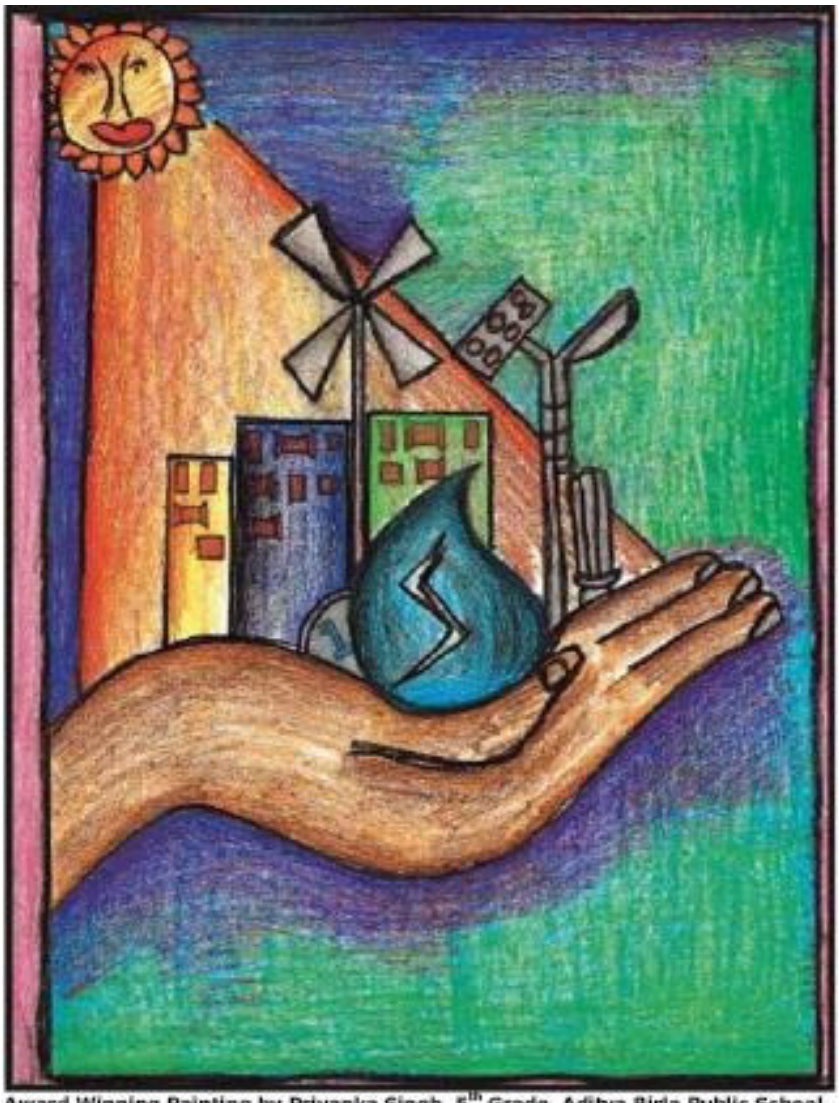
India:

Addressing Energy Security And Climate Change



Award Winning Painting by Priyanka Singh, 5th Grade, Aditya Birla Public School, Rawan, Raipur; National Energy Conservation Painting Competition, 2006

Ministry of Environment & Forests

Ministry of Power
Bureau of Energy Efficiency

Government of India

October, 2007

Enabling Access to Clean Energy

Per capita energy consumption in India is less than 500 kgoe, compared to the global average of nearly 1,800 kgoe

Poverty reduction and economic growth are the prime objectives of national policy. Energy is the sine qua non of development. India, with over a billion people, today only produces 660 billion KWh of electricity and over 600 million Indians, a population equal to the combined population of USA and EU, have no access to electricity, and limited access to other clean, modern fuels such as LPG and kerosene. This constrained energy access is reflected, as shown in Figure 1, in the relatively low Human Development Index of India. Enhancing energy supply and access is therefore a key component of the national development strategy.

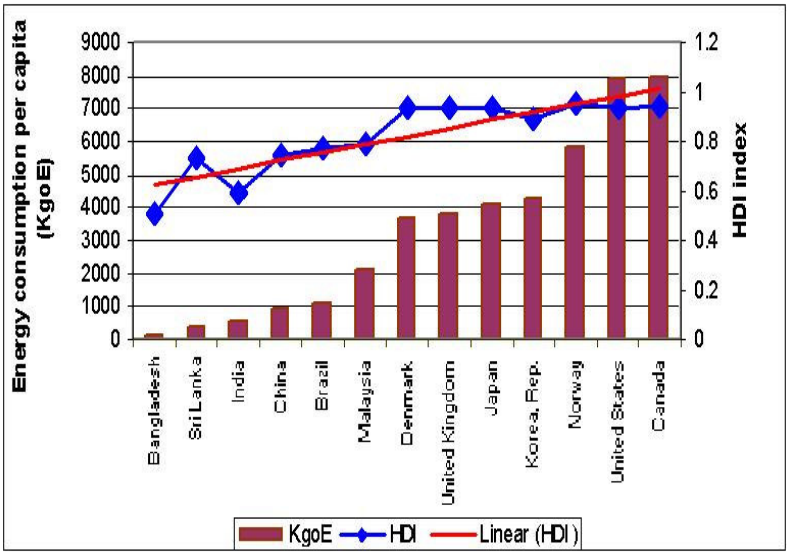


Fig.1: Energy consumption is a prime driver of the Human Development Index

Since 2004, the Indian economy has grown at a rate of over 9% per year, supported by an energy growth rate of less than 4% per year

Over the past decade, gains in both poverty reduction and economic growth have been significant, and supported by energy growth which has been significantly lower than the economic growth. This reduced energy intensity of the economy, in the period since 2004, has been marked by an economic growth rate of over 9% per annum, which has been achieved with an energy growth of less than 4% per annum.

These policies have been driven by the imperatives of sustainable development, and have, as a co-benefit, led to a

India's per capita CO emissions are approximately 1 tonne per annum, compared to a world average of 4 tonnes per annum

decline in the intensity of energy use and carbon dioxide emissions as well. Figure 2(a) illustrates the declining trend in energy use and CO_2 emissions intensities, and Figure 2 (b) highlights that the energy intensity of the Indian economy compares favourably with those of other major economies.

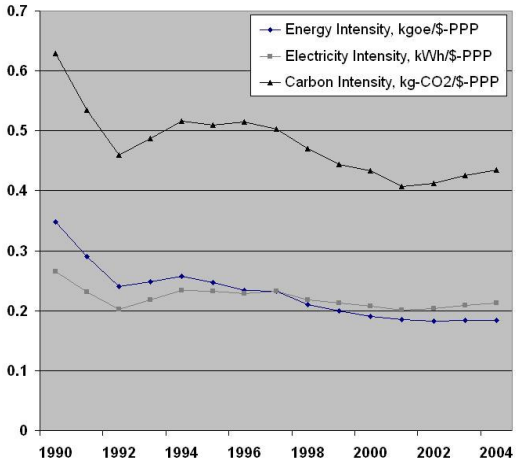


Fig. 2(a): Emissions and Energy Intensity Trends in India

"We are determined that India's per-capita GHG emissions are not going to exceed those of developed countries even while pursuing policies of development and economic growth."

Prime Minister Manmohan Singh, Heiligendamm, 8th June 2007

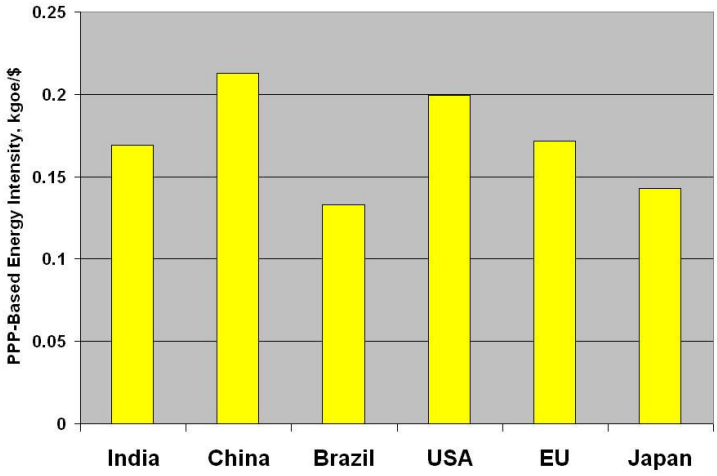


Fig. 2(b): Total Primary Energy Intensities of the Major Economies

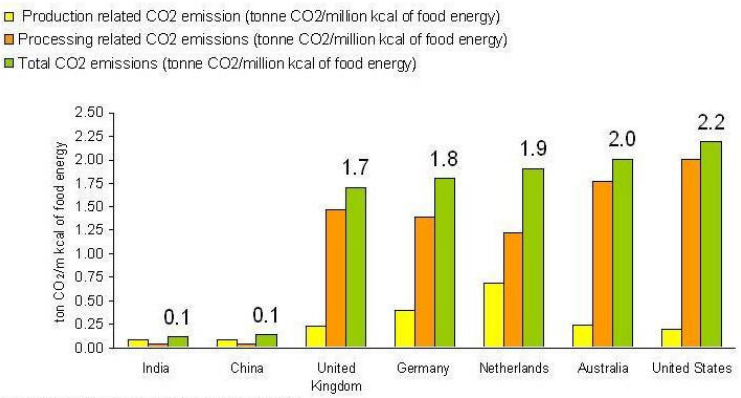
Enhancing Sustainable Development and Mitigating Climate Change

This reduced energy intensity, at the relatively low level of India's per-capita GDP, has been made possible by a range of factors, including India's historically sustainable patterns of consumption, enhanced competitiveness, proactive policies to promote energy efficiency, and more recently, the use of the Clean Development Mechanism to accelerate the adoption of clean energy technologies.

Food preferences and high recycling rates have mitigated growth in energy demand, and in CO_2 emissions

(a) Patterns of Consumption

Food habits and recycling processes have mitigated growth in energy demand and GHG emissions. The specific GHG emissions from food production and processing are much lower in India than in developed countries, as seen in Figure 3.



Source: TERI Analyses (various data sources)

Fig. 3: CO_2 Emissions from the Food Sector – from field (Production) to Table (processed food), excluding cooking

The high ratio of recycling in India, compared to that of other major economies in Figure 4, has also limited the growth in energy use, and GHG emissions, because of the lower demand for virgin material such as steel, aluminum and copper.

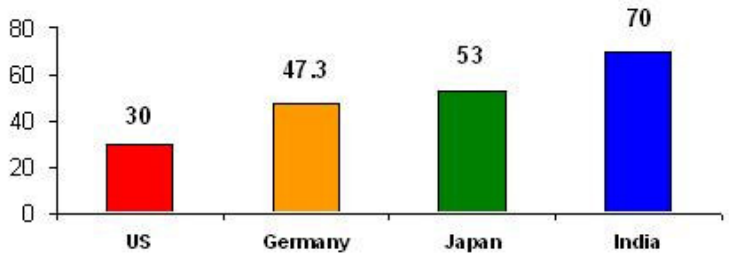


Fig. 4: Recycling Ratios in Major Economies

(b) Increased Industrial Energy Efficiency

Over the past decade, energy efficiency in Indian industry has increased steadily. In the major energy-consuming industrial sectors, such as cement, steel, aluminum, fertilizers, etc., average specific energy consumption has been declining because of energy conservation in existing units, and (much more) due to new capacity

In almost every industrial sector, some of the world's most energy-efficient units are located India

addition with state-of-the-art technology. For example, as shown in Figures 5(a) and (b), the specific energy consumption of Indian cement plants and of Indian iron & steel plants has been declining rapidly. In the cement sector, the specific energy consumption of the most-efficient plants is now comparable to that of the most efficient plants in the world.

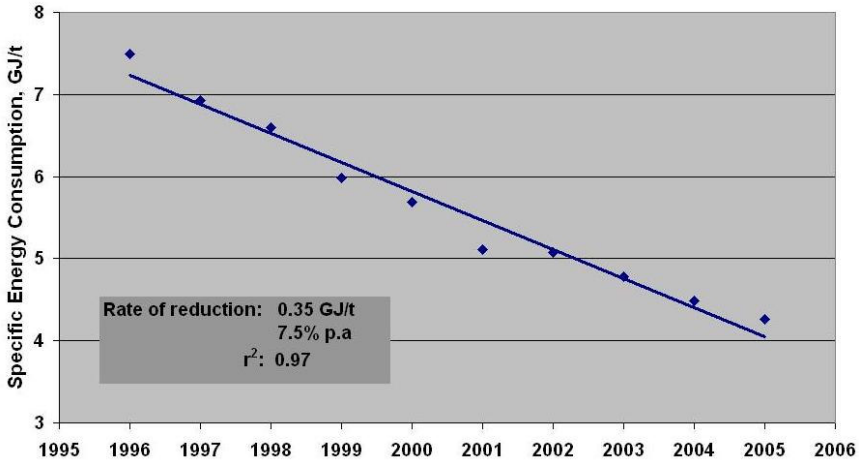


Figure 5(a): Trends in thermal specific energy consumption in the Indian cement sector

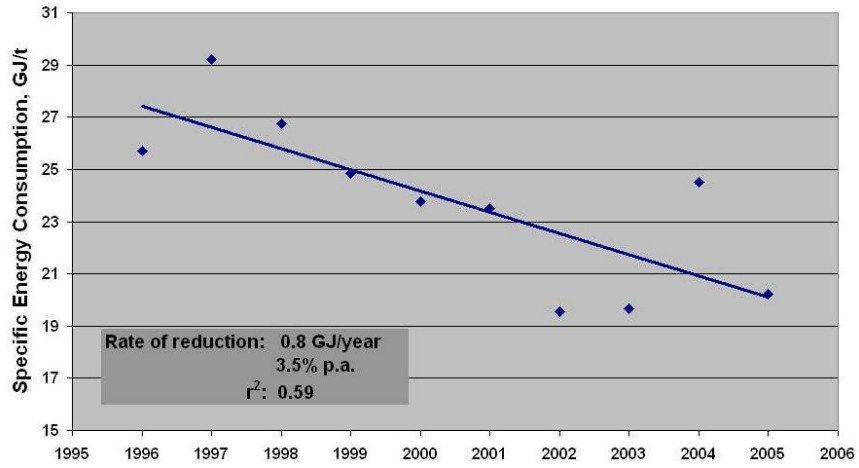


Figure 5(b): Trends in specific energy consumption in the Indian iron & steel sector

(c) Policies to Promote Energy Efficiency and Renewable Energy

(i) Electricity from Renewables: The Electricity Act, 2003, requires State Electricity Regulatory Commissions to specify a percentage of electricity that the electricity distribution companies must procure from renewable sources. Several Commissions have already

India has over 7,000 MW of wind energy capacity – the fourth largest in world. The growth of electricity from renewables has been accelerated by the legislative mandate for its procurement

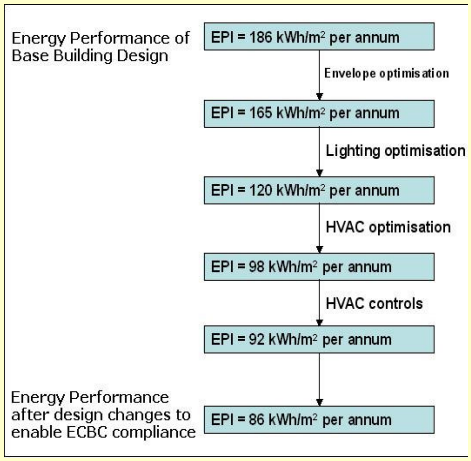
operationalized this mandate, and also notified preferential prices for electricity from renewables. This has contributed to an acceleration in renewable-electricity capacity addition, and over the past three years, about 2,000 MW of renewable-electricity capacity has been added in India every year, bringing the total installed renewable capacity to over 11,000 MW. Of this, a little over 7,000 MW is based on wind power; India now has the fourth largest installed wind capacity in the world. The National Hydro Energy Policy has resulted in the accelerated addition of hydropower in India, which is now over 35,000 MW.

(ii) Enhancing Efficiency of Power Plants: Coal is the mainstay of India's energy economy, and coal-based power plants account for about two-thirds of the total electric generation installed capacity of about 135,000 MW. In addition, the Electricity Regulatory Commissions are also linking tariffs to efficiency enhancement, thus providing an incentive for renovation and modernization. New plants are being encouraged to adopt more efficient and clean coal technologies, and four new plants under construction have adopted the more-efficient super-critical technology for power generation.

(iii) Introduction of Labeling Programme for Appliances: An energy labeling programme for appliances was launched in 2006, and comparative star-based labeling has been introduced for fluorescent tubelights, air conditioners, and distribution transformers. Figure 6 shows labels for refrigerators and tubelights.

The labels provide information about the energy consumption of an appliance, and thus enable consumers to make informed decisions. Almost all fluorescent tubelights sold in India, and about two-thirds of the refrigerators and air conditioners, are now covered by the labeling programme.

Fig. 6: Energy Labels for Refrigerators and Fluorescent Lamps



Application of ECBC reduced the energy demand by more than 50% in a new building being constructed near Delhi

(iv) Energy Conservation Building Code: An Energy Conservation Building Code (ECBC) was launched in May, 2007, which addresses the design of new, large commercial buildings to optimize the building's energy demand. Commercial buildings are one of the fastest growing sectors of the Indian economy, reflecting the increasing share of the services sector in the economy. Nearly one hundred buildings are already following the Code, and compliance with it has also been incorporated into the Environmental Impact Assessment requirements for large buildings.

(v) Energy Audits of Large Industrial Consumers: In March 2007, the conduct of energy audits was made mandatory in large energy-consuming units in nine industrial sectors. These units, notified as "designated consumers" are also required to employ "certified energy managers", and report energy consumption and energy conservation data annually.

(d) Accelerated Introduction of Clean Energy Technologies through the CDM

The Clean Development Mechanism has accelerated the diffusion of renewable energy and energy efficient technologies by mitigating some of the risk associated with the adoption of new technologies

Over 700 CDM projects have been approved by the CDM National Designated Authority, and about 300 of these have been registered by the CDM Executive Board. The registered projects have already resulted in over 27 million tones of certified CO_2 emissions reductions, and directed investment in renewable energy and energy projects by reducing the perceived risks and uncertainties of these new technologies, thereby accelerating their adoption.

Adaptation to Climate Impacts

India is especially vulnerable to the adverse impacts of climate, and over 2% of GDP is currently spent on measures to adapt to these impacts

The adverse impacts of current climate already threaten the livelihoods of many Indians, especially the poorest. Current government expenditure on adaptation to climate variability, as shown in Figure 7, already exceeds 2% of the GDP, with agriculture, water resources, health and sanitation, forests, coastal-zone infrastructure and extreme weather events, being specific areas of concern.

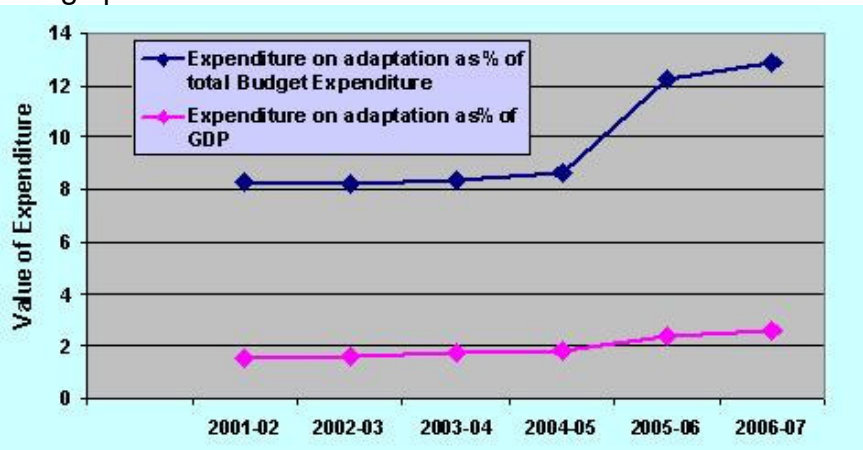


Fig. 7: Expenditure on Adaptation Programmes in India

The broad areas where adaptation programmes have been developed include:

(a) Crop Improvement

Programmes address technical issues, such as development of arid-land crops and pest management, as well as capacity building of extension workers and NGOs to support better and vulnerability-reducing practices.

(b) Drought Proofing

Programmes seek to minimize the adverse effects of drought on production of crops and livestock, and on productivity of land, water and human resources, so as to ultimately lead to drought proofing of the affected areas. They also aim to promote overall economic development and improve the socio-economic conditions of the resource poor and disadvantaged sections inhabiting the programme areas.

(c) Health

The prime objective of these programmes is the surveillance and control of vector borne diseases such as Malaria, Kala-azar, Japanese Encephalitis, Filaria and Dengue. Programmes also provide for emergency medical relief in the case of natural calamities, and train and develop human resources for these tasks.

(d) Risk Financing

Two risk-financing programmes support adaptation to climate impacts. The Crop Insurance scheme supports the insurance of farmers against climate risks, and the Credit Support Mechanism facilitates the extension of credit to farmers, especially in instances such as crop failure due to climate variability.

(e) Disaster Management

The National Disaster Management programme provides grants-in-aid to victims of disasters, and manages disaster relief operations. It also supports proactive disaster prevention programmes, including dissemination of information and training of disaster-management staff.

(f) Livelihood Preservation

Programmes support income diversification, as well as minimum employment guarantees in order to enable sustainability of livelihoods, including in response to loss of livelihoods due to the adverse impacts of climate.

Mainstreaming Climate Change in Sustainable Development

Government initiatives for the diffusion of renewable energy and energy-efficient technologies, joint forest management, water resources management, agricultural extension services, web-enabled services for farmers and rural areas, and environmental education in schools and colleges represent a broad spectrum of efforts to integrate climate change concerns in sustainable development. This integration is institutionalized through specialized institutions, such as the Ministry of New & Renewable Energy, the Bureau of Energy Efficiency, and the Technology Information,

The Ministry of New & Renewable Energy, the Bureau of Energy Efficiency, and the Technology Information Forecasting & Assessment Council, have specific mandates to promote clean energy technologies

Forecasting & Assessment Council, with specific mandates to promote climate friendly technologies.

The National Environment Policy, 2006, provides the basis for the integration of environmental considerations in the policies of various sectors. The Policy Statement for Abatement of Pollution, 1992, stresses the prevention of pollution at the source based on the "polluter pays" principle. The Forest Policy, 1988, highlights environmental protection through preservation and restoration of the ecological balance. The policy seeks to substantially increase the forest cover in the country through afforestation programmes.

The statutory framework for the environment and energy efficiency includes the Indian Forests Act, 1927, the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Forest (Conservation) Act, 1980, and the Environment (Protection) Act, 1986. Other enactments include the Public Liability Insurance Act, 1991, the National Environment Tribunal Act, 1995, the National Environment Appellate Authority Act, 1997, the Energy Conservation Act, 2001, and the Electricity Act, 2003. The courts have also elaborated on the concepts relating to sustainable development, and the 'polluter pays' and 'precautionary' principles. In India, matters of public interest, particularly pertaining to the environment, are articulated effectively through a vigilant media, an active NGO community, and through the judicial process which has recognized the citizen's right to a clean environment as a component of the right to life and liberty.

Addressing climate change mitigation and adaptation involves many stakeholders, cuts across short and long timeframes, and requires that all development projects be assessed for their sensitivity to climate concerns. This integration of climate concerns in the development process has been mainstreamed in India through high-level multi-stakeholder committees.

The **National Committee to Assess the Impacts of Climate Change** is chaired by the Principal Scientific Advisor to the Prime Minister, and includes meteorologists, climate modelers, hydrologists, energy economists, as well as representatives of key Ministries. The Committee is evaluating the impact of climate change on key development

Climate change is integrated into the national development planning process, and overseen by the Prime Minister's Council on Climate Change

activities, and assessing options to mitigate climate risks.

At the national level, the integration of climate change in national development is guided by the **Prime Minister's Council on Climate Change**, which includes representation of key Ministries, as well as experts, and representatives of industry and of media. The Council provides overall strategic guidance on mainstreaming climate change in development, identifies key intervention priorities, and monitors the implementation of these interventions.