3. INDIA

3.1 Introduction

Although India is ranked fifth in total GHG emissions, its emissions per capita still remain low - 1/5 of the world average.

India, being the world's second most populous country with a burgeoning middle- and high-income population with increasingly energy-intensive lifestyles, has strong influence on global energy consumption and thereby GHG emissions. For example, the relatively rapid economic and energy growth rates since the 1990s (6-7% per year) led to a surge in electric power demand (8% per year). However, India is also the home to more than 250 million people living on less than US$1 per day and about 550 million people without access to electricity. India occupies 2.4% of the world's geographical area, supports nearly 17% of its population, and emits less than 5% (4.4% in 1998) of GHG emissions (Table 3.1). GHG emissions per capita in India are thus very low (a fifth of the world average), around 1.3 tons CO_2 equivalent as against 20-30 tons in developed countries. Despite such low per capita emissions, India ranks fifth in total emissions after the USA, China, Russia and Japan.

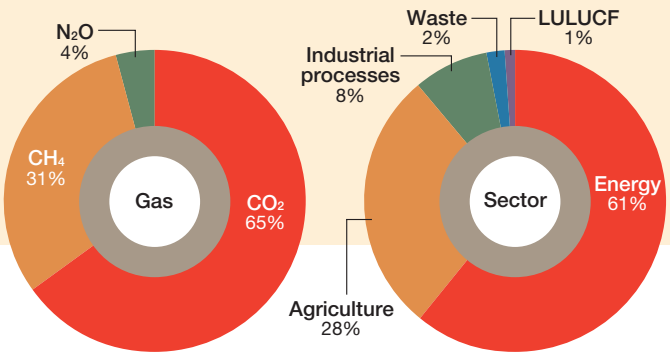
Table 3.1 Key statistics for India

Population (2004)		1,079 million
Annual Population Growth (2004)		1.43%
GDP (Current US$) (2004)		US$ 691.9 billion
GDP per capita (2004)		
	Current US$ (2004)	US$641
	Purchasing Power Parity (2004)	US$3,115
GNI per capita (Atlas Method) (2004)		
	Current US$ (2004)	US$620
	Purchasing Power Parity (2004)	US$3,100
Annual GDP growth (2004)		6.90%
Energy demand (2002)		538 million Mtoe
Per capita energy consumption (2002)		513.34 kgoe
Per capita electricity consumption (2002)		379.78 kWh
Energy mix (2002)	Fossil Fuel	65%
	Traditional biomass	32%
	Other renewable sources	2%
	Nuclear energy	1%
GHG Emissions (1994)		1,229 million $MtCO_2e$
GHG Emissions per capita (1994)		1.30 $MtCO_2e$
CO_2 Emissions (2000)		1,071 million $MtCO_2$
CO_2 Emissions per capita (2000)		1.05 $MtCO_2$
CO_2 Emissions per GDP (2000)		2.34 kg/US$

Sources: UNFCCC (2005g), World Bank (2005), IEA (2005)

Of all GHG, CO_2 emissions were the largest and the energy sector contributed most (Fig. 3.1). After increasing steadily for at least two decades, India's energy, power, and carbon intensities began to decline rapidly after 1995, due to factors such as increased share of service sector in the GDP, and energy efficiency improvements. This shift suggests the start of a decoupling of the energy and economic growth, as has historically occurred in industrialised countries at higher per capita income levels (Chandler et al., 2002). Assuming sustained economic growth and continued dependence on domestic coal reserves, Business-as-usual (BAU) projections suggest a rapid rise in GHG emissions, with the energy- and forestry-related carbon emissions amounting to at least 688 and 29 million tons respectively in 2030 (ALGAS, 1998). Another study projected that carbon emissions would increase by 2.9% from 2001 annually to reach 500 million metric tones of carbon (1,834 MMt CO_2) in 2025 (McKibbin, 2004). Even with such increases, projections by 10 models suggest that India's GHG emissions would largely be within the range of 6-8% of global emissions even in 2100 (Weyant, 2004).

Figure 3.1 Distribution of GHG emissions from India in 1994



Source: UNFCCC, 2005g

3.2 Major Climate Policies and Contributions to International Discussions

Being a developing country, India has no obligations to reduce GHG emissions under the UNFCCC. However, India initiated a number of policies and measures for the mitigation of and adaptation to climate change (Table 3.2). In 2000 alone, energy policies reduced carbon emissions growth by 18 MMt—about 6% of India's gross energy-related carbon emissions. However, because Indian industry is still highly energy-intensive compared to developed countries, there is considerable room for improvement (Chandler et al., 2002).

Corresponding author: Dr. Ancha Srinivasan (ancha@iges.or.jp)

Table 3.2 Selected GHG mitigation and adaptation policies and measures in India

	Area	Policies and Measures	Remarks
MITIGATION	Energy efficiency improvement and energy conservation	• Gradual removal of energy subsidies, regulatory restructuring, privatisation and un-bundling of state-owned utilities. • Promotion of efficient use of coal through pricing reforms and technology up-gradation including coal-washing, combustion technology and recovery of coal-bed methane. • Increase in fuel efficiency and conservation in oil sector through reduction of gas-flaring, installation of waste heat-recovery systems, energy audits, equipment up-gradation, substitution of diesel with natural gas and development of fuel-efficient equipment. • Promotion of fuel-efficient practices and equipment, replacement of old and inefficient boilers, and other oil-operated equipment, fuel switching and technology up-gradation. • Import of foreign cars and appliances which generally are more energy-efficient than those they replace. • Energy Conservation Act (2001), Electricity Act (2003) and the establishment of the Bureau of Energy Efficiency helped in taking conservation measures, such as energy standards, labelling of equipment/appliances, energy codes for buildings and energy audits.	A 370% rise in the price of coal between 1980 and 1995 reduced demand for coal.
	Promotion of renewable energy	• Creation in 1992 of a separate Ministry of Non-Conventional Energy Sources, strong R&D programmes and shift from purely subsidy-driven dissemination programmes to technology promotion through the commercial route. • Setting a goal of using renewable energy for 10% of new power generating capacity by 2010. • A national hydropower initiative targeted at the setting up of an additional 50,000 MW of hydropower by 2012, of which 50% would be from Run-of-River (ROR) projects without large reservoir capacities. • Improving the efficiency of wood stoves in 34 million homes reduced deforestation in several areas. • Installation of 7,760 MW of hydropower; 3,000 MW of wind power; small and micro hydro plants of 1,600 MW; and 600 MW of biomass-based power; Additional 41 schemes of 15,300 MW power are in different stages of implementation.	Over 3.5% of grid capacity is based on renewable energy; Enhanced renewable energy focus led to installation of 3.26 million biogas plants, 34.3 million improved wood burning stoves, 350,000 solar lanterns, 177,000 home lights, 41,400 street lighting systems and 4200 solar pumping systems;
	Transportation	• Reduction of vehicular air pollution (e.g., In Delhi, 84,000 public vehicles—all buses, taxis, and three-wheelers—were converted from gasoline and diesel to Compressed natural gas (CNG)) - initiative to be expanded in many other towns and cities in a time-bound manner. • Introduction of emission standards (Bharat Stage II) for motor cars and passenger vehicles in Delhi on 1 April 2000 and extension to other metropolitan cities. • Use of bio-diesel: The blending of ethanol in petrol and diesel is to be gradually increased to 10%.	
	Carbon sequestration	• Afforestation policy (Between 1990 and 1999, over 14 million hectares were brought under afforestation). The increase the forest and tree cover in the country is planned to be increased from existing 23 per cent to 25 per cent by 2007 and 33 per cent by 2012. • Checking diversion of forest land to non-forestry purposes.	The per capita rate of deforestation in India is among the lowest in developing countries.
	Technology initiatives	• Coal gasification, beneficiation and liquefaction for value addition to domestic coal, and recovery of coal bed methane; Reduced gas flaring; Improved household stoves.	
	Other initiatives	• Introduction of market-based pricing for both power and liquid fuels replacing the administered-price system. • Standardisation of fuel-efficient pump sets, rectification of existing ones and rationalisation of power tariffs in agriculture sector.	
ADAPTATION	Natural resources management	• Agricultural policies for promoting integrated watershed management, and resource conservation technologies such as zero tillage and rainwater harvesting. • Forestry policies: Afforestation and wasteland development policy, Conservation reserve strategy, Joint forest management. • Identification of 30 mangroves and 4 coral reefs for conservation and management.	
	Infrastructure management	• Preparation of coastal zone management plans.	
	Other initiatives	• Established a climate change cell in Ministry of Agriculture for mainstreaming climate change concerns in agricultural programmes and policies.	

Sources: Parikh and Parikh (2002), Chandler et al. (2002), UNFCCC (2005g)

While India does not face any obligations of emissions reduction under the UNFCCC and the Kyoto Protocol, India has been actively committed to international efforts to mitigate climate change.

India signed the UNFCCC on 10 June 1992 and ratified it on 1 Nov. 1993. It acceded to the Kyoto Protocol on 26 August 2002 and hosted COP8 in October 2002, when the "Delhi Declaration on Climate Change and Sustainable Development" was adopted to provide an impetus to global discussions on adaptation later on. It submitted the first National Communication in 2004. While there has been some apprehension on India's participation in the recently announced (28 July 2005) Asia-Pacific Partnership on Clean Development and Climate, many participants maintained that India is committed to the international regime represented by the UNFCCC and its Kyoto Protocol. India's extensive experience with Activities Implemented Jointly (AIJ) and Global Environmental Facility (GEF) projects helped the country to take a proactive role in initiating CDM projects. Insofar as scientific research is concerned, Indian scientists played a key role in international efforts, such as the World Climate Programme, Global Observing System, and the International Geosphere-Biosphere Programme.

3.3 Assessment of the Current Climate Regime from the Indian Perspective

3.3.1 Progress to date

Participants noted that progress was substantial in formulating guidelines and institutional setting, but dismal in actual implementation, especially with regard to progress in GHG emission reductions by Annex I countries, and in the transfer of technologies and financial assistance to developing countries. The Kyoto Protocol is considered a small but significant step in the right direction to mitigate climate change. Institutionalisation of market-based mechanisms such as the CDM was also seen positively.

3.3.2 Global challenges

Some participants noted that it is nearly impossible to persuade India to control the growth of emissions if Annex I countries fail to achieve their emissions reduction commitments.

3.3.2.1 Trust building challenge: In order to restore trust between developed and developing countries and ensure stabilisation of the climate, it was noted that Annex I countries should fulfil their GHG emissions reduction commitments under the Kyoto Protocol and that Annex I countries which have not ratified the Kyoto Protocol should make meaningful domestic policies. Some participants noted that it is nearly impossible to persuade India to control the growth of emissions if Annex I countries fail to achieve their emissions reduction commitments. Several participants expressed frustration that some industrialised countries have not initiated any substantive action to fulfil the promises of returning to their 1990 levels of emissions by 2012. For instance, the increase in GHG emissions of developed countries during the 1990s was nearly as much as India's total emissions. IEA projections indicate that the aggregate CO_2 emissions of developed countries will continue to increase over the next three decades, despite their obligations under the UNFCCC and the Kyoto Protocol (IEA, 2004).

3.3.2.2 Compliance challenge: Some participants raised the issue of compliance as a challenge, as they felt that current regime does not specify clearly if and how penalties for non-compliance will be enforced by the end of the first commitment period.

3.3.2.3 Communication challenge: Communicating the right information to civil society so that all sections can participate proactively is considered a major challenge. It was noted that in democratic societies like India, it is often difficult to persuade the public to bear short-term costs or inconveniences in pursuit of achieving long-term benefits

such as GHG mitigation. It is important, therefore, to raise public awareness and understanding of the co-benefits of climate policies. While agreeing with the importance of raising awareness, some participants noted that we should be cautious not to sensationalise climate information which may mislead the public. Capturing the attention of political leaders and creating conditions that prompt the development of leadership are considered paramount.

3.3.2.4 Technology challenge: Development and deployment of climate-friendly technologies are considered a major challenge as very few examples of successful transfer of technologies to developing countries were reported in the Annex I National Communications.

Maintaining the spirit of Kyoto in the future regime discussions by turning the problems of climate change into opportunities, and building a road map by defining deliverables at each step of implementation of the climate regime are two other challenges.

3.3.3 National Challenges

3.3.3.1 High dependence on coal and fuel wood: Endowed with large coal reserves (estimated to be 234 billion tonnes in 2002), India has an energy system that is highly carbon intensive. India's dependence on coal, which meets 52% of its commercial energy needs, is likely to continue in the near future. India's coal production grew to more than 328 million tonnes in 2001/02 making the country the third-largest producer after China and the USA. How to utilise this natural resource in a sustainable manner without increasing emissions considerably remains a major challenge. In addition, large quantities of traditional biomass resources consumed for the energy needs of the vast rural population are exerting pressures on forests and village woodlots. Here again, how to meet energy needs without significant rises in GHG emissions remains a major challenge.

Due to its high dependence on coal and fuel wood, India faces difficulties in finding ways to utilize natural resources in a sustainable manner without increasing carbon emissions considerably.

3.3.3.2 Adaptation challenge: India is strongly concerned about the adaptation to climate change because its economy is heavily reliant on climate-sensitive sectors. As 65% of Indian agriculture is dependent on rainfall, any adverse impacts on water availability due to glacier retreat, decreased rainfall and increased flooding in certain pockets would threaten food security. Sinha and Swaminathan (1991) estimated that a 2°C increase in mean air temperature could decrease rice yield by about 0.75 ton/hectare. Kumar and Parikh (2001) reported that a 2°C rise temperature and an accompanying precipitation change of +7% could reduce farm level net revenue by 9%. Climate change can exacerbate the drought impacts in 150 of the country's poorest districts, where it is a perennial feature. In the absence of protection, a 1-metre sea level rise could displace 7 million people and submerge 500,000 hectares of land (UNFCCC, 2005g). How to improve the adaptive capacity of both the people and the ecosystems is thus a big challenge.

3.3.3.3 Capacity challenge: Improving human and institutional capacity to assess costs and benefits of, and to develop adaptation strategies to, climate change is a challenge.

3.4 Major Concerns on Current and Future Climate Regime

3.4.1 Developmental and economic concerns

The United Nations Development Programme (UNDP) ranks India at a level of "medium human development," ranking 127 on the list of 183 countries (UNDP, 2005a). The overriding priorities of India, therefore, are economic development (with a target GDP

growth rate of 8% and the doubling of the per capita income by 2012), poverty alleviation (to achieve 10% reduction by 2012) and provision of basic human needs to its population. Achieving these priorities will require a substantial increase in energy consumption, both at the macro and the micro levels, and consequent rise in GHG emissions. Addressing global issues such as climate change while continuing to develop is a major concern in India.

India is strongly concerned about energy security, as it faces serious energy shortages.

India is strongly concerned about energy security, as it faces serious energy shortages. India is highly dependent on coal, and it has just 0.8% of the world's known oil and natural gas resources. The World Energy Outlook projects that India's dependence on oil imports will grow to 91.6% by the year 2020 (IEA, 2004). A few participants noted that the current high fuel prices in terms of PPP are serving as an automatic check for reducing emissions in India. Assuming an energy growth rate of 5% per annum, the demand from power sector will increase from 120,000 MW to about 400,000 MW in 2030. At that time, the power generated from coal-based power plants would increase from the existing 67,000 MW to 200,0000 MW, which in turn would demand significant build-up of thermal power plants and large scale expansion of coal fields with significant implications for GHG emissions. How to produce energy from the coal sector with minimum GHG emissions is, therefore, a major concern.

Although India made considerable efforts in promoting renewable energy, the impact to date is still low as these technologies are still costly. The latest national energy outlook predicted that it would be difficult for renewable energy to exceed 3% of the total energy supply. Concern on ways to make these renewable energy technologies affordable to Indian society was expressed.

Indian policy makers asserted that it is premature for India to take any legally-binding GHG emissions reduction commitments.

The concerns on India's energy security led to a discussion on its stance on mitigation commitments. Some participants argued against the relevance of such terms as "large developing countries" and "key emitters" in considering the future GHG emission reduction commitments, and noted that indirect "pressure" from Annex I countries was totally unjustified and would not positively contribute to the discussions on the future regime. They mentioned that "cap and trade" emission trading is not necessarily appropriate for countries like India in the future regime. Murthy et al. (2000), for example, reported that a 30% CO_2 reduction over a period of 30 years can lead to a fall in the GDP by 4% and an increase in the number of poor by 17.5% in the 30th year. Kallbekken and Westskog (2003) reported that the efficiency gains obtained by participating in emissions trading cannot offset the economic risks incurred by taking on binding commitments. Others insisted that developed countries should first fulfil their own commitments before requiring developing countries to take such commitments.

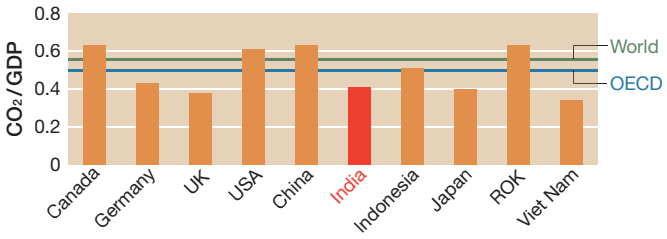
3.4.2 Equity-related concerns

Many participants noted that global warming was largely due to the industrial revolution and the use of fossil fuels by developed countries for the attainment of their current levels of prosperity, and that developing countries, such as India, have not significantly contributed to the problem, although the latter would be the most affected due to its low adaptive capacity. As India emits less than 5% of the world's GHG emissions but has 17% of its population, and currently 57% of its population do not have access to electricity (IEA, 2004), several participants felt that it is premature for India to take any legally-

binding GHG emissions reduction commitments. However, some participants argued for India making realistic progress in reducing its emissions growth trends so that it could be a positive signal to global community.

A concern was its raised regarding the criticism from Annex I countries that India is not doing enough in the GHG mitigation efforts. Some participants noted that such criticism is both unwarranted and unfair, as the CO_2 intensity of GDP at PPP in India is much lower than that of OECD and world averages and some developed countries (Fig. 3.2).

Figure 3.2 CO_2 emissions per GDP using purchasing power parities in selected countries



Source: IEA, 2004

3.4.3 Market mechanisms-related concerns

Participants noted a rapid shift in perceptions of the Indian policy-makers and industry leaders regarding the CDM from being overly pessimistic to overly optimistic. India is now a leading country in the CDM, as more than 100 projects worth more than US$ 2 billion were approved and more are in the pipeline to be approved by the national CDM authority. However, participants expressed concern that only seven out of 107 projects were registered by the CDM Executive Board as of 1 November 2005 and that most projects developed to date (91 out of 107) are unilateral. Of the seven projects approved by the CDM EB, three are unilateral (UNFCCC, 2005b). Therefore, some considered that the spirit of the Kyoto Protocol was not maintained.

A few participants cautioned against unrealistic expectations on the CDM in relation to financial and technological transfers and reminded that the CDM would at best meet only 4-15% of the gap in the world's demand for CER, which translates to 275 to 885 $MTCO_2$ eq. per year. They noted that the real concern was to examine how far developed countries would indeed be forthcoming in relation to the apportionment of the cost of emission moderation measures taken in developing countries. Several concerns were raised on the slow and complex CDM approval process which were similar to those noted in the national strategy study on the CDM implementation (TERI, 2005).

Some participants expressed concerns that the CDM did not significantly improve the transfer of technologies or finance as originally envisioned at the time of formulating the CDM. Others were concerned about the high transaction costs due to the extremely complex procedures of the CDM approval and implementation process, long lead times, low price of CERs, and reduced demand for CER, especially due to the withdrawal of the USA from the Kyoto Protocol and the existence of Russian and East European "hot air". Concern was also raised on the relatively low share of CDM projects with sustainable development benefits as against a large share of projects, such as landfill methane recovery, and decomposition of hydrofluorocarbon (HFC) and nitrous oxide (N_2O). Some participants raised concern that there is a very limited CDM market, especially for small-scale projects. Many participants strongly argued against utilising current ODA for CDM. A few participants noted the need for an organised inquiry on why the CDM did not fulfil expectations on sustainable development and technology transfer.

The CDM did not significantly improve transfer of technologies and finances as originally envisioned at the time of its formulation.

Some experts argued, however, that India is in the process of learning market-based mechanisms and that it should get as much benefit from the CDM as possible while following the rules of the game precisely. Major opportunities include demand- and

supply-side efficiency measures, fuel switching from coal to gas, afforestation, and power transmission improvements. Over the next decade, 120 million tons of carbon mitigation could be achieved at a cost of $0-15 per ton avoided (Chandler et al., 2002).

3.4.4 Technology development and transfer-related concerns

Participants noted that very few examples of successful transfer of technologies were reported in Annex I National communications, and that information networks and capacity-building were often included under technology transfer. It was noted that critical technologies which can have significant impact on de-carbonisation have been out of reach of developing countries because of both prohibitive costs and the existing IPR regime. India has a coal-based energy structure and is expected to predominately use coal in its energy mix over the next 100 years, hence clean coal technologies and the production of energy through integrated gasification and combined cycle (IGCC) route are very important. Although the promotion of renewable energy is one pillar of Indian mitigation policies, renewable energy has limitations in terms of technology and cost. These observations led to an argument that technology development and transfer relating to clean coal technologies and renewable energy technologies were critical for India's mitigation efforts.

A concern regarding limited cooperation on nuclear energy among developed and developing countries was also raised. As the current regime does not adequately address development and transfer of climate-friendly technologies, some participants opined that pacts, such as the Asia-Pacific Partnership on Clean Energy and Development which aims to cover a broad range of technologies (energy efficiency, clean coal, IGCC, Carbon Capture and Storage (CCS), Combined Heat and Power (CHP), civil and nuclear energies, etc.) would be useful.

3.4.5 Adaptation-related concerns

The lack of strong institutional mechanisms, financial resources and human capacity to assess vulnerability and impacts are barriers for taking effective measures for adaptation to climate change.

India is highly vulnerable to the impacts of climate change, hence adaptation is a crucial issue. The majority of the Indian population (agricultural, coastal fishing and forest-dwelling communities) is susceptible to shifts in weather systems and ecosystems resulting from climate change. Diminishing water resources due to changing climate was another point of concern. Despite such extreme vulnerability, research on the vulnerability of India is very limited, and the few existing analyses focus almost exclusively on coastal zones and agriculture. A concern was raised with regard to the lack of focus on impacts and uncertainty in predictions of local and sub-national impacts. Some participants emphasised that adaptation strategies should be based on the sound science of vulnerability assessment and raised a concern that very few examples of impacts of climate change from Asia in general, and India in particular, are available in IPCC reports to date.

Strong concerns were expressed regarding weak institutional mechanisms, inadequate financial resources, the lack of research on adaptation issues, and the failure to integrate adaptation concerns in development planning in India. Participants noted, for example, that water resource development plans for the next 50 years do not discuss the impacts of climate change at all, although it is well-known that climate change is already adversely

influencing monsoons, water flow in rivers, and groundwater recharge.

Concerns were raised regarding how adaptation is addressed under the current climate regime. Some participants noted that the current regime is not robust enough to address adaptation as funding for adaptation is extremely limited and most GEF funds for climate change were directed to mitigation rather than adaptation. Participants voiced serious concerns on the complex procedures for accessing GEF funds with regard to their requirements to demonstrate "global benefits" and compute "incremental costs". Participants noted that too many focus areas were placed under the jurisdiction of GEF over time, thereby reducing GEF focus on adaptation. Concern was also expressed on lack of clear guidance to GEF from COP regarding utilisation of adaptation funds.

The 2% share of CDM proceeds for the Adaptation Fund were regarded inadequate to meet adaptation needs. It was noted that traditional technologies and indigenous knowledge on adaptation could be useful, but the future focus for the climate regime should be on funding for the development and transfer of new technologies for adaptation. Some participants welcomed that ODA should facilitate adaptation measures, but some objected to the idea of linking ODA and adaptation and argued that ODA for adaptation should be additional. A concern was raised that despite its importance, international support for capacity-building on adaptation issues was limited. The need for public-private partnerships in facilitating adaptation was emphasised. However, some participants noted that incentives for private sector are not yet appealing for them to be involved in adaptation.

