorming
- Conducting training as capacity building events
- Organizing study tours as experience sharing events

Looking Ahead

Near-Term Project Activities

The ECO project is expected to accomplish the following during the coming months:

- Financial closure of at least four projects designed in the ESCO format
- Financial closure of at least six other EE projects (mostly in industry, and including perhaps one or two in the commercial and residential buildings sector). Some of these will leverage funds other than the ECO Fund
- Investment grade feasibility studies of at least two cogen projects in non-sugar industries
- A strategy for accelerating investment in non-sugar industries cogeneration

Greenhouse Gas Pollution Prevention Project's Climate Change Supplement (GEP-CCS)

Objective

The GEP-CCS seeks to develop human and institutional capacity to design and implement policies and projects that reduce GHG emissions. This is accomplished through direct technical assistance for GHG mitigation projects, and by collaborating and fostering technology cooperation between U.S. and Indian entities. The GEP-CCS also works to attract funding from private and international sources for clean energy technology and GHG mitigation projects, and by collaborating closely with other bilateral, multilateral, and private funds to leverage a larger pool of resources for project implementation.

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Partner Organizations and their Roles

- Confederation of Indian Industry (CII) and Development Alternatives (DA's) Climate Change Centers work towards development of clean energy projects and dissemination of GHG reduction methodologies
- ICICI is a Gol partner assisting with project development
- Global Energy Partners and Infrastructure Development Corporation (Karnataka) Ltd and IDECK are working on the solid waste management demo project
- The Lal Bahadur Shastri National Academy of Administration (LBSNAA) is a Gol training academy enabling development and delivery of the module on clean energy/climate change for Gol officials at different levels
- Lawrence Berkeley National Laboratory (LBNL) developed a model for screening and pre-feasibility of GHG mitigation projects
- Municipal Corporation of Hyderabad (MCH)
- Natsource LLC, Global Finance Solutions assisted with FI sector training
- NASED, USA officials coordinate state-based programs to deliver cost-effective energy savings and emission reductions and share experiences with Indian industry associations, i.e. CII and FICCI
- Society of Indian Automobile Manufacturers (SIAM) and MCH are partners for the transport activity
- The Environment Resource Trust (ERT) shares its experiences in GHG registry operation
- World Resources Institute (WRI) – Promotion of corporate GHG accounting practices
- USAID is the prime funding agency for the GEP-CCS project.

Locations

All over India with key activities in:

- Delhi – Planning and working with USAID, DA, CII, FICCI, SIAM, MoEF, MNES/ IREDA and other partners
- Mumbai – Working with key financial institutions (FIs, such as ICICI, IDFC, IL&FS) and research institutions (IGIDR, IIT)
- Hyderabad – Transport Sector Demonstration project (with the Municipal Corporation of Hyderabad Urban Department), and preparation of CCM Project Development roadmap
- Bangalore – Working with IDECK and Bangalore Mahanagar Palike (BMP) for demo project on reducing methane emissions from MSW
- Mussoorie – Working on development of a curriculum for LBSNAA

Details

The U.S. Agency for International Development (USAID) launched the GEP Project in 1995 to help India increase the efficiency of its coal-fired power plants and promote year-round cogeneration of power in the sugar industry. CCS expands on this effort by focusing on the links between climate change and urban and sustainable development. ICICI Limited, a premier Indian financial institution and the Indian implementing partner for GEP-CCS, implements activities jointly with USAID and The Louis Berger Group, Inc.

Building Institutional Capacity

Project technical assistance strengthens the capacity of the following institutions:

- CII's Climate Change Center, to increase awareness among its constituents and

facilitate partnership between Indian and U.S. industry on cooperation in clean energy, power, transportation, and industrial energy efficiency projects that lead to GHG emissions reduction

- DA's Climate Change Outreach and Facilitation Center to increase awareness among stakeholders and facilitate partnership between India and U.S. industry on cooperation in decentralized energy projects
- LBSNAA, through collaboration on issues related to sustainable energy management and its linkages with GHG emissions reduction, public administration, economics, and management
- The Indian financial sector, to appraise GHG emissions reduction projects and develop financial and risk-appraisal tools. U.S. bankers will train Indian financial officials to become trainers in turn for their organizations
- Municipal authorities, on advanced technologies and implementation mechanisms for methane capture from wastes and use as a source of energy

GHG Mitigation Projects

Targeted sectors for demonstration projects include:

- Electric utilities
- Urban: transport and municipal solid waste
- Industrial and energy efficiency

Outreach and Collaborative Activities

To disseminate information and initiate a dialogue and cooperation between Indian and



U.S. stakeholders on GHG emissions mitigation, the project has focused on the following:

- Commissioning of joint research between Indian and U.S. institutions on climate change and its impacts on sustainable development
- Organization of senior policy-level roundtables, workshops, exchanges, and study tours
- Motivation of “champions” of GHG emissions mitigation activities from stakeholders in Indian industry, government, academia, and NGOs and promoting dissemination of information on global climate change issues particularly as they relate to clean energy development in India

Type of Activities

The project has a multidisciplinary focus with the following major activities:

- Developing a curriculum for the Lal Bahadur Shastri Academy on clean energy/climate change issues
- Facilitating capacity building initiatives of Climate Change Centers, the financial sector, Government of India, and municipal managers
- Project development in the area of GHG emissions mitigation in power, transport, municipal solid waste disposal, cement, steel, and other energy intensive industries
- Outreach
- Research and development

Technologies/Approaches Promoted

The Louis Berger Group identifies clean energy and urban projects that have GHG emissions mitigation potential and works with their promoters to enhance the project structure for identifying the GHG emissions mitigation potential, and improving the ability to leverage it for investment opportunities.

Period

June 2000 to April 2004

Status

Building Institutional Capacity

- Assisted DA in building its capacity for the development of GHG emissions mitigation projects
- Developed the clean energy and climate change module in the curriculum of the Lal Bahadur Shastri Academy of Administration and delivered it at the foundation course
- Developed a computational toolkit with multiple tools addressing baseline development, carbon finance, monitoring & verification, marketing & funding and sustainable development of a climate change mitigation project
- Conducted major training programs for Indian FIs to strengthen their project appraisal process for clean energy projects
- Conducted GHG assessments of five FI’s portfolios of assisted projects, and informational exchange on GHG portfolio management with U.S. based FIs
- Conducted three training programs covering over 150 municipalities and urban local bodies on techniques for municipal solid waste disposal with a view to mitigating/capturing methane emission

Project Development

Provided technical assistance to ten project developers by highlighting the GHG emissions mitigation potential of their projects. These projects cover renewable energy and energy efficiency projects. To date, four projects have secured financing.

GEP-CCS has developed a web-based project tracking system to provide information to stakeholders on the progress of GHG emissions mitigation projects. A computational toolkit has also been developed to analyze the GHG emissions reduction potential of a project to enhance financing ability.



Outreach and Collaborative Activities

GEP-CCS organized and supported the following activities:

- Four Senior Policy Roundtables for discussing strategies for reduction in the growth of GHG emissions covering electric utilities, renewable energy, industry and urban transport and solid waste management sectors
- Two project development meetings in association with DA and ICICI
- Two meetings of a Research Forum in India in association with the Indira Gandhi Institute of Development Research (IGIDR), and in USA in association with the World Resources Institute (WRI)
- Meetings in association with CII, FICCI, NTPC were organized to promote the accounting of GHG emissions from industrial and infrastructure activities. These were conducted in association with WRI's GHG Protocol Initiative
- Luncheon/breakfast meetings with topical U.S. GHG experts and participated in events organized by partners such as CII, FICCI, ICLEI, DA etc.
- Organized two workshops on identification of interventions in the transport sector for reducing growth of GHG emissions in Hyderabad
- A brainstorming session with key working and retired IAS officials and subject experts in association with the National Society for the Promotion of Development Administration, Research & Training, (NSDART) at Mussoorie

Performance and GHG Mitigation

The overall potential of GHG emission reduction from the ten projects (which cover mainly CO₂ and CH₄ reduction) is of the order of 1.4 million metric tons of CO₂e per annum.

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

- Since GEP-CCS promotes clean energy projects, it leads to more efficient use of resources
- The training programs for LBSNAA, FIs and the urban managers could lead to a multiplier effect
- Research sponsored under GEP-CCS also analyzed possible impacts of climate change on the vulnerable population and systems and consequences of policies on macroeconomic parameters

Looking Ahead

Near-Term Project Activities

GEP-CCS proposes to

- Assist all the stakeholders in designing demonstration projects for minimizing GHG emissions from the transport sector and municipal solid waste (MSW) treatment
- Continue to assist climate change mitigation project developers to make energy efficiency and renewable energy projects 'bankable' and to identify funding for such projects
- Support ongoing capacity building efforts by linking Indian and U.S. Institutions and fostering collaborative partnerships

Climate Change Center

The Climate Change Center (CCC) at Development Alternatives works on global environmental issues such as climate change, global convention and protocols, sea level rise, depletion of ozone layer and various issues pertaining to trade and global environment.

