Sustainable Development and Climate Change

12 CHAPTER

This new chapter in the Economic Survey reflects the growing challenges of sustainable development and climate change. Pressures on land, air, water, forests and loss of plant and animal habitat are growing. At the same time, a warming planet is already causing adverse effects, such as more frequent extreme weather events. The science and evidence of climate change are compelling. Both India and the world are reviewing the challenges ahead. The Earth Summit in Rio in June 2012 will take stock of sustainable development priorities globally. The Durban meeting in December 2011 has set some directions for appropriate responses to climate change. And closer to home, the Twelfth Five Year Plan, commencing in April 2012, is setting out India's priorities for a sustainable and inclusive, lower-carbon development path.

12.2 India's journey on the path of sustainable development has so far been marked both by reasons for celebration and introspection. The right place to begin the story would be the 1980s and early 1990s, which mark the beginning of economic reforms, catalyst for India's phenomenally faster growth rates since, and coinciding with a time when countries around the world acknowledged and started addressing the increasing environmental concerns, such as at the Earth Summit in Rio in 1992. India's faster gross domestic product (GDP) growth over the last two decades has been unprecedented; but at the same time India's rankings in terms of the human development index (HDI) as well as indices measuring environmental sustainability are yet to fully reflect this growth(Box 12.1). However, it would be a mistake to downplay the enormous progress made, as India has followed a much more conscious path of sustainable development with impressive results on the ground.

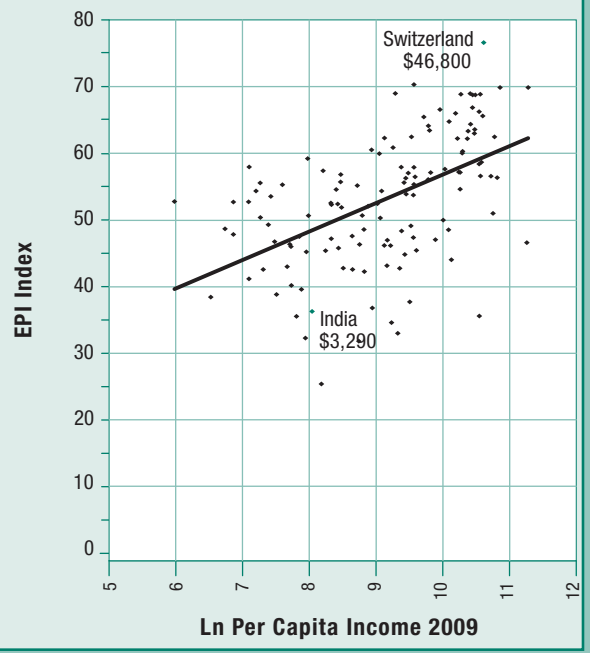
12.3 The key environmental challenges have become sharper in the past two decades. The 2009 State of the Environment Report by the Ministry of Envionment and Forests (MOEF) clubs the issues under five key challenges faced by India, which are climate change, food security, water security, energy security, and managing urbanization. Climate change is impacting the natural ecosystems and is expected to have substantial adverse effects in India, mainly on agriculture on which around 58 per cent of the population depends for livelihood, water storage in the Himalayan glaciers which are the source of major rivers and groundwater recharge, sea-level rise, and threats to a long coastline and habitations. Climate change will also cause increased frequency of extreme events such as storms, floods, and droughts. These in turn will impact India's food & water security problems. India also faces the critical challenge of meeting its rapidly growing energy demands. It currently depends on around 80 per cent imports for its crude oil requirements. A large section of the rural population is still not connected to the grid or efficient modern cooking fuel sources, and India's per capita energy consumption of 439 kg of oil equivalent is far below the world average of 1688 kg (Planning Commission report in 2006). The energy poverty of the household sector is indicated not only by the low penetration of electricity into the sector, but also by its primary dependence on

Box 12.1 : Measuring India's Environmental Performance

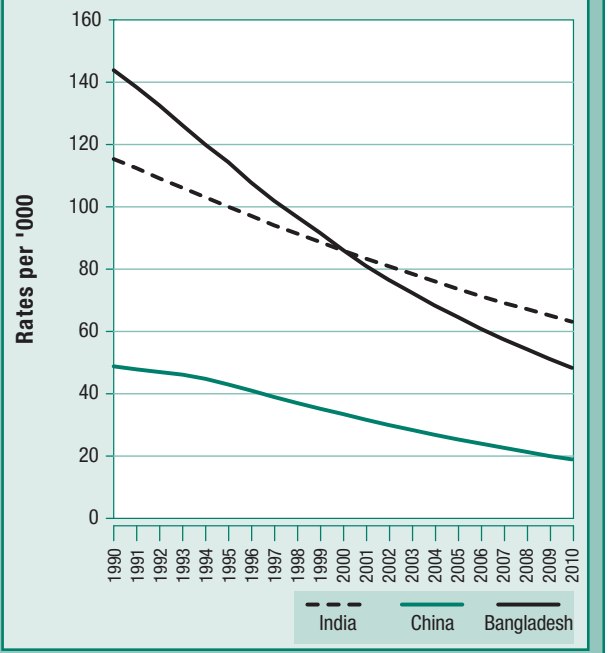
In a recent ranking of environmental performance (EPI 2012), India was placed 122 out of 132 countries. Its performance was better on protecting its forests (rank 21) and fisheries (39), and on climate change (55). Poorer ratings were given to air quality (132), agriculture (126), and water resources (122). Like all such rating exercises, this one too has significant data and methodological problems. In agriculture, India's performance on two sub-components—banned pesticides and protection—has been wrongly evaluated. India has banned or restricted a dozen organic pesticides and its protection to agriculture is negative. The environmental health indicator, with the largest weight, uses child mortality rates between ages 1 and 5; this exaggerates differences. A broader life expectancy at birth index would be less biased. Three other adjustments—more appropriate country normalizations for biodiversity, energy, and water—should be made. The cumulative impact might improve India's overall ranking closer to the middle of all countries. The other methodological issue is how to separate environmental performance from incomes. While 'distance-to-targets' methodology helps, this does not fully correct the problem: richer countries still tend to perform better (because they can afford to) and economic development is still a critical driver of sustainability.

The EPI exercise is nevertheless useful in flagging some areas of concern. We should do better on public health and environmentally preventable child mortality, as has Bangladesh (Sen and Dreze 2011). Another is an alarming increase in air-borne respirable small particulate matter (PM) of less than 2.5 microns. Delhi has seen recent PM 2.5 levels that surpass Beijing's. Increased private diesel transport, power plant emissions, burning of agricultural residues, and sub-Himalayan winter inversion are the culprits. A MOEF study has identified a menu of options, none of them easy: tougher regulations (e.g. ban on burning residues, power plants), prices (diesel and private transport), and investments in public transport, to address these problems.

Per capita income and the EPI index



Under-5 Mortality Rates (1990-2010)

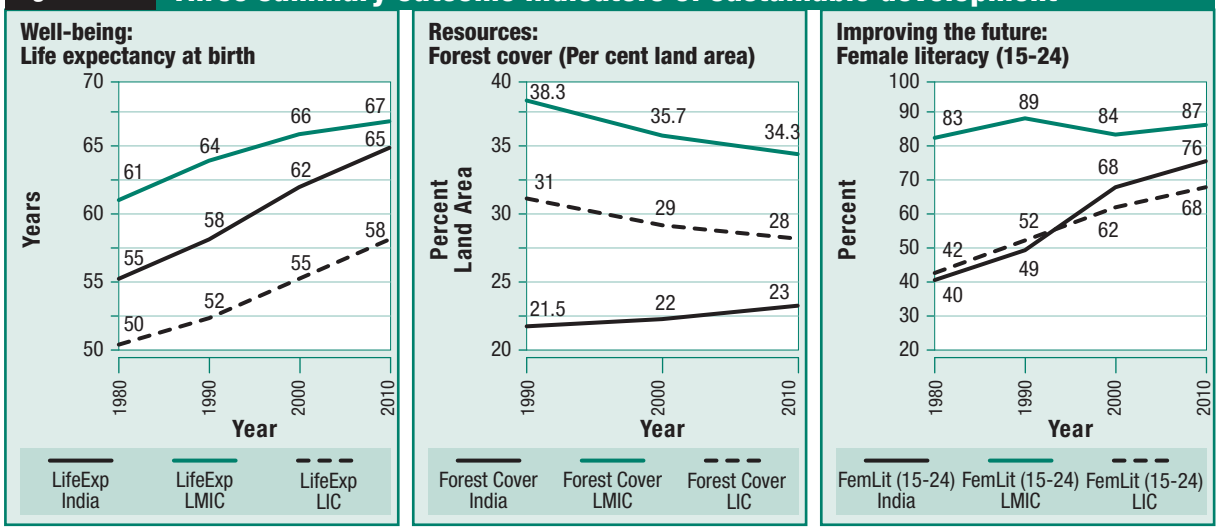


Source : **Staff estimates and data from EPI 2012 and World Development Indicators.**

References : **(1) EPI 2012. Environmental Performance Index and Pilot Trend Environmental Performance Index (www.epi.yale.edu) (2) IPEP, 2006.Country Situation on Persistent Organic Pollutants (POPs) in India. (3) Yogesh Bandhu, 2010. Agricultural Market Prices and Subsidies Implication for Indian Agriculture, Giri Institute of Development Studies, Lucknow; (4) Will Martin and Kym Anderson, October 2010, Trade Distortions and Food Price Surges, World Bank and University of Adelaide (5) WHO, 2003. Making a Difference: Indicators to Improve Children's Environmental Health, 2003. (6) Amartya Sen and Jean Dