

**USAID/India
Environment Team
In-house Strategy Assessment**

Background

India has been called a continent rather than a country. It is home to over a billion people from a myriad of ethnic, linguistic and religious backgrounds. It is the largest democracy in the world and has an enormous and expanding economy, which has doubled in the past twenty years. India contains some of the largest and most polluted cities in the world in Delhi, Mumbai, and Calcutta. Air pollution from industry and vehicular traffic has increased by four and eight-fold since the 1980's.

Significant shortages exist in the supply of energy, water and wastewater services across the country, exacerbated by an increasing population, a low per capita income, a large population living in poverty, degradation of natural resources, and widespread industrial pollution. Substantive research and experience over the past two decades has demonstrated strong linkages between poverty alleviation and reliable access to basic amenities such as energy and water.

The current environment portfolio in USAID/India focuses on global climate change issues through reduction of greenhouse gases in production facilities, industry, transport sector, and end use efficiencies. Major activities include the Greenhouse Gas Pollution Prevention Project (GEP), the Clean Technologies Initiative (CTI), and the Energy Conservation and Commercialization Project (ECO), the South Asia Regional Initiative in Energy (SARI/E) and the newly proposed Water-Energy Nexus Activity (WENEXA). The current Environmental Strategic Objective is, "Increased environmental protection in energy, industry, and cities." This focus is due to various reasons including USAID's response to changing economic conditions in India, a concern with global climate change, the realization that inefficiencies in the power sector were having a detrimental impact on socio-economic development throughout India, and USG sanctions.

As part of USAID/India's strategy development process for 2003 to 2008, the Mission's environment team is in the process of proposing a new theme focusing on delivery of services with an emphasis on the consumer and highlighting the important links between water and energy sectors. A focus on energy and environmental services is driven largely by USAID's response to the economic reforms, which began in India during the early 1990's. These reforms helped to liberalize the economy, stimulated economic growth, and called for decentralization and market-based approaches, including foreign investment rather than centrally-planned public investments. Given this climate of economic reform and growth, USAID's promotion of clean energy technologies and energy efficiency helped to manage emissions of CO₂ and other greenhouse gases while the Indian economy has grown. More recently, as a result of India's nuclear bomb test in 1998 and the subsequent USG sanctions imposed against the government, the USAID environment portfolio has been constrained exclusively to activities to support energy

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programs aimed at reducing emissions of greenhouse gases. These sanctions were recently lifted and, therefore, no longer constrain the formulation of a new strategy.

Providing services in ways that are demand-driven, customer-responsive, and based on market principles of financial and commercial viability are the best means to ensure the long-term sustainability of those services and the most efficient use of environmental and public resources. We must also help to build new and stronger relationships between service consumers, government, NGOs, and the private sector. These factors will, therefore, be central to the proposed new environment strategy.

Key Issues

Four major issues seem to be of paramount importance when considering energy and environment issues in India. These are power distribution reform, the nexus between water and energy sectors, global climate change, and urban development. Additional considerations include the modalities of how and where to attempt to affect change, given USAID's limited resources and the size and complexity of India.

Power Sector Reform

Studies have shown that the inefficiencies within the energy sector provide a tremendous drain on state fiscal resources. The World Bank estimates that current losses in the Indian power sector amount to approximately \$5 billion annually. In many Indian states, the cost of electricity supplied to rural areas is up to ten times the revenue received and in some states, the power supply to that agriculture sector is not charged at all and earns no revenue. This climate of subsidies and of failure to adequately collect payments from consumers of electricity is bankrupting the State Electricity Boards (SEBs). State funds used to subsidize rural energy services are no longer available to invest in other sectors such as health care, education, or environment.

Coupled with this situation of inefficiencies is the fact that the country is presently facing an energy shortage of approximately 10%, with peak shortages of approximately 18%. According to Government of India (GOI) projections, the country needs to double its power generation capacity within a decade. India is, therefore, investing heavily in new electric power generation capacity. However, the government-owned vertically integrated monopolies with their inherent inefficiencies will have a difficult time meeting the projected demands for investments.

To help address these inefficiencies, the GOI initiated power sector liberalization a decade ago, allowing private sector investments in power generation. An attempt to unbundle the vertically integrated state utilities followed, however, the success of power sector reform has been much less than hoped for.

The first phase of reforms focussed on the legal, institutional, structural and regulatory measures. States developed financial restructuring plans, which have been only partially implemented. Over the course of the reform process, the financial situation of the power

utilities has further deteriorated and the need for change, particularly privatizing the distribution business, has become even more urgent.

The genesis of dismal financial performance of the state utilities can be traced to the irrational and non-remunerative tariff structure. Though the average price of power has increased over the years, it continues to be lower than the cost of power supply (i.e., the cost of power generation and purchase plus transmission and distribution costs). It is increasingly clear that the success of power sector reforms will hinge upon rationalizing the tariff structure. Private investment will be hampered by a lack of confidence in the power sector. This situation has been exacerbated by the recent inability of the Maharashtra SEB to honor its power purchase agreement with the Enron Corporation, as part of the largest private power producer schemes in India.

Another major constraint in the power sector is the transmission and distribution losses, which average 20% and in some states such as Delhi these losses are up to 50%. Losses stem from technical as well as commercial sources such as theft, non-metering, and poor billing and collection systems. Reduction of these losses to acceptable levels is essential to increase the financial viability of the power sector.

Though the GOI's Electricity Regulatory Commissions Act 1998 has resulted in the creation of Central Electricity Regulatory Commission in Delhi and State Electricity Regulatory Commissions in several states, these are yet to become fully functional and effective entities.

The Environment team concluded that the situation can be improved through support for power sector distribution reforms. Key to this process will be support to the independent regulatory system, broadened public and private sector participation in the process, and improvements in the technical and commercial aspects of power distribution systems.

Water/Energy Nexus

While the situation for water and energy is serious when each resource is viewed independently, vicious cycles exist between the two that greatly exacerbate inefficient behaviors. Among other things, significant resources are wasted in one sector to compensate for inadequate service provision in the other. Patterns of waste and inefficiency at the nexus of water and energy resource use exist in all sectors including urban/domestic and industry, but are especially prevalent in agriculture, which is the largest single consumer of both water and electrical power in the country. The performance of the Indian power sector is increasingly dependent on how efficiently irrigation water is pumped, used and paid for. Highly subsidized power supply policies have impaired state finances and impeded sector reforms.

As stated earlier, power sector restructuring and reforms have met with mixed results. The principle problem facing the power sector is the poor financial condition of the utilities in most states. This is largely attributable to the fact that a substantial fraction of the nation's total power is sold to agricultural users at well below production cost and in many cases, at no cost at all. Change in technologies, policies and behaviors in the

agricultural sector will be absolutely essential to achieving overall success with power sector reform in India. Water withdrawal is an energy-intensive operation performed by all farmers, with an estimated 30-40% of India's power consumption used for irrigation, including a significant proportion of wasted energy, due to pump inefficiency and other losses. This has led to a chronic shortage of power, under-investment in the agricultural/rural power distribution grid, and a lack of additional generation capacity that is likely to further increase the existing gap between power supply and demand. Moreover, power supply to agricultural users is consistently of poor quality (low voltage, constant interruptions, and variable frequency). To compensate, the agricultural consumer has been forced to resort to a number of harmful practices, including power theft, use of inefficient pumps and oversized motors, and irregular irrigation practices resulting in increased energy consumption, declining water tables, and sub-optimal crop productivity.

Water is essential to all aspects of sustainable development, and water availability and quality have become increasingly critical concerns throughout India. Although the Indian subcontinent is home to some of the world's largest rivers and their tributaries, many regions are witnessing shortages in water supply. In these regions, groundwater levels have fallen as much as 1-3 meters per year to 70 meters or more below the levels of 30 years ago. Approximately 12% of India's aquifers are severely overdrawn, and the problem has been exacerbated by the increase of runoff of surface water and reduction in groundwater recharge.

Lowered water tables in many areas can be attributed in part to farmers' over-exploitation of groundwater, which has been directly linked to unreliable energy supplies and the energy and water pricing policies of the central and state governments, both of which discourage conservation. Over-exploitation is also a significant contributor to India's growing carbon emissions, as considerable additional energy is required to pump ever-deeper water supplies. In addition, over-withdrawal has led to the widespread use of lower-quality groundwater for drinking purposes, exposing affected populations to potentially serious long-term health risks from arsenic, fluoride, increased salinity, and microbiological contamination.

Decreasing water availability and associated issues such as reduced crop yield and income flow, increased labor demand to haul water, and declining sanitary standards due to pollution are of significant concern to Indian farm families. As water tables decline, women and girls spend more time hauling water and caring for sick family members affected by poor sanitary conditions.

In the face of emerging crises in India's power and water sectors, an integrated water-energy strategy has emerged from our ongoing activities in energy efficiency, power sector reform, global climate change, and urban development. A water/energy strategy was developed, which identifies programming opportunities in the urban, industrial, and agricultural sectors. An initial set of activities will target the agriculture sector and look for ways to address inefficiencies and conserve both water and energy resources.

Global Climate Change

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The world scientific community rates global climate change as a top environmental issue of this century. The 2001 Intergovernmental Panel on Climate Change (IPCC) updates the scientific assessment of research into global warming occurring as a result of increasing industrialization and population pressures on the ecosystem. The new report projects an increase in world global average temperature of 1.4 to 5.8 degrees Celsius (2.5 to 10.4 degrees Fahrenheit) by 2100, significantly higher than that predicted by the IPCC in its previous assessment report. According to the report, sea levels are likely to rise 9 to 88 centimeters (3.5 to 34.6 inches) over the same period. The recently released report of the National Academy of Sciences, which was requested by the Bush Administration, supports the general conclusions of the IPCC.

India is the world's sixth largest source of greenhouse gas emissions and the second fastest growing after China. This trend will continue into the future. If the climate continues to warm, this could have a detrimental impact on Indian coastal zones through inundation, increased flooding or saltwater contamination. Agricultural yields could be depressed, resulting in more and more land needed to cultivate less and less food. In extreme cases, ecosystems could be altered significantly enough to further endanger threatened endemic species. Assessments have also linked climate change to increases in disease prevalence and to melting of the Himalayan glaciers. Glacier melt would result in major changes to water resource availability and have significant impacts on the frequency and severity of natural disasters. Impacts of this magnitude could in turn provoke social upheaval and an increase in internal and external refugee populations.

The single largest contributor to India's greenhouse gas emissions is the inefficient power sector. Seventy-one percent of Indian power is thermal. Most of that is produced by high-ash coal, which releases significant levels of particulate matter and, due to its low heat value, more greenhouse gas emissions per kilowatt hour than most other coal-fired power anywhere else in the world.

India is the fourth largest user of coal after China, the U.S. and Russia. India's emission of 0.25 metric tons of carbon per person is approximately one quarter of the world average and 22 times less than that of the U.S. However, with a population of approximately one billion people, even these low per capita levels contribute significantly to greenhouse gas emissions. With continued urbanization, increased access by all sections of the population to commercial fuels, increased vehicle usage and prolonged use of older and more inefficient coal-fired power plants, the situation will exacerbate in the future without strategic intervention. In fact, due to fast-paced industrialization, per capita emissions in India are expected to triple between 1990 and 2020.

Other sources of power include hydro (25%), nuclear (3%), and wind (1.5%). Renewable energy sources other than hydro and wind currently make up relatively insignificant portions of total generation. Though the potential for hydropower is nearly tripled the realized capacity (80,000 MW compared to an installed 25,200 MW), the share of hydropower has declined in the recent years due to strong civil society opposition to displacement of indigenous population and submergence of cultivable lands. Poor construction

management of hydropower stations leading to severe cost over-runs and improper siting and construction technologies compound this.

Controlling greenhouse gas emissions in India will have multiple benefits for the global environment as well as for human health in India. Successful energy efficiency activities will eventually result in less coal mining, which could result in a positive impact on India's biodiversity.

India remains a key climate change country. USAID has helped India avoid millions of tons of greenhouse gas emissions and save millions of dollars in coal costs through efficiency gains in the thermal power sector and through investments in biomass energy. The government has a keen interest in market-based mechanisms and energy efficiency gains. Our challenge is to stay engaged with the Indians and promote market-based approaches, technology transfer, and research related to greenhouse gas emissions reduction.

Urban Services

Insert Key Issues

Geographic focus

Interest in the USAID approach is high in certain Indian states (Andhra Pradesh, Rajasthan and Uttar Pradesh, for example). Given the size of the country and the sheer scale of the issues facing India's environment and power sector, it makes sense to focus on a few geographic locations, where opportunities exist for good collaboration and proof of the Environment team's concept. This will allow for demonstration of best practices in a way that will facilitate greater impact and for enhanced potential to replicate more broadly as reforms continue to slowly gain ground nationwide.

Partnerships for Reform

A key to USAID success throughout the world and particularly in India is the ability to forge partnerships for sharing ideas, leveraging resources, and working synergistically. We will continue to follow this model for success and continue to form partnerships with the diversity of stakeholders engaged in areas of common interest. The Environment team will seek both public and private partners in India and abroad, who collaborate on providing improved energy and environmental services in India.

Assessment Methodology

USAID has actively participated in the energy and environment sectors for many years. Early work focused on infrastructure creation. During the 1960's, USAID financed and helped to build many of India's power plants. Later the focus evolved to promotion of science and technology, and in the 1990's, as stated earlier, the approach evolved again to promotion of power sector reform, energy efficiency, market-based approaches, and global climate change.

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Over the years, USAID has played a valuable role in several key developments, notably: energy technology development and commercialization, clean coal technologies; strengthening of functional central and multiple state energy regulatory bodies; advancing electrical demand side management and end-use energy efficiency improvements; and introduction of private power, specifically cogeneration. The Agency's recent work with private distribution utilities(e.g., BSES, AEC, SEC) and the reform of State Electricity Boards (SEBs) in Haryana, Rajasthan and Andhra Pradesh and elsewhere has identified urban and rural power distribution issues, illustrated methods to improve delivery efficiency, and introduced new business processes to implement these solutions. USAID's training and energy partnership activities have also provided nascent regulatory commissions and their staff with information and techniques to address issues and resolve problems.

During these decades of bilateral assistance in the energy and environment sectors, many lessons have been learned. The Environment team will capitalize on this accumulated experience in crafting the new strategy. In addition to building on past success, the Environment team has conducted a rigorous analysis of issues through various methods, including focus group meetings, participation in workshops and conferences, discussions with stakeholders, review of literature, and drafting various concept papers or discussion papers.

The Environment team has discussed the new approach to our work with a variety of audiences over the past year. In addition to the numerous workshops with Indian stakeholders on the water/energy nexus, the team briefed other agencies at post and sought their ideas during meetings of the Global Advocacy Group in February and again in August 2001. More in-depth, informal discussions have been held over the past several months with officers from the Embassy's ECON and SCI sections.

During May 2001, the Environment team initiated a series of strategy meetings, which have continued through October 2001, to help develop ideas leading to a potential strategic objective and associated intermediate results and indicators. In late July 2001, a core group was formed within the Environment team – including the leadership from E-cubed and RUDO – to refine the results from the May retreats and focus on two to three framework options.

Concurrent to this process were additional meetings of broader geographic focus, which provided additional opportunity to validate and vet the India approach. A meeting was held of South Asia Environmental Officers from USAID and State in association with a consulting team from the International Resources Group (IRG). One outcome from this workshop was a list of promising environmental themes for the sub-continent. Finally, during the July 2001 USAID Environment Officers workshop in Cumberland, Maryland, the ANE group also articulated various themes of importance to the region. These ideas and themes are presented in Table 1 and have been considered in developing the new energy and environment strategy.

Significant environmental issues in India ¹	Significant environmental issues in South Asia ²
<ul style="list-style-type: none"> ❖ Provision of services ❖ Global climate change: markets, research, technology transfer ❖ Market based approaches ❖ Global Development Alliance ❖ Poverty reduction ❖ Reduced emphasis on industry ❖ Capacity building ❖ Water and energy nexus ❖ Agriculture 	<ul style="list-style-type: none"> ❖ Environmental governance ❖ Water quality and quantity ❖ Urbanization ❖ Energy and global climate change

Table 1. Energy and Environment Themes in India and South Asia.

Additional opportunities for vetting and validating will occur through various venues proposed over the next two months. These include focus groups on water and energy, global climate change, and urban services; an environmental donors meeting; and site visits and one-on-one discussions with key stakeholders. A comprehensive stakeholder list has been developed to assist with organizing this process and a short handout on the proposed strategic approach has been written to guide discussions.

In addition to the processes described above for developing themes and ideas and vetting and validating our approach, Appendix A represents some of the documents that have helped the Environment team assess possibilities and better conceptualize how a possible new environment strategic framework might unfold.

The Donor Landscape

Much donor activity in the energy and environmental services sector is directed to supporting comprehensive reform of the institutional and regulatory frameworks at the state level. The World Bank is active in Andhra Pradesh, Rajasthan, Orissa, Uttar Pradesh and Haryana, whereas the Asian Development Bank (ADB) is active in three states: Gujarat, Madhya Pradesh and Kerala, as well as supporting the Power Finance Corporation (PFC) which assists smaller states in their reform process. USAID technical assistance to PFC allowed the organization to effectively utilize \$565 million in World Bank and ADB loans under the Energy Management Consultation and Training (EMCAT) program.

In the water sector, the World Bank is supporting several national initiatives (e.g., the National Hydrological Research Project) as well as several large state projects in irrigation and water management (e.g., Rajasthan irrigation management). The United

¹ Environmental opportunities in India as identified by the USAID/India Environment team.

² Environmental issues of importance within South Asia as identified by USAID ANE Environment Officers and USAID and Department of State Environment Officers in South Asia.

Kingdom's Department for International Development (DFID), and the government of the Netherlands have also been involved in several water sector projects.

The Global Environment Facility (GEF) operating through the UNDP and World Bank is the major global climate change donor. A total of \$109 million has been committed by GEF for projects involving mostly renewable energy development in the country. GEF also funded the preparation of India's first "Initial Communication" to the UN Framework Convention for Climate Change (UNFCCC), which will help India define baseline emissions and policies towards sustainable development.

British, German (GTZ), Canadian, Swiss, Swedish, Japanese and the Dutch assistance focus on power sector reform and restructuring, industrial energy efficiency and renewable energy to improve power sector efficiency. There is one British activity focused on GCC vulnerability assessment. GTZ has been quite active with energy efficiency and pollution control, as well as with watershed and natural resource management in Maharashtra and Himachal and in collaboration with the Indian Ministry of Agriculture and the Centre for Environmental Studies in Chennai.

USAID has worked closely with the World Bank, ADB and DFID over much of the past decade on power sector reform in India. We have leveraged significant amounts of World Bank funding for energy efficiency in Rajasthan and have plans in place to leverage a \$110 million GEF pumpset replacement program, as well as additional funds from the DFID distribution reform program in Andhra Pradesh. USAID and the World Bank have established a unique relationship in the energy sector by the four-year secondment of a World Bank energy specialist to USAID/India as the Mission's senior energy and environmental advisor. This continued collaboration and ability to leverage resources from other donors will be a very significant aspect of the new strategy.

Optional Approaches for USAID

- ❖ Do not invest in the energy and environment sector at all.
- ❖ Invest in natural resource conservation.
- ❖ Treat Global Climate Change issues as a Special Objective.
- ❖ Focus exclusively on water and energy at the SO level.
- ❖ Ignore water issues and focus only on the energy sector.
- ❖ Do not address urban issues explicitly at the IR level.
- ❖ Focus exclusively on urban issues.
- ❖ Focus exclusively on rural issues.
- ❖ Focus exclusively on industry as a major source of pollution.
- ❖ Focus exclusively on transportation as a major source of pollution.
- ❖ Ignore transportation and focus only on the electricity sector.
- ❖ Focus on renewable energy sources.

Selection Criteria for USAID Involvement

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Recent GOI policy developments and overall levels of awareness in the country present USAID with an important and unique opportunity for addressing energy and environmental issues in a synergistic fashion. Criterion used to assess the focus of a revised Environment team strategic framework include whether the activity will provide:

- ❖ Significant impact on the Indian citizen.
- ❖ Significant impact on vulnerable populations, particularly the poor in India.
- ❖ Significant impact on the Indian economy.
- ❖ Significant impact on the quality of air and water resources in India.
- ❖ Significant global impact.
- ❖ Ability to leverage resources from other donors.
- ❖ Broad-based interest by other partners—both public and private, international and domestic.
- ❖ Potential for synergies with other SO teams.
- ❖ Potential for private sector investment to sustain activities.
- ❖ Promotion of USG policy issues—technology transfer, research, market-based approaches.
- ❖ Opportunities to work with recent GOI initiatives such as the Accelerated Power Development Program (APDP) and the National Hydrology Project (NHP);

Recommended Interventions

The interventions recommended below are complementary. Each works to support the other, therefore, the Environment team recommends all four of them as an interrelated package.

Priority 1. Improve electricity distribution cost-recovery.

The Environment team concluded that focused support for strengthening India's ongoing economic reform process, as it pertains to the power distribution and environmental sectors, is key to improving energy and environmental services. This will arguably generate the greatest impact for our investment and is the best fit for our selection criteria. Reform and the resultant improvement in services has the potential to better the lives of millions of Indians directly through environmental, health and economic development, and perhaps most significantly, by reducing the drain on state fiscal resources from power sector subsidies.

Priority 2: Improve water management in reform states.

The work in water and energy is a creative, cutting-edge approach to addressing significant issues for local farm families with strong potential for replication and scaling up of impacts. The holistic approach represented by the water-energy nexus provides USAID a unique opportunity to affect reform within the power sector, promote energy efficiency, mitigate greenhouse gases, conserve water resources, and expand into the agriculture sector.

USAID demonstration projects based on improving the efficiency of power distribution and reducing the agricultural pumping demand through end-use efficiency would be an

effective multi-purpose tool to address the core problem of power sector financial viability and performance. 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.

Priority 3: Improve basic urban services for the poor.

The continuing process of urbanization is a phenomenon that impacts every aspect of life in India. The millions who currently reside in urban areas and the many millions more who are projected to live in cities in the near future represent a great stress on urban services. They also represent a great opportunity for USAID intervention.

Central to successful reform are consumers that pay for services – and in turn experience a direct linkage between payment and improvement in service provision. To do this, consumers must be aware of reforms, and be partners with service providers at the local level. USAID work in the urban sector will continue to support the development of commercially viable infrastructure projects. Millions of Indians, especially the poor, will directly benefit from these activities, which in turn will help stimulate the reform process within the country.

Priority 4. Enhance U.S.-India cooperation on greenhouse gas emissions reduction.

This intervention can be viewed as promoting U.S. policy issues to significantly engage developing countries in greenhouse gas emissions mitigation, while also meeting additional criteria of having a significant impact on the global and Indian environment, and on Indian citizens. Controlling greenhouse gas emissions in India will have multiple benefits. Assessments indicate that global climate change would cause the flood-prone areas in India to triple and submerge large tracts of the coastline. Further, vector-borne diseases would increase in magnitude, water availability would be severely affected and crop production would decline over the long run. The occurrence of natural disasters and social upheaval could be exacerbated.

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