The CCC was initially set up with the support of USAID to facilitate and coordinate projects as part of Activities Implemented Jointly (AIJ) under the UNFCCC. This concept was further translated into action by USAID during their Climate Change Outreach and Awareness Activity (CCOA) Project, for which DA was a partner. Upon successful completion of the CCOA project, the formal establishment of the CCC was initiated with USAID's Greenhouse Gas Pollution Prevention – Climate Change Supplement (GEP-CCS) Project. Over the last two years, the CCC has been fully operational. The main functions of the CCC are Research and Analysis, Facilitation of Climate Change Mitigation Projects, and Outreach and Awareness.



Accomplishments

- Recently recommended to be the South Asian Resource Center on climate change
- Developed a series of toolkits and a portfolio of climate change mitigation projects
- Established methodologies and procedures to incorporate sustainable development goals in climate change mitigation projects, and developed training modules for trainers on sustainable development indicators
- Created awareness and capacities among stakeholders such as the business sector, grassroots NGOs, and regulatory authorities

Future Plans

The Climate Change Center plans to develop a portfolio of climate change mitigation projects in the field of renewable energy, energy efficiency and policy analysis and advocacy in the field of climate change. The CCC is an active member of the Climate Action Network, South Asia.

Accelerating Renewable Energy Commercialization in India (ARECOMM)

Objective

ARECOMM is designed to overcome the barriers that impede private investment in the commercialization of renewable energy technologies and in the development of commercially viable small – and medium-scale enterprises (SMEs) that harness these technologies.

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Type of Activities

Financing and enterprise incubation.

Locations

All India; target states include

- Karnataka
- Andhra Pradesh
- Tamil Nadu
- Rajasthan
- Himachal Pradesh
- Gujarat
- Madhya Pradesh

Details

- Assist private sector renewable energy projects/enterprises in accessing financing
- Facilitate technology transfer between Indian and U.S. business organizations
- Work with renewable energy entrepreneurs to develop institutional mechanisms to design and articulate their interests and inputs in the formulation of policy in the energy sector
- Help forge trade and investment links with U.S. firms

Technologies/Approaches Promoted

Solar, wind, hydro, and biomass technologies. Financing, tailored enterprise assistance, and facilitating access to further financing as required.

Period

October 2001 – December 2002

Status

WII has held two investment committee meetings, where financing for two projects (subject to the achievement of certain milestones) was approved. Funds to one project have been disbursed.

Partner Organizations and their Roles

USAID is the prime funding agency while WII provides a cost-share on the project.

Sustainable Development Benefits

- Improves job opportunities at the site as well as jobs for the company that is executing the project
- Moves the Indian grid away from primary dependence on coal and other fossil fuel based power, leading to related health and environmental benefits
- Provides off-grid and distributed power to those without access
- Helps lead private capital that otherwise may not be available for related projects into investments in the renewable energy sector by increasing familiarity and comfort with renewable energy in commercial lending institutions
- Helps share the risk and defray the high upfront capital costs in establishing new renewable energy enterprises
- Provides benefits to other stakeholders, which include the residents of rural areas targeted to be served by the development and/or expansion of renewable energy enterprises and NGOs (including rural cooperatives and nonprofit development organizations). Local NGOs benefit from inclusion in a community network of service providers, technicians and project coordinators. The residents of rural areas will have a better quality of life. The access to basic renewable energy-based electric services will provide, for example:
 - Respite from time-and labor-intensive activities related to fetching water and fuel wood, which are frequently the responsibility of women and children
 - Improves health by reducing or eliminating exposure to noxious gases, as well as soot, smoke and fire hazards posed by traditional energy sources
 - Enhances educational opportunities through night reading and increased access to the media via radio, television and video distance learning programs
 - Economic empowerment through productive, income-generating activities such as extended hours of operation for small businesses and development of cottage industries
 - New employment opportunities in technical and service areas created by the development of a local energy resource and enterprise

Looking Ahead

- The ARECOMM investment committee meeting on September 11, 2002, approved three additional projects for funding. The team plans to place all funds by December 2002.
- The ARECOMM team is planning to conduct research designed to finalize the form of the umbrella institution for the renewable energy community in India.



Water-Energy Nexus Activity (WENEXA)

The “Water-Energy Nexus” is a concept that recognizes the interdependence of water and energy resources and the role that each plays in the generation and use of the other. The focus on this relationship comes at a critical time, when India is experiencing a crisis of quantity and quality of both water and energy resources in all sectors.

The agriculture sector has been selected for the initial WENEXA focus, which began in April 2002 implemented by PA Consulting. Agriculture is the largest consumer of water in India and also uses a significant portion of the country’s electricity.

Objectives and Major Components

WENEXA seeks to improve co-management of energy and water resources in the agriculture sector through enhanced power distribution and end-use efficiency coupled with sound water management practices. The activity will contribute to the power distribution reform process and introduction of commercial best practices, help conserve energy and water resources, reduce the growth of GHG emissions, and improve the quality of life for participating farm families.

Strategic Approach

Initial activities have been organized to align with the three components that correspond to the three objectives outlined above and operate at distinct scales:

- Policy Dialogue: Activities at the central level, and to some extent state level, will enhance cross-sectoral policy dialogues, institutional support



to energy/water initiatives, and integrated information management.

- Sector Reform: Interventions at the state level related to power utilities and water institution strengthening will help promote sector reform. The private sector will also be encouraged to participate in a range of market-based solutions for obtaining sustainable sources of financing and improving the efficiency and reliability of water and energy services in all sectors.
- Customer Service: At the local level, broad stakeholder involvement will be promoted to improve electricity and water services to agricultural consumers and rural areas.

Initial activities should provide help to set the stage for subsequent activities in which municipalities and industries will be engaged in developing comprehensive efficiency packages for both water and energy resources. Combined with integrated water resources management, water harvesting and conservation efforts, USAID’s energy-water nexus activities would provide a solid beginning for seriously addressing the potentially devastating water crisis that is rapidly descending on India. (For further information contact Ms. A Walia, USAID at email: arwalia@usaid.gov)

Integrated Environmental Strategies (IES)

Objective

IES supports the development of in-country capacity to quantify and implement clean energy policies and technologies that have significant air quality, public health, economic, and GHG emission reduction benefits.

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- USAID – Guidance on overall project
 - USEPA – Direction on overall project
- USAID and USEPA are funding the projects.

Location

Hyderabad, India

Details

Specific Objectives

- Build capacity to quantify ambient and indoor air quality, public health, sustainable economic development, and GHG emission reduction benefits of clean energy technologies, urban development, and transportation policies.
- Develop and institutionalize an analytical framework to aid policymakers to identify, analyze, and implement integrated measures to address local priorities such as air quality, human health, and sustainable economic development while simultaneously reducing GHG emissions
- Establish an interdisciplinary team with capabilities to conduct integrated analysis of multiple benefits on a sustainable basis

Partner Organizations and their Roles

- Environmental Protection Training and Research Institute (EPTRI) – Coordination, development of emissions baseline, scenario development, air quality modeling, workshops
- ICF Consulting – Provide assistance with transportation sector analysis
- Institute of Health Systems – ambient air quality and health valuation
- Lawrence Berkeley National Laboratory (LBNL)
- National Renewable Energy Laboratory – Technical support
- Sri Ramachandra Medical College – indoor air quality analysis
- Tata Energy Research Institute (TERI) – indoor air quality analysis



- Build support at the local and national level for implementing efficient and cost-effective integrated short – and long-run strategies for improving air quality and public health, promoting sustainable economic development, and reducing GHG emissions
- Recommend cost-effective policies and technologies that will improve indoor air quality or ambient air quality while reducing GHG emissions and achieving public health and economic development objectives
- Develop implementation plans for a select number of promising measures

Category Overview

Clean and efficient energy technologies/policies with emphasis on the transportation sector.

Type of Activities

Capacity building, training, analysis of clean and efficient energy technologies/policies, policy workshops.

Technologies/Approaches Promoted

Clean energy technologies/policies.

Period

February 2002 - September 2003

Status

The IES program was launched in February 2002. In-country teams have been established, a workplan has been prepared, and potential integrated measures have been identified.

Performance and GHG Mitigation

The project will build support for the implementation of measures that will influence the reduction of air pollutants and GHG emissions, morbidity and mortality, and will lead to valuation of health benefits.



Sustainable Development Benefits

The IES program will provide technical capacity in India to enable policymakers in analyzing cost-effective clean and efficient energy technologies/policies with multiple economic, environmental, social benefits. The majority of the harmonized or integrated mitigation options have sustainable characteristics and benefits (e.g., improved air quality and public health) that positively affect the social, environmental and economic fabric of the developing countries.

Training and Capacity Building Initiatives

There will be a variety of training and capacity-building efforts on many topics including emissions inventory, air quality and energy modeling, health impact analysis.