3.4.6 Financing-related concerns

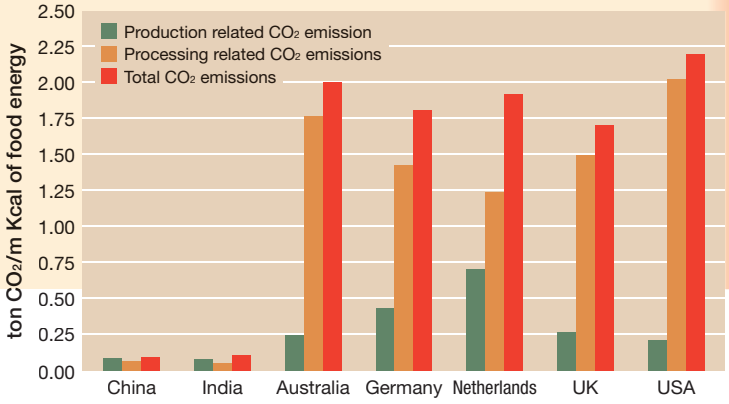
A concern was raised that climate-related funding under current regime is both inadequate and unpredictable. For example, it was noted that against the pledge of US$2.75 billion, GEF allocation during the second replenishment period was only about US$648 million. Only 7.2% of bilateral ODA was targeted for climate change-related activities. Balancing publicly-funded R&D with private sector investments is considered a major challenge to address climate issues in the future regime.

Concerns for unsustainable consumption patterns in Annex I countries, which contribute significantly to growth in GHG emissions, should be addressed more seriously than requiring developing countries to make commitments.

3.4.7 Unsustainable consumption patterns in Annex I countries

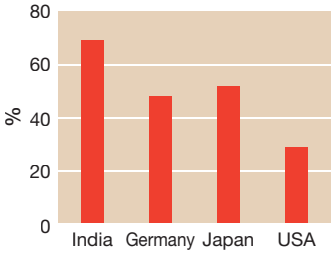
Senior policy-makers in India expressed concern that unsustainable consumption patterns in developed countries continue to contribute significantly to increase in GHG emissions. Only 25% of the global population live in these countries but emit more than 70% of the total global CO_2 and consume 75-80% of many of the world's resources (Parikh et al., 1991). Several examples to demonstrate sustainable consumption patterns of India, which are linked to inherent lifestyle preferences rather than poverty, were given. For example, CO_2 emissions from the agricultural sector – from the field to the table – are about 0.1 tons CO_2/million calories in India as against 1.7-2.2 tons in five developed countries (Fig. 3.3).

Figure 3.3 CO_2 emissions from the agricultural sector – From field (production) to the table (processed food) – excluding cooking in selected countries



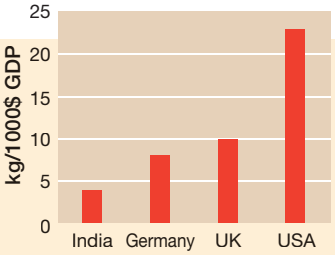
Source: UNFCCC, 2005f

Figure 3.4 Municipal solid waste recycling (excludes reuse) in selected countries



Source: UNFCCC, 2005f

Figure 3.5 GHG emissions from municipal solid waste in selected countries



Source: UNFCCC, 2005f

Likewise, recycling and the reuse of municipal solid waste is 70% in India as against 30% in the USA (Fig. 3. 4). GHG emissions from municipal solid waste per US$1000 GDP at PPP was 4 kg in India against 23kg in the USA (Fig. 3.5). The estimated CO_2 emissions from transportation per passenger km. are 16, 118 and 193 g in India, EU-15 and USA respectively. It was felt that unless such unsustainable lifestyles in Annex I countries are modified, no effective climate regime beyond 2012 can be envisioned.

3.4.8 Capacity concerns

The funding for climate-related activities in India is small - only a fraction compared with many countries of the industrialised world. Consequently, the number of climate change researchers and analysts in India is much smaller than in the developed countries (Kandlikar and Sagar, 1999). Although 452 researchers were involved in the preparation of the initial national communication, very few of them are working on climate change continuously. Policy research on climate change is very limited. Some participants noted that there are very few studies on the potential impacts on the economy of controlling GHG emissions growth by 3 or 5%, compared to the BAU scenario.

3.5 Priorities for Restructuring the Climate Regime

Indian participants identified a few options for strengthening the future climate regime (Table 3.3).

Table 3.3 Options for strengthening the climate regime beyond 2012 from India's perspective

Issue	Options for strengthening the future climate regime
Market mechanisms	• Streamlining of the CDM approval process through the reduction of bureaucracy, including reform of the CDM Executive Board. • Expanding the scope of the CDM to cover "policy-based" CDM or "sector-based" CDM. • Ensuring a guarantee of continuity of the CDM beyond 2012. • Delaying the registration deadline beyond December 2005 for projects considering to derive CERs from activities initiated in 2000.
Adaptation	• Enhanced focus on science-based adaptation. • Development of adaptation strategies to suit natural circumstances. • Promotion of public-private partnerships in adaptation. • Development of options for mainstreaming adaptation in development through appropriate reorientation of other portfolios. • Creation of a Global Adaptation Fund.
Technology development and dissemination	• Placing clean technologies under limited public domain. • Increased international funding for energy efficient technologies through establishment of funds, such as clean technology acquisition fund or global technology venture capital fund. • Amendment of the IPR regime for climate-friendly technologies along the lines of addressing HIV/AIDS.
Financial assistance	• Mainstreaming climate financing into ODA. • Innovative financing options for technology transfer.
Capacity building	• New focus on capacity-building for market mechanisms and adaptation. • Capacity strengthening of research on adaptation and GHG mitigation.
Other initiatives for more effective involvement of developing countries	• Voluntary pledge and review with assistance. • Development of a better incentive structure than in current regime.

3.5.1 Market-based mechanisms

Most participants argued that: (a) the Kyoto process and its flexibility mechanisms should gain further momentum in the future regime, (b) the countries which ratified the Kyoto Protocol should make use of the CDM more proactively, and (c) the countries which have not ratified it should initiate CDM-like mechanisms.

Structural reforms to the current CDM process attracted major attention in consultations. Many participants noted that current CDM approval process, which is complex with high transaction costs, should be streamlined through suitable reforms of the CDM Executive Board. Participants underscored the importance of assurances on: (a) continuity of CDM beyond 2012, and (b) delaying the registration deadline beyond December 2005 for projects hoping to count CERs from activities

initiated since 2000. Expanding the scope of the CDM to encompass sector-based or policy-based CDM was considered especially desirable, as India has many opportunities for energy efficiency improvement. As sector-based CDM would allow the development of projects without pre-established limitations in terms of the territorial coverage or enabling instruments, it is considered as an evolutionary step through which developing countries such as India can increase their participation in the regime (Samaniego and Figueres, 2002). There was also a view, however, that sectoral baseline setting might lead to "capping", and that the CDM should be limited to a project-based approach due to enormous technical difficulties in setting sectoral baselines. Further promotion of unilateral CDM in the future regime was also considered useful, as such projects may entail relatively lower transaction costs due to project developers not requiring protracted negotiations for emissions reduction purchase agreements (Bhandari, 2004).

Structural reforms to the current CDM process are urgently needed.

3.5.2 Technology development, dissemination and diffusion

Many participants noted the need for treating critical climate-friendly technologies as global public goods and suggested that restructuring the IPR regime along the lines of approaches taken to combat HIV/AIDS could be a way forward. One of the options suggested was to place clean technologies under limited public domain and redefine the extent of patent protection for such technologies especially in developing countries. Another option could be to establish a mechanism for the purchase of patent rights of certain technologies through a global technology acquisition fund. While developing countries would not be required to pay any license fees for such technologies, the patent holder could continue to receive license fees for their use in industrialised countries. Other approaches for technology transfer (e.g., shared international IPR along the lines of agricultural technologies by the Consultative Group on International Agricultural Research (CGIAR), compulsory licensing which enables the government to grant a license to a domestic manufacturer of a technology who in turn agrees to pay royalties to the patent holder, and bilateral negotiation along the lines of Costa Rica and the Merck Agreement on biodiversity may also be relevant for future regime discussions (Ogonowski et al., 2004).

Critical climate-friendly technologies should be treated as global public goods, and the IPR regime should be restructured to enhance the access for developing countries to these technologies.

Based on the observation that the major international mechanisms, such as GEF, CDM and Climate Technology Initiative (CTI) have not yet succeeded in promoting dissemination of decarbonisation technologies to developing countries, participants noted the need for adaptive research and development at domestic level and increased funding at international level, especially for energy efficient technologies, through the establishment of a clean technology acquisition fund or a global technology venture capital fund. Even though the Indian parliament enacted the Energy Conservation Act 2000, providing for the efficient use and conservation of energy, participants noted that current energy efficiency in major Indian industries was only around 32-33% and that increasing it to 40% could reduce GHG emissions growth considerably. For example, Schumacher and Sathaye (1999) showed that energy savings of up to 38% could be achieved in India's cement industry through investments in energy efficiency technologies for existing and new plants. Likewise, Chandler et al. (2002) reported that demand- and supply-side efficiency measures alone could avoid 45 million tons of carbon emissions. Participants felt that regional agreements such as the Asia-Pacific Partnership on Clean Development and Climate could be complementary to technology deployment efforts under the future climate regime.

3.5.3 Adaptation

Participants overwhelmingly supported the argument for creating a more robust future climate regime to address adaptation. Considering the fact that the research capacity on vulnerability and adaptation in India was limited and that no practical examples of adaptation measures in Asia were reported yet in IPCC reports, participants noted that the future regime discussions should facilitate measures for strengthening research capacity on adaptation. This is especially relevant because uncertainty about the local impacts of climate change is a major bottleneck for designing appropriate adaptation strategies. Many participants underscored the importance of mainstreaming adaptation in natural resource management and recommended that future regime framework should provide avenue for discussions on such options.

Participants recognised that the flexibility of GEF guidelines should be improved in the future regime, so that GEF funds could be used for enhancing coping capacities at the local level.

Dissatisfied with current international mechanisms for funding adaptation, participants recognised that the flexibility of GEF guidelines should be improved in the future regime, so that GEF funds could be used for enhancing coping capacities at the local level. Some participants recognised the need for tackling adaptation beyond voluntary agreements, perhaps through the design of an adaptation protocol if necessary, with well-defined commitments. However, some participants questioned the suitability of adaptation for designing a separate protocol and stressed that it is not necessary to create it from scratch because there were other windows of opportunities. Likewise, some participants advised caution in utilising the market-based mechanisms (vouchers, credits, etc.) for facilitating adaptation in the future regime, as they recognised that mitigation and adaptation are not alike. The need for utilising global insurance funds to support adaptation in future regime was also recognised.

3.5.4 Capacity-building

Capacity-building towards designing consistent data reporting formats for GHG inventory, collecting data for formal and informal sectors of the economy, and conducting detailed and fresh measurements of Indian emission coefficients was considered crucial. Capacity building in scientific assessment of the impacts of climate change and potential adaptation strategies, especially in water resources sector, were also considered vital.

3.5.5 Other issues

The need for creating a better incentive structure in the future regime was also emphasised as a way towards global participation and for more effective involvement of developing countries.

Participants noted that the future regime must be flexible enough to duly accommodate national circumstances (e.g., need for poverty alleviation, coal-based energy mix, energy shortage, high fuel prices in terms of PPP in India). The need for creating a better incentive structure in the future regime was also emphasised as a way towards global participation and for more effective involvement of developing countries. As an example, the idea of a "pledge and review with assistance" approach was presented. The idea is that reflecting national interests, priorities and capacity, a developing country would announce its pledge for containing GHG emissions growth. If a country is able to fulfil its commitments, more funds for adaptation and climate-friendly technologies are provided. The provision of assistance can create incentives for fulfilling commitments, even though such commitments are purely pledges and not binding. The participation of the USA in an international framework was also pointed out as an incentive for India to take on commitments in future.

In summary, consultations in India showed that the future climate regime must aim to bridge a number of existing gaps in the current regime. They include: resource gap (gap between needs and available resources); relevance gap (relevance of various policy instruments to suit national circumstances); participation gap (gaps in ability of negotiators and civil society between developed and developing countries); perception gap (gaps in understanding of issues including differential responsibility, capacity and commitment); and, policy culture gap (gaps in policies aimed at GHG mitigation and adaptation).

Future climate regime discussions should aim to bridge a number of existing gaps in the current regime.

3.6 Epilogue

India plays a significant role in the issue of global climate change not only as a rapidly developing nation with growing GHG emissions, and as a country most likely to experience the negative impacts of climate change, but also through intellectual contributions to the global debate. However, from a national perspective, India is yet to develop a coherent position on climate change and appropriate strategies for international negotiations perhaps because the climate change debate in India is still hedged by several uncertainties on local impacts, and costs of mitigation and adaptation initiatives.

For a developing country like India, the potential conflicts between developmental aspirations and environmental concerns must be resolved. Therefore, helping find energy solutions is as important as raising awareness of climate change in India. Many efforts to moderate GHG emissions growth are already under way in India but they are primarily motivated by concerns on energy security, economics or local environmental issues, such as air pollution. Indian stakeholders repeatedly pointed out that India is not, and will not be a problem in the foreseeable future with respect to climate change, based on the notion that per capita emissions would only be a fraction of that in developed countries for the foreseeable future. However, it is important for India to develop a more proactive position in climate negotiations in order to help build a more equitable and effective regime that can address its interests and developmental aspirations. As climate change can adversely affect all initiatives for sustainable development in India, successful negotiations can be a good means of reducing or postponing future vulnerability and improving its long-term energy and resource efficiency. Rather than sticking to one energy strategy (e.g., over-dependence on coal), it is perhaps important to consider various choices (e.g., joint development of climate-friendly technologies with industrialised countries to share IPRs, finding a niche for itself for bridging the gaps between developed and developing countries).

It is important for India to develop a more proactive position in climate negotiations in order to help build a more equitable and effective regime that can address its interests and developmental aspirations.

Indian policy-makers are urged to pursue strategies that take advantage of synergies between climate protection and the overriding development priorities to simultaneously advance both. In this connection, India should be an active and decisive partner in climate negotiations through focussing on strategies, such as the CDM and other innovative mechanisms, that will limit GHG emissions and at the same time help achieve sustainable development. As India is also the home to several millions of vulnerable communities and about 550 million people without access to reliable modern energy services, Indian negotiators must ensure that the future regime would empower and enable them to respond to climate change and its impacts appropriately.