Looking Ahead

Short-term activities include assembling technical teams, developing mitigation scenarios, collecting health/demographic data, and preparing baseline emissions inventories. Outputs include air dispersion modeling runs based on different air quality scenarios, estimates of health impacts of different scenarios, and development of cost estimates for quantifiable health endpoints.

Future Potential for the Sector

GHG and air pollutant reductions will materialize after mitigation options are implemented in later phases. In addition to the core IES project activities, outreach to public officials, the private sector, and the general public Hyderabad will be initiated in late 2002 to engage key constituencies and build support for implementation of promising measures.

Solar Finance Capacity Building Initiative (SFCBI)

Background

The Solar Finance Capacity Building Initiative (SFCBI) is designed to measurably reduce the constraints on, and increase the capacity for, financing of solar energy markets in India while at the same time helping local entrepreneurs in the for-profit and not-for profit sectors build sound portfolios of solar energy projects for investment. Under Winrock's leadership, six organizations are working together to execute the Initiative: Winrock International, Winrock International India, Solar International Management, Institute for Sustainable Power, Insights In Action, and the Solar Electric Light Fund. The SFCBI team offers expertise in and a comprehensive knowledge of the policy, finance, institutional, capacity building, and technological variables necessary to execute successful solar energy projects in India, combined with in-country capabilities and relationships with organizations that have long-term strengths in serving the end users' needs through the market.



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Type of Activities

The SFCBI team is executing activities in four thematic areas to address the finance-related challenges to developing a sustainable market for solar energy in India.

Training Lending Personnel

The SFCBI team is executing an education and training program on issues relevant to financing solar home systems (SHS) for lenders and other financial professionals. These are short courses



on the technological, economic, and financing issues pertinent to SHS. This is different than training technicians, who are expected to go out and make installations. With financial professionals, the task is to get them up the learning curve to the point that they begin asking the right questions and have a context for understanding the answers they receive. The goal is to make lenders more comfortable with solar technologies and more confident in their own abilities to assess financing situations.

With the assistance of Bharathiya Vikas Trust and Syndicate Bank, the SFCBI team executed ten training courses in four months, training over 400 branch manager level bankers. These ten courses represent the first phase of the training program. In the second phase of the training program, the team implemented five "Train-the-Trainer" courses designed to ensure the ongoing sustainability of the SFCBI Bankers' Training Program by transferring sufficient knowledge to Faculty of Banks' Staff Training Colleges thereby enabling them to continually offer courses that teach branch manager level officials within their bank the skills necessary to analyze and process solid loans for SHSs.

Strengthening Micro-Credit Organizations and their role in Solar Energy Market

The SFCBI team has undertaken activities designed to assist the Society for Helping and Awakening Rural poor through Education (SHARE) in strengthening their existing micro-credit programs for the specific purpose of

promoting consumer access to solar energy financing. The work with SHARE is structured to serve as a pilot, and will help generate knowledge to work with micro-credit organizations throughout India enabling them to include loans for solar PV in their portfolio.

Developing Financing Mechanisms

The SFCBI team is working to structure and recruit management talent for the SolarBank Fund of India (SBF-India). SBF-India is designed as a finance facility that links private capital markets to the end-use markets for solar energy in India.

Developing Solar Markets and Projects

It is widely acknowledged that while the lack of financing is a major constraint on the growth of solar markets, it is equally true that the lack of good solar projects is a major impediment to the development of financing mechanisms. Further studies to document the lack of good projects and the difficulties of developing good projects in developing countries will not solve the problem. Only hands-on development work applied after careful study of the situation, will cause good projects to take shape. To this end, the SFCBI team is providing targeted technical assistance services and business planning grants to assist entrepreneurs to develop viable solar projects in India and to advance the financing potential for each opportunity. The business planning grants are targeted towards organizations that are at present, not active in solar but desirous of entering solar business in the near-term. In this way, the program will have greater impact in developing solar markets and projects in the country by bringing-in new players and supporting innovative ideas for building commercially viable solar businesses. The technical assistance services are targeted at assisting existing solar energy firms in strengthening existing operations and expanding into new markets and/or areas of business.

Green Business Center



The USAID-USEA, The Confederation for Indian Industry (CII), Private Sector Trade and Investment Working Group on Clean Energy and the Environment will lead to creation of the Green Business Center (GBC) in Hyderabad, Andhra Pradesh.

The GBC was created with the goal of becoming the focal point of energy, environment and efficiency issues in India. The web site (www.greenbusinesscentre.com) provides extensive technical and other information. USAID and USAEP collaboration helped develop a business plan, which has leveraged over \$1M in private sector contributions. GBC construction began during July 2002. CII facilitates the activity.

CII hopes to achieve the highest Leadership in Energy and Environment Design Rating System, USA (LEED) award (the platinum award). If it does receive this award, it will have the unique distinction of being the first building outside the U.S. to have done so. As per current plans, the construction should be complete during 2003.

USAID assistance has enabled the CII and Andhra Pradesh Government to network and exchange ideas on green architecture with U.S. entities such as U.S. Green Building Council, the Green

Business Council, and the U.S. cities of Minneapolis, Minnesota and Oakland, California.

In December 2000, USAID sponsored a design tour to the U.S. for a CII/AP government team that provided partners useful ideas and contacts which have greatly influenced the design and structure of the GBC. In September 2001, CII organized and USAID sponsored an International Green Building Congress and Exposition in Hyderabad. The GBC will organize similar events in the future.

It is important to note that the activities of GBC have already begun, in advance of the building that will house them, in keeping with the recommendations of the Business Plan. It is also important to note that the newly released action plan for the Ministry of Power's Bureau for Energy Efficiency contains activities related to energy efficient building codes. The Government of India has acknowledged that energy conservation can significantly contribute to greenhouse gas emissions mitigation and economic development for the country. (For further information contact Mr. S Padmanaban, USAID at email: spadmanaban@usaid.gov)

Biomass Energy from Mustard Husk Briquettes



The Indian state of Rajasthan produces over 3.5 million metric tons (MT) of mustard annually. The total production of mustard husk in the state is over five million MT. Out of this availability of mustard husk in Alwar District alone is around 700,000 MT. This is a significant source of renewable energy. Normally, agro-waste is used as cattle feed. However, this is not eaten by the cattle because of its bitterness and has to be burnt on the fields without any manure value.

The process of densifying loose agro-waste (mustard husk) into a solidified biomass of high density, which can be conveniently used as a fuel, is known as briquetting. This process involves grinding and drying of the mustard-husk to make particles of uniform size (less than 5 mm) and to reduce the moisture content to an optimum level. The pre-processed mustard-husk is then subjected to a high temperature and pressure when the lignin present in the biomass melts out to the surface, allowing the loose particles to adhere with each other, forming a cohesive mass, called "briquette." It is then air-cooled, and stored/packed to avoid direct contact with moisture. Besides the consistency in quality, low moisture content, and lower price, mustard-husk briquettes have the following characteristics/qualities:

- High calorific value ranging between 4,000-4,500 kcal/kg as compared to 3000-3500 kcal/kg in coal
- Low ash content of 2-5% as compared to 30-40% in coal normally available in India
- No pollution, as it does not emit any sulfur or phosphorus fumes, eliminating the need for expensive pollution control measures
- Lower cost than coal
- Provides a facility for utilizing a renewable source of fuel more efficiently, thereby saving the country scarce resources spent

in importing the fuel

- Saving the country's most scarce natural resource forests

Manipal-NRI International, LLC (MNI), a U.S.-based corporation, incorporated in 1995, has a license to set-up a 100 MW power plant based on biomass fuel in Rajasthan. In view of the availability in large quantities MNI has selected mustard-husk briquettes as the fuel for its proposed thermal power plant. In order to set-up a pilot power of 12.5 MW in district Alwar, MNI had planned to set-up 6-7 decentralized briquetting plants each with an annual capacity of 15,000 tpa. USAID has facilitated a loan of Rs. 36 million (\$850,000) from ICICI out of the USAID/ICICI Technology Development and Commercialization (TDC) Reflows Funds for setting up three briquetting plants.

MNI's proposed pilot power plant is estimated to cost \$10 million in equivalent rupees. MNI plans to raise \$7 million as loan finance from private banks and the remaining \$3 million will be brought in as equity. USAID has issued a letter of intent to MNI for a Development Credit Authority (DCA) Guarantee to facilitate borrowing from private sector banks. MNI has been issued a letter of intent from ICICI Bank to provide loan finance for this project. MNI is currently in the process of meeting the conditions stipulated in ICICI letter of intent. The financial closure of the project is expected within next couple of months. (For further information contact Mr. R. K. Berry, USAID at email: rberry@usaid.gov)

United States Asia Environmental Partnership (USAEP)

In India, USAEP runs a relatively large operation covering a broad spectrum of environmental activities. USAEP's activities address critical problems associated with drinking water as well as wastewater, solid waste management, air quality, and energy efficiency. The program is seven years old and is beginning to mature and measurable progress has been made in raising awareness, addressing and scoping environmental problems.

USAEP has offices in five major Indian metropolitan areas: New Delhi, Mumbai, Chennai, Kolkata and Ahmedabad. The first four have a regional responsibility that includes coverage of Nepal from Delhi and Bangladesh from Kolkata. The fifth center concentrates on urban issues nationwide and will increasingly work with the regional centers.

Achievements

- Strong relations with government (federal, state, and municipal) appropriate NGOs, industrial associations, industrial development cooperations and especially environmental agencies. Notably, USAEP developed more intimate relations in the key central ministries and among some important municipal leaders.
- Focus on improving urban air quality working with the auto industry and municipal officials to establish inspection and certification facilities in several key cities and beginning the process in several others, added to the city managers association and created demand for future expansion, initiated environmental management systems in two city metro rail systems in partnership with a U.S. city, expanded awareness of, bottom line benefits, and created demand for Ecotel certification in the Indian hospitality industry through one of USAEP's first cross-regional activities.
- Support of USEPA initiatives to re-engage in India is particularly noteworthy. It has led to the point where a Ministry of Environment and Forest (MoEF)/USEPA MoU is expected that will promote Indo-American collaboration in a wide variety of environmental areas. USAEP now has excellent access to policy makers at the Federal and State levels.
- Strengthened environmental extension centers in Mumbai, Kolkata and Delhi as well as launching one in Hyderabad. Bolstered the new professional chapter of the Indian Environmental Association (IEA) in its partnership with the Water Environment Federation (WEF).
- Increased promotion of American best practices and technology by organizing a wide variety of exchanges and trade missions to and from the United States. Several sales of American technology directly resulted from these tours and more are expected as demand rises. (For further information contact Mr. James Stein, USAID at email: jstein@usaid.gov)



Section II

URBAN

ENVIRONMENT, AIR QUALITY AND TRANSPORT

Clean Cities International, New Delhi Program

Objective

The USDOE Clean Cities International Program is sharing its model with the City of Delhi. Support will be provided in the form of quantification of GHG emissions, benefits and/or penalties of alternative fuel vehicles (AFVs) and assistance with safety and specification standards for the equipment and vehicles through train-the-trainer programs.

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Partner Organizations and their Roles

- ANGI International – Serve on advisory committee related to refueling stations
- Clean Fuel Technologies, Gilbarco – Serve on advisory committee related to siting options
- Centre for Science and Environment (CSE) – Provide in-country guidance and consulting
- Department of Energy (DOE) – Share/Train on Clean Cities Model
- eMobility International – Manage project, coordinate with SIAM and CSE
- IMPCO Technologies – Serve on advisory committee for creation of Indian testing laboratory, development of light-duty test kits, development of heavy-duty test kits
- Liquid Controls – Serve on advisory committee related to LPG and CNG components
- National Energy Technology Laboratory (NETL)

- OPW Equipment – Provide training on nozzles and accessories for CNG and LPG
- Propane Education and Research Council (PERC) – Provide reports on local and global pollutant reduction from propane vehicles
- Society of Indian Automobile Manufacturers (SIAM) – Provide in-country guidance and consulting
- Science Applications International Corporation (SAIC) – Quantify the GHG benefits/penalties of CNG buses
- WVU and NGV Institute provide train-the-trainer programs.

Funds have been provided for the DOE Clean Cities Program (Phase I & II) by IMPCO Technologies, Angi International, Clean Fuel Technologies Gilbarco, Liquid Controls, Propane and Education Research Council and OPW.

Location

Delhi, India

Details

Specific Objectives

The DOE Clean Cities International Delhi project will provide advisory services to stakeholders in New Delhi with respect to alternative fuel vehicles (AFVs) and infrastructure. The project will bring a group of delegates to the U.S. to view U.S. natural gas vehicle (NGV) and propane vehicle technology



and provide advisory services on GHG emissions benefits/penalties of NGVs and provide train-the-trainer programs to ensure the safety and performance of vehicles and stations.

Type of Activities

Training and Capacity Building Technology Demonstration Project Development

Technologies/Approaches Promoted

Natural gas vehicles and propane vehicles and infrastructure for vehicles (refueling, maintenance, and safety).

Period

October 2002-December 2004

Status

For Phase I, a Memorandum of Understanding (MoU) has been signed between SIAM, the Delhi Transport Corporation and the National Alternative Fuels Training Consortium to provide a train-the-trainer course for technicians on CNG and cylinder inspection. In addition, an overview course will be taught on CNG and LPG vehicles to policy makers. The first meeting of the Clean Cities Delhi stakeholders is scheduled for November 2002.

The DOE will also conduct a reverse trade mission in October 2002 in conjunction with the World NGV 2002 conference.

For Phase II, technical assessments will be conducted on infrastructure, additional training on station performance and vehicle safety, and GHG emissions/reduction calculations.

Sustainable Development Benefits

It is estimated that there are 8 deaths a year in the city of Delhi as a result of diesel emissions. This project will eliminate particulate matter from each bus replaced.

This project also has the potential to reduce GHG emissions by an estimated 20% per vehicle for each gasoline powered vehicle replaced.

Training and Capacity Building Initiatives

- There will be a training session on the safe use of NGVs and refueling NGVs in November 2002.
- There will also be an information session on the quantification of GHG emissions from NGV buses during a scoping mission to New Delhi in November 2002.

Looking Ahead

- Training session on the safe use of NGVs in New Delhi (November 2002)
- Technology tour of U.S. NGV equipment in Washington, DC (October 2002)
- Advisory services on safety and equipment standards for natural gas and propane vehicles-ongoing throughout project.

Sustainable Cities Initiative - India

Objective

This project identifies and implements energy efficiency initiatives together with municipalities to address their water supply issues and to share experiences with other municipalities in the region.

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- State of Karnataka-Directorate of Municipal Administration
- Tata Energy Research Institute (TERI) Southern Region

The Karnataka project is designed to make KUIDFC an energy efficiency resource in the state, and to help municipalities improve their energy efficiency. This is being accomplished through the establishment of an energy efficiency technical cell within KUIDFC's operational structure. TERI will support the municipal energy and water audits. Indore will continue to work with the Alliance as it pursues implementation of efficiency recommendations.

Indore has made an allocation in their fiscal year budget for April 01-March 02, to cover

Partner Organizations and their Roles

- Indore Municipal Corporation (IMC)
- Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC)
- Pune Municipal Corporation (PMC)



energy efficiency expenses, giving the energy cell the financial resources to evaluate and implement energy efficiency projects. KUIDFC in Karnataka provided resources for printing the Alliance's Watergy report and will oversee widespread distribution of the report throughout the state. The state of Karnataka has committed to provide support for the KUIDFC energy cell, following the Alliance's initial year of support.

Locations

Projects focus upon energy and/or water audits of select municipalities facing specific energy management challenges. Audits attempt to address how municipalities can increase the efficiency of their municipal water delivery and lighting systems. Participating municipalities were selected on the basis of their interest in implementing energy efficiency initiatives and their need to address water supply and energy management issues. The recently initiated Karnataka outreach phase of work focuses upon four municipalities from across the state ranging in size from 45,000 to 900,000 inhabitants.

Details

Type of Activities

Training, capacity building, and project development.

Technologies/Approaches Promoted

- Capacity building
- Municipal outreach
- Development of management tools

Water System Efficiency Opportunities

- Leakage reduction in water supply systems
- Pipe relining
- Installing capacitors
- Installation and harmonization of high efficiency and variable speed pump drives
- Development of public education programs focusing upon wise water use

Street Lighting Efficiency Opportunities

- Load management systems (LMS)
- Timer installation
- High efficiency lamps



Projects in Indore/Pune

Specific Objectives

- Develop replicable municipal energy efficiency models applicable to Indian municipal needs
- Identify tools for assisting municipal decision makers to apply efficiency concepts within a range of urban services, primarily water and lighting
- Promote capacity building efforts to assist municipal technical staff identify and implement energy efficiency in both project development as well as daily operations

Period

Indore - May 2000 to January 2003 (estimated)
Pune project completed in January 2002

Projects in Karnataka

Specific Objectives:

- Build on Indore/Pune initiatives to promote awareness among small and middle-sized municipalities of benefits of energy efficiency
- Create additional efficiency models working with local municipal partners
- Develop energy efficiency know-how of state organization for implementation of municipal infrastructure projects
- Instill awareness among state and municipal officials of benefits of energy efficiency
- Create and disseminate water and energy efficiency toolkit that will serve to jumpstart the efforts of the municipalities committed to undertaking more of these activities
- Create a municipal outreach model that can be replicated elsewhere in India

Period

May 2002 to May 2004 (estimated)

Technical Performance Data

(for Indore/Pune/Karnataka)

Implementation of efficiency recommendations is now the main focus in Indore and Pune while outreach and on-going capacity building will continue in Karnataka. Indore shows initial energy savings within the existing water pumping system of 45 million kWh or 20%. Indore has also opened a dialogue with a private Energy Service Company (ESCO) to evaluate and install a street lighting load-monitoring system (LMS). These trials have identified savings opportunities of 25% over the current level of energy being consumed, which amounts to savings of 4.4 million kWh per year. Pune has made savings amounting to more than 300,000 kWh, or Rs 1.5 million mainly in its water pumping systems. A study showed that potential energy savings in excess of 20% exist in the pumping facilities operated by Pune. Energy efficiency activities identified to this point in Pune and Indore total 6,230 MWh and 7,700 metric tons of CO₂ avoided per year.



The Karnataka energy efficiency outreach will build upon the models created in Pune and Indore. The project will begin with audits of four municipalities, focusing upon how they can increase the efficiency of their municipal water delivery and lighting systems. No- and low-cost recommendations from the audits will be implemented and the resulting energy and cost savings will be measured. The experiences of the four demonstration cities will then be shared through a series of workshops with other municipalities in the state.

Sustainable Development Benefits

- Help build capacity in local authorities to use resources efficiently.
- Reduce energy resources, which will result in a decrease in both air pollution and in GHG emissions.
- Improve access to water by achieving cost-efficiency in providing energy services.

Looking Ahead

The Alliance is currently focused upon developing additional efficiency models within the scope of its Karnataka project. As these models are developed much effort will be made to disseminate them to the largest Indian audience possible, along with the tools to help implement these efforts. As these efforts will often require additional financial resources, the Alliance is seeking to work with appropriate funding agencies for project implementation and to realize additional GHG emissions reductions.

Cities For Climate Protection (CCP) Campaign

Objective

The CCP Campaign objective is to build a worldwide movement of local governments who adopt policies and implement measures that achieve measurable reductions in local greenhouse gas (GHG) emissions, improve air quality, and enhance urban livability and sustainability.

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Partner Organizations and their Roles

Seven municipal corporations at seven locations (Guntur and Hyderabad in Andhra Pradesh, Jabalpur in Madhya Pradesh, Kolkata in West Bengal, Ludhiana in Punjab, Sangli in Maharashtra, and Vadodara in Gujarat).

All the municipal corporations have signed MOUs with ICLEI and USAID's Regional Urban Development Office to establish an operating understanding to explore and find innovative and cost-effective solutions to environmental and urban management problems that also mitigate the emissions of greenhouse gases

(GHGs) under this Campaign. The intended beneficiaries of this collaboration are the citizens of all seven cities and the Corporations themselves.

As part of the CCP Campaign, each participating municipal commissioner/mayor agrees to do the following:

- Designate at least two city staff members (one senior) who will lead/coordinate the city's involvement in the program.
- Ensure that all relevant staff cooperate in the activity and facilitate availability of information for completing the energy/emission survey in a timely fashion.
- Ensure that the designated staff for CCP is available to participate in the orientation/training program and workshops conducted from time to time by ICLEI/USAID.
- Provide reasonable working space for the Intern, who will work under the guidance of the municipal commissioner.
- Commit that at least two of the measures identified in the Action Plan will be implemented at the end of the 24-month period.

Locations

- Guntur and Hyderabad in Andhra Pradesh
- Jabalpur in Madhya Pradesh
- Kolkata in West Bengal
- Ludhiana in Punjab
- Sangli in Maharashtra
- Vadodara in Gujarat



Details

Specific Objectives

Together with city governments, the CCP Campaign works towards improving city management and addressing economic, environmental and quality of life concerns, and in doing so reducing or avoiding air pollution, including GHG emissions.

Through its various sectoral projects related to land-use policies, infrastructure and other service provisions, transportation management systems, building codes, and waste management, this Campaign helps local governments to directly influence and control many of the activities that emit GHG emissions. In India the Campaign also looks into 'no cost or no loss' provisions so that the city governments can save some money through energy efficiency in current activities and invest the same in other developmental projects.

Type of Activities

As part of the CCP Campaign, ICLEI:

- Provides technical support for emission inventory and implementation of reduction measures
- Fosters city-to-city exchange of knowledge and experience through workshops and other training
- Helps broker funding for project implementation

ICLEI strives to bring together the corporation staff, elected officials, commercial institutions, industry, and other stakeholders in a vital effort to build the consensus necessary to implement these measures.

ICLEI has developed a five-milestone process to help implement the CCP campaign. These are:

- Milestone 1: Choose a baseline year and inventory energy use and greenhouse gas (GHG) emissions from the city's operations and the community, and then forecast these emissions for the next 10 to 20 years
- Milestone 2: Set a target for GHG emissions reduction or avoidance
- Milestone 3: Develop a Local Action Plan that identifies the measures that, when implemented, will reduce emissions and energy use to meet the city's emission reduction or avoidance goal
- Milestone 4: Begin implementation of measures as per the Local Action Plan
- Milestone 5: Monitor and verify progress on the implementation of measures



Technologies/Approaches Promoted

As part of its Action Plan, the CCP campaign concentrates on improving energy efficiency in municipal buildings, street lighting, water distribution, treatment and pumping that will result in cost savings for the local government. This campaign is also planning to address transportation and traffic-related problems, and waste management concerns. All these measures will improve air quality and urban livability in the locations specified.

Status

ICLEI has recently completed Milestone 1 that pertains to the emissions inventory and projection. It is currently carrying out activities under Milestones 2, 3 and 4 simultaneously that refer to the reduction goal formulation and action plan development, and initiation of demonstration projects on the ground with the help of other financial institutions and technical partners. An energy audit was undertaken and energy efficiency measures recommended for municipal pumping systems in Kolkata and a demonstration project on retrofit tube lighting in Jabalpur and Ludhiana was initiated by ICLEI.

Performance and GHG Mitigation

- 130,236 metric tons of CO₂e reduced from energy efficient water and drainage pumping system projects in six corporations (this is an estimate of GHG emission abatement if all six municipal corporations implement projects on energy efficiency in water and drainage pumping systems)
- 9,798 metric tons of CO₂e reduced from energy-efficient street lighting retrofit tube light projects in five municipal corporations (this is an estimate of GHG emission abatement if five municipal corporations implement projects on energy efficiency retrofit tube lights)

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

Cities participating in the CCP Campaign benefit in the following ways:

- Cost savings – Actions that reduce GHG emissions will reduce electricity and fuel use by reducing energy costs for citizens, businesses, and institutions and creating savings for municipal budgets
- Improved local economies – Decreased energy costs, coupled with expansion into new services and technologies (e.g., energy efficiency and renewable energy) give local firms a competitive edge. Demand for energy efficient products and services, and for new or alternative energy technologies expands local business, creates local jobs and boosts local economies
- Improved air quality and public health – In the short-term, less fossil fuel use in all sectors means less air pollution and fewer air quality-related public health impacts, such as asthma and other respiratory ailments. In the long-term, reduced GHG emissions may reduce the likelihood of climate-related public health problems, such as the spread of heat-dependent diseases
- Improved quality of life – Reduced GHG emissions with measures that make our communities less dependent on autorickshaws can reduce traffic congestion, clean the air, and contribute to more efficient homes, offices, and land-use patterns. Combined, these measures can help build a more livable community

Training and Capacity Building Initiatives

ICLEI organized two workshops (in October 2001 and June 2002) involving all the seven corporation officials including the commissioners, mayors and technical staff. Other technical consultants in the field of energy efficiency in lighting, pumping systems also attended the workshops and buildings, solid waste management and renewable energy; NGOs; financial institutions; other donor agencies, etc. Around 200 participants benefited from these workshops, including regional participants from Nepal and Sri Lanka.

ICLEI conducted training on the GHG Emission Inventory and Forecast software at all the seven corporations.

Looking Ahead

Near-Term Project Activities

ICLEI is planning to establish a Technical Advisory Group (TAG). TAG will visit all the cities and provide technical assistance and training on energy efficiency in municipal activities. ICLEI is also planning to conduct some street corner meetings to educate the residential/household sector on energy efficiency activities.

ICLEI has begun two demonstration action plans:

- An energy efficiency audit at one water pumping station in Kolkata (measures yet to be implemented)
- Retrofit tube light project at Jabalpur (some streetlights have been fitted already). The monitoring of this activity (Milestone 5) will begin in September 2002

The other projects which ICLEI is looking at are transportation/ traffic management, solid waste management, retrofit tube lights at residential localities (this will be in all seven cities), solar water heating systems, etc.

Indian Zero Emission Transportation (IZET) Program

Objective

The main objective of the IZET is to mitigate local, regional, and global atmospheric emissions from the Indian transport sector. This is accomplished by determining the technical and economic feasibility of electric vehicle transport technology, accelerating the commercialization of alternative transport technologies and by offering consumers an environmentally benign alternative transport option.

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Partner Organizations and their Roles

- Archeological Survey of India, Starwood Hotels, Welcomgroup and Tricon Restaurants International assisted as demonstration hosts
- Bajaj Auto Ltd – Vehicle manufacturer
- New Generation Motors – Electric drive system designer
- Tricon Restaurants International

Locations

- New Delhi, India – Electric 3-wheelers are to operate as flag-down taxis and one unit is stationed at the American Embassy supporting their mail operation. Electric 2-wheelers are to support Tricon's delivery of Pizza Hut's pizzas.

- Agra, India – Electric 3-wheelers are operating at WelcomGroup's Mughal Sheraton Hotel transporting guests to points of interest. One unit is operating within the grounds of the Taj Mahal providing transportation for the elderly and physically challenged.
- Pune, India – Electric 2- and 3-wheelers are undergoing extensive tests at Bajaj's facility and operating within the city.
- Ashburn, Virginia, USA – Design, assembly, and testing of electric drive systems is being carried out at this location.

Details

The IZET program was designed to determine the technical and economic feasibility of electric drive technology, in collaboration with the private sector, for the Indian two- and three-wheeler market while catalyzing and developing private sector interest to sustain the commercialization of the technology after USAID disengages.

Type of Activities

Technology Demonstration and Project Development

Technologies/Approaches Promoted

Electric drive systems for 2- and 3-wheelers – Vehicles were specifically designed to operate under Indian performance, use, and environmental conditions

Period

November 1998 - July 2002



Modernizing Cycle Rickshaws



The Agra Cycle Rickshaw Improvement Project was a collaborative effort of the Asian Institute of Transport Development (AITD), New Delhi, the Institute for Transportation and Development Policy (ITDP), New York, in cooperation with the Indian Institute of Technology-Delhi (IIT). The project was supported by USAID.

The project goal was to modernize the passenger and goods-hauling cycle rickshaws and initiate a process of private sector-led technological innovation in cycle rickshaw design.

Over a three-year period, ITDP facilitated the development of six new prototypes in collaboration with AITD. Three of these prototypes have been commercialized. The improved vehicles weigh 34 kg less than a standard cycle rickshaw, have more comfortable seats and better sun and rain protection. These innovative designs not only provide enhanced comfort and efficiency both for the passenger and the rickshaw puller but are also cost-competitive as compared to the traditional cycle rickshaw. Currently over 5000 such rickshaws are plying the streets of Agra, Mathura, Bharatpur, Lucknow, and Delhi.

Status

USAID's role of proving commercial and technical feasibility while sustaining the private sector relationship has ended. The private sector is moving forward, applying the lessons learned from IZET, to produce the next iteration of EVs for India. This additional investment is estimated to be \$1.5 million, extending USAID's leverage to about 1:6.

The potential benefits are:

- A cleaner environment
- Mitigating urban air pollution and attendant health effects
- Technology transfer and industrial development in India
- Indo-U.S. trade and business partnerships
- Partially realized lower life-cycle costs

Sustainable Development Benefits

The benefits are yet to be fully realized. The technical and commercial feasibility has progressed to a point where the private sector has decided to continue development. This is a large step and appears to validate USAID's perspective that alternative transport technology may be high risk but with commensurate rewards.

Accomplishments till date include:

- Increased public awareness for alternative technologies for the transportation sector
- Increased private sector awareness of the potential that India and other larger SE Asia urban areas represent for alternative transport technology
- Growing concern for ambient urban air quality
- Increasing regulation to limit tailpipe emissions
- Recognition that alternative transportation technologies may be part of the solution but effective mitigation of air pollution extends well beyond the prime mover

Looking Ahead

The commercialization path is continuing as Bajaj and New Generation Motors apply the lessons learned from IZET.

India Electric Vehicle Program



USAID has been supporting an Electric Vehicle Program over the last 5 years. In 1997, USAID sponsored two publications – “Electric Vehicles; Investment Opportunities in India” and “The Electric Vehicle Alternative and a Directory of U.S. EV Industry”.

Initial involvement in this sector began with electric car REVA developed by Amerigon Inc. (Amerigon) Monrovia, CA and Maini Group of Companies (Maini), Bangalore. Financial assistance was provided using central funds to Amerigon for certain tests to be conducted in the U.S. Thereafter, in late 1997 a \$100,000 grant was authorized to Amerigon through Winrock International’s, India Renewable Energy Project Support Office (REPSO) using USAID Renewable Energy Commercialization (RECOMM) grant funds from the EMCAT project. The grant facilitated field-testing of REVA in Delhi and created awareness among the people. REVA was flagged-off by former U.S. Ambassador Celeste in March 1998 in the Embassy compound. Amerigon and Maini have formed a joint venture company, REVA Electric Car Co. Pvt. Ltd. (RECC) Bangalore to manufacture REVA in India. USAID also facilitated financial assistance of Rs. 75 million (US\$ 1.8 million) to RECC from ICICI out of USAID/ICICI TDC Project Reflow funds to accelerate commercial production. Currently, REVA is commercially marketed

REVA Debuts in Delhi

Zero-polluting, battery-driven REVA debuts in Delhi PTI, New Delhi, April 11, 2002



Claimed to be India’s first zero-polluting, battery-driven car, Reva was launched in Delhi on Thursday. The manufacturer claims the car has a running cost of just 40 paisa per kilometre. Manufactured by Bangalore-based Reva Electric Car Company, the car has been priced at Rs 2.54 lakh (ex-showroom Delhi), Reva Electric Car Company managing director Chetan Maini said. Reva is a two-door hatchback which the company says can seat two adults and two children comfortably. Besides being eco-friendly, the vehicle offers easy driving as it has no clutch or gears. The car’s battery has a normal life span of 40,000 km which should last for three-four years in city driving conditions, according to Maini. On a single charge Reva could be driven for 80 km and be charged using a 220-volt, 15-amp power source. Reva Electric Car Company has already sold over 180 Reva cars in Bangalore and Goa in the last 11 months, and has targeted to sell 1,500-2,000 cars in the current fiscal year.

in Bangalore. RECC has some export orders in hand from Nepal and Britain. REVA will be introduced at other places in India soon. (For further information contact Mr. R. K. Berry, USAID at email: rberry@usaid.gov)

USEPA's Program of Environmental Cooperation in India: Air Quality Management

Objective

U.S. Environmental Protection Agency (EPA) Administrator Christine Todd Whitman visited India in January 2002 to mark EPA's commitment to engage in India in a robust program of environmental cooperation. This visit followed from the Joint Statement Between the United States and India that emerged from the meeting between President Bush and Prime Minister in Washington, D.C. on Nov. 9, 2001 "affirming their commitment to complete the process of qualitatively transforming U.S.-India relations in pursuit of their many common goals in Asia and beyond." The Joint Statement called for, inter alia, expanded cooperation in the areas of environment, energy, health, science and technology.

During her visit to India, EPA Administrator Whitman and the Minister of Environment and Forests, T.R. Baalu, signed a Memorandum of Understanding (MOU) concerning cooperation in environmental protection. The MOU provides framework for EPA and the Indian Ministry of Environment and Forests (MoEF) to pursue policy and technology cooperation in the following major areas: air and water quality management, management of toxic chemicals and hazardous waste, and environmental governance. Most relevant to the objective outlined in this compendium is EPA's work with Indian counterparts addressing air quality management.

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Air Quality Management

Most of EPA's current workplan for environmental cooperation in India is focused on addressing air quality management in cooperation with the MoEF, the Central Pollution Control Board, selected State Pollution Control Boards and an array of other partner

organizations. EPA's cooperative efforts addressing air quality management in India, address a broad set objectives including:

- Reducing public health impact from serious air pollution problems confronting India, with a particular focus on addressing Particulate Matter (PM). The World Bank estimates that premature deaths in India from air pollution are about 950,000 per year, about equally split among impacts from outdoor (in urban areas) and indoor (primarily from biofuel cookstoves) air pollution. Children under 5 bear a disproportionate burden of this pollution, and work to reduce these risks supports the EPA's commitments to addressing Children's Environmental Health.

- Cooperating with India on effective strategies to reduce emissions of greenhouse gases, as well as climate forcing aerosols (e.g. black carbon, Nox), including through efforts to reduce energy and pollution intensities in the transportation and industrial sectors.
- Reduce emissions of key toxic air pollutants, particularly those that persist in the environment, transport over long distances, and bioaccumulate in the food chain (e.g. dioxin and mercury).

Air Quality Management Projects that EPA has initiated in the last year include:

Urban Air Pollution Control Strategy Training and Demonstration Program

Building on the results of an EPA-MoEF organized "Brainstorming Workshop on Air Quality Management" held in New Delhi in September 2001, EPA is moving forward with partners in India to enhance institutional capacity in Central and State government environmental agencies to better develop air quality management strategies for cities in India. The program consists of an iterative sequence of training and demonstration projects to improve air monitoring, emissions inventory development, air modeling and control strategy development to help identify the most cost effective approaches to quantify and reduce air emissions.

Also related to this program is a training and demonstration project to improve capacity in India for conducting source apportionment studies that help cities characterize the relative proportion of air pollution coming from different sources (e.g. power plant, versus diesel vehicles, versus open burning). The program will also introduce the new "International Vehicle Emissions Model", a software tool developed by the Center for Environmental Research and Technology (University of California-Riverside) in

cooperation with EPA, to better estimate emissions of criteria pollutants, air toxics, and greenhouse gases from various types of vehicles.

Integrated Environmental Strategies Program

This program is promoting a methodology to assess co-benefits (health and economic) from integrated air pollution and greenhouse gas reduction strategies. A more detailed description of the project is provided in Section I of this compendium (Energy Projects).

Market Mechanisms for Air Pollution Control

This project was initiated in March 2002 with a workshop in New Delhi on Market Mechanisms for Air Pollution Control, and jointly sponsored by the Indian Ministry of Power and the Ministry of Environment and Forests. The objective of this activity is to design a framework for cooperation with India to better understand and use market-based instruments for air pollution control. Under the first phase of this project, participants were educated in the use of cap and trade to reduce emissions from the thermal power sector in India. EPA, USAID, and representatives from MoEF, Central Pollution Control Board, Ministry of Power, National Thermal Power Corporation, and the Center for Power Efficiency and Environmental Protection discussed a framework for future cooperation on market mechanisms. There was interest in pursuing a pilot emissions trading program in one region in India. In order to initiate the process, continued training and capacity-building will be pursued, leading to an analysis of options, a feasibility study, and the design and implementation of a model program.

Looking ahead, EPA, in cooperation with the U.S. Agency for International Development and other international collaborators, will seek to develop specific projects with partners in

India under the auspices “Powering Sustainable Development” partnership announced by President Bush in connection with the World Summit for Sustainable Development held in Johannesburg, South Africa in September 2002. In particular, EPA hopes to develop projects associated with two specific components of this initiative:

The Clean Fuels and Vehicles Initiative

This WSSD initiative promotes an international partnership that has two key objectives: eliminating lead in gasoline in countries where this has not already occurred, and developing a partnership among government, industry, NGOs and other interested parties aimed at reducing sulfur in diesel and gasoline, while concurrently adopting new cleaner vehicle technologies. As India has already phased lead out of its fuels, the focus of proposed EPA cooperation is on addressing fuel quality (reducing sulfur content) and opportunities for improved technologies to reduce air pollution particularly from heavy duty diesel vehicles. These efforts will also address priorities for addressing fuel quality and vehicle emissions as outlined in India’s new Auto Fuels Policy Report.

EPA funding support to the National Alternative Fuels Training Consortium (NAFTC) in the U.S., including for the development of training curricula, will also be supporting efforts to advance use and safety of CNG and LPG vehicle technology in India. Transfer of these train-the-trainer materials to India is occurring as part of a Memorandum of Understanding signed between NAFTC, the Indian Society of Indian Automobile Manufacturers, and the Delhi Transport Corporations, and the transfer to India is being supported as part of the U.S. Department of Energy’s Clean Cities International, New Delhi Program (see description in compendium under Section II: Urban Environment).

The Partnership for Clean Indoor Air

Also launched at WSSD as part of the “Powering Sustainable Development” partnership, was a U.S. supported initiative to that seeks to reduce the estimated 2 million deaths that occur globally as a result of exposure to pollution from traditional biomass fuels used for cooking and heating. Women and children are the most seriously affected. As India has the highest population suffering from these health risks, and in view of the considerable experience in India on this issue, including within the Ministry of NonConventional Energy Sources, this initiative is logical focus for expanded EPA cooperation with India, along with USAID and other international partners.

Other Supporting Activities

In addition to specific air quality management projects reference above, EPA’s agenda in the area of Environmental Governance contributes directly and indirectly to the objectives of EPA’s air quality activities. These activities, however, tend to be advanced in a cross-media context. Examples include planned EPA work in building capacity on environmental compliance and enforcement, risk assessment, environmental standards, laboratory quality management systems, and use of information technology in environmental management to support public awareness and public-private partnerships.

EPA’s ability to advance this program of environmental cooperation in India is due in large measure to the financial, in-country support, and other cooperation provided through the U.S. Agency for International Development and the U.S.-Asia Environmental Partnership. EPA’s program is also benefiting directly from coordination and joint efforts with the World Bank’s environmental projects in India, particularly through their Environmental Management Capacity Building Project.



Section III

SUSTAINABLE

**FORESTRY
PRACTICES**

Management of Forests in India for Biological Diversity and Forest Productivity

Objective

This project seeks to integrate the conservation of Indian biological diversity with the sustained flow of forest products to support urban and rural lifestyles, and to demonstrate the approach in four “conservation areas” that mix protected and managed forests, and the intervening agricultural matrix.

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Locations

- Annamalai Conservation Area, Tamil Nadu
- Garo Hills Conservation Area, Meghalaya
- Satpura Conservation Area, Madhya Pradesh and Maharashtra
- Terai Conservation Area, Uttar Pradesh

Partner Organizations and their Roles

- Forest Departments of Tamil Nadu, Meghalaya, Madhya Pradesh, Maharashtra, and Uttar Pradesh
- Indira Gandhi National Forest Academy
- USDA Forest Service & USDA Foreign Agricultural Service

The Wildlife Institute of India is the lead agency while the USDA Forest Service has a primary advisory role. The collaborators are the Indira Gandhi National Forest Academy, and the principal chief conservators of forests and chief wildlife wardens of the five states where conservation areas are located.

The funding has been provided by the USDA Foreign Agricultural Service, and the Government of India.





Details

Specific Objectives

- Assess plant and animal diversity in each conservation area
- Use existing information to set up information systems on baseline wildlife-habitat relationships
- From stand- to landscape-levels, evaluate the impact of existing forestry practices and use of forest-based resources by local people
- Rapidly assess the social and economic systems of surrounding villages in terms of land use and forest resource dependency
- Use modern ecological concepts to develop landscape-scale management strategies and practices for integrating protected and managed forests, and forest and village systems through sustainable land use practices
- Conduct workshops and seminars to disseminate knowledge and begin the process of training scientists and managers

Type of Activities

Training and capacity building at university and operational field level; outreach through workshops; research and development within pilot conservation areas.

Technologies/Approaches Promoted

Forest ecosystem management, landscape ecology, social forestry, remote sensing and mapping technologies.

Period

1996 -2002

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits:

- Resource maps were generated for all the four sites using remote sensing and GIS technology
- Baseline information on floral and faunal diversity, land use, historic development, socio-economic condition, and wildlife–people conflict was collected
- Wildlife-habitat relationships, status, and management issues of vertebrate species were documented
- Management strategies with novel guidelines for managing biodiversity at the landscape scale that take into account all types of lands and cross multiple spatial scales for multiple wildlife species and resource management needs
- Information dissemination – the project compiled annual reports, research data on elements of biodiversity and human use, and a large spatial database for each conservation area. Several national workshops with forest managers were held. Printed and electronic versions of the final reports and data are widely available

Training and Capacity Building Initiatives

- New training curricula at the Wildlife Institute were formulated for frontline staff, middle and senior level managers, and planners of state forest departments. Project information has been included in curricula at the National Forest Academy. Procedures in the draft National Working Plan Code, 1999, for assessing biodiversity and for wildlife and habitat management planning were largely based on learning from this project.
- A 13-member Indian delegation visited the USA on a study tour from July 24, 1999 to August 7, 1999. The delegation included five faculty members from the Institute and eight field managers representing the four project sites across five Indian states.

Looking Ahead

The project will end with the delivery of a six-volume final report and a national workshop of project participants and mid-level and senior forest managers during December 2002. The workshop will showcase results, discuss implementation in the field, and consider further research and development on the topic.

Communities and Climate Change

Community Forestry International, USA and the Indian Institute of Forest Management were partners in this initiative in 2000-01 to explore the feasibility of using carbon credit-based financing mechanisms to support Indian community forest restoration initiatives, with support from USAID, USDA Forest Service International Programs, the Madhya Pradesh Forest Department, and the World Bank.

Activities included collaborative research between Community Forestry International, the Indian Institute of Forest Management, the Center for Ecological Sciences, and the Ministry of Environment and Forests in Madhya Pradesh. The program also included activities to initiate and sustain forest protection committees, and to consult with resident communities.

Results found that teak and dry deciduous forests in Harda Division under community protection sequestered 1-3 metric tons of carbon per hectare per year, and that degraded forests lacking community forest management have the greatest potential for future carbon sequestration, as well as local livelihood and community benefit.



Section IV

SENSITIVITIES

AND

ADAPTATION

Cochin Assessment of Possible Sensitivities and Responses to Global Climate Change

Objective

This project considers the sensitivity of Cochin to possible climate change impacts related to urban development priorities and stresses, develops strategies for enhancing Cochin's coping capacity that also contribute in other ways to urban development, and designs practical implementation steps for such strategies.

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Partner Organizations and their Roles

- Cochin University of Science and Technology, Cochin (CUSAT)
 - Oak Ridge National Laboratory (ORNL)
- Funding for this project is provide by USAID.

Location

Cochin in Kerala State

Details

This project is the first assessment of sensitivities to possible climate change impacts in a developing country city.

Period

December 2001 to December 2002

Status

Priorities for urban management and development in Cochin have been identified, and a preliminary list of the most important sensitivity issues related to climate change

impact has been developed in consultation with city leaders and experts. CUSAT and ORNL are carrying out analyses that will be foundations of a full impact assessment scheduled for the October-November 2002 period.

Sustainable Development Benefits

The project will increase the ability of Cochin to adapt to such possible climate change impacts as changes in precipitation pattern and sea-level rise, emphasizing strategies that also contribute to sustainable urban development in other ways, such as a possible canal restoration initiative.



Looking Ahead

The project will result in an assessment report and an implementation plan. In addition, it is expected to lead to the development of a self-assessment tool that can be used by developing country cities worldwide to assess their own sensitivities and response options relative to possible impacts of climate change.



Section V
SCIENCE
AND
RESEARCH

Indo-U.S. Science Cooperation in the Areas of Earth and Atmospheric Sciences

Objective

This effort provides for the real-time exchange of Indian geostationary satellite data and U.S. earth observation data to greatly enhance advanced forecasts, improve monitoring and prediction of El Nino events, augment seasonal to inter-annual climate forecast capability, and sustain major science programs addressing global monitoring, sustainable development, climate change, and natural disaster reduction.

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Partner Organizations

- Indian Space Research Organization (ISRO), Department of Space (DoS)
- India Meteorological Department (IMD)
- National Aeronautics Space Administration (NASA)

Locations

India Meteorological Department,
New Delhi, India

Details

- Agreement signed in 1997
- Operational data exchange allows for advanced forecasts
- Research component comprises six projects (3 NOAA) with focus on global monitoring, sustainable development, climate change, and natural disaster reduction
- Cooperative research entails visits by scientists to each country. Scientists work with satellite data to form models to better address the issues stated above

Ongoing status

- Indian scientists visited the U.S. to work on three NOAA projects in March 2002
- High-level (Administrator-level) discussions with Indian counterparts on future direction of MOU
- Joint NASA-NOAA Workshop Fall 2002 to review and renew Agreement
- Ongoing discussions at the working-level to enhance cooperation under MOU

Sustainable Development Benefits

Cooperation under the MOU is mutually beneficial. In India, the receipt of U.S. earth observation data and information has allowed India to work with U.S. data to better make advanced short-term warnings and forecasts, improve monitoring and prediction of future El Nino events, augment seasonal to inter-annual climate forecast capability, and sustain major science programs addressing global monitoring, sustainable development, climate change, and natural disaster reduction. The economic and social impact of such work is significant.

Looking Ahead

Near-Term Activities

During the March 2002 high-level meeting between NOAA and Indian counterparts, climate issues were highlighted as a potential area of cooperation over the next few years. NASA and NOAA are currently working with their Indian counterparts to determine projects to be pursued in the future.

Indo-U.S. Science and Technology Forum

Objective

The Indo-U.S. Science and Technology (S&T) Forum has been established in order to advance Indo-U.S. science and technology cooperation and will periodically sponsor workshops and related Indo-U.S. cooperation efforts in alternative energy and other technologies.

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Partner Organizations and their Roles

At the first workshop funded by the Indo-U.S. S&T Forum, fuel cell experts participated from Tata Energy Research Institute (TERI), Indian Space Research Organization, Bharat Heavy Electricals Limited, Fuel Cell Energy, U.S. Army Corps of Engineers, Penn State University, U.S. Department of Energy, NED Energy Limited, Computer Systems Management, Inc., Kirloskar Oil Engines Limited, Argonne National Laboratory, India's Ministry of Environment and Forests, University of Maryland, Reva Electric Car Co. Ltd., Los Alamos National Laboratory, Energy Conversion Devices, Inc., Technology Information, Forecasting and Assessment Council, Pacific Northwest National Laboratory, International Advanced Research Centre for Powder Metallurgy & New Materials, Gas Authority of India Ltd., National energy Technology Laboratory (DOE), Siemens Westinghouse, and Diversified Commercial Hydrogen Technology.

Workshop participants provided presentations on their respective company (or organization), participated in fuel cell discussions, and participated on teams to formulate project proposals.

Location

The first workshop was sponsored by the U.S.

Department of Energy and conducted in Washington, D.C.

Project Details

Specific Objectives

The Indo-U.S. S&T Forum – co-chaired by Dr. Norman Neureiter, Science and Technology Adviser to the U.S. Secretary of State, and Professor V.S. Ramamurthy, Secretary, Department of Science and Technology – will facilitate and promote the interaction, in India and the U.S., of government, academia, and industry in science, technology and other areas addressed by its predecessor, the U.S.-India Fund. The Forum shall focus on issues of common concern and activities of mutual benefit while exploring trends in science and technology. The Forum shall promote research and development, the transfer of technology, the creation of a comprehensive electronic reference source for Indo-U.S. S&T cooperation, and the electronic exchange and dissemination of information on Indo-U.S. S&T cooperation.

The objectives of the first, energy-related workshop under the Forum's sponsorship were to introduce key Indian and U.S. fuel cell experts and to develop a synopsis of plans for joint fuel cell projects

Type of Activities

- Capacity building in terms of supporting interactions of fuel cell and other alternative-energy experts from India and the U.S.
- Project development of projects that would include R&D and technology demonstration. Web site developed for information exchanges among workshop participants, and possible public outreach (pending Forum approval)

Technologies/Approaches Promoted

Fuel Cells (stationary & transportation)

Status

The first workshop was successfully completed. Further project development (among the three proposed projects) is as yet to be determined. Additional workshops in alternative energy are anticipated.

Sustainable Development Benefits

Social, Economic, Technological, and Environmental Benefits

Alternative energy technologies such as fuel cells can help to reduce local and global air pollution, thereby contributing to improved human health and the environment.

Looking Ahead

The Indo-U.S. S&T Forum will continue to meet regularly, review proposals for cooperation, and plan future cooperation in alternative energy, the environment, and health, as well as nano-scale S&T, weather modeling, education, genomics and brain research. The Forum also will sponsor special 3-day symposiums for young scientists from both countries to help build longer-term relationships and cooperation.

Performance and GHG Mitigation

This and future workshops on alternative energy technologies promises to lay the foundation for work that will help reduce, or in some cases eliminate, GHG emissions.

The Indian Ocean Experiment (INDOEX)

As part of the National Science Foundation Collaborative Activities with India, INDOEX demonstrated some new and interesting results which has stimulated plans for further research, including the impact of human activity on the Earth's climate. This mega project was supported by national resources from the U.S., the Netherlands, France, Germany, India, and the Maldives.

The field phase was completed March 1999, but the analytical effort will continue well into the next decade. Initial findings identify the Asian Brown Haze as cause for dramatic reductions in the amount of sunlight reaching the earth/ocean surfaces around the Indian subcontinent and thousands of miles away. This could impact human health, crop yield and the hydrological cycle for all of Asia.

INDOEX researchers may, under an arrangement with the United Nations Environment Programme, make an assessment of the haze's impact on climate and ecosystems including the water cycle, agriculture and health. This could develop a more complete picture for the region.

U.S.-India Science Cooperation

Cooperative research projects, primarily involving individual investigators from the United States and India, have been supported with U.S. dollars and Indian rupees from the United States India Fund (USIF). Following termination of the USIF in January 1998, NSF created a new joint program with the Indian Department of Science and Technology, which continues to play a key role in U.S.-India scientific collaboration. The NSF/DST joint program has supported approximately 100 new collaborative projects since its start in 1998.

- The Indo-U.S. Science & Technology Forum: The Forum was established in March 2000 and is endowed with the rupee equivalent of \$7.1 million, which remained from the United States India Fund. Forum members were charged with major tasks such as mapping the most promising opportunities for collaboration in the future, developing a vision of Indo-U.S. science, exploring new means of collaborating and forging partnerships between science, academia, and industry. The Forum's Governing Body met for the first time in March 2001 in New Delhi.
- Members have agreed unanimously that Forum efforts must confront the knowledge gap and inspire young investigators from both countries. They decided that the Forum's "signature" will be a summit of mid-career, cutting-edge scientists and engineers that will brainstorm, lecture, and inform the Forum's agenda for the succeeding year.
- In addition to the "Forum Fellows," members agreed to sponsor a distinguished lecture series, pre-proposal travel, establish a database of Indian scientists resident in the U.S., and advance on a range of administrative issues. Subsequent meetings are to be held in India or the U.S. at least once a year.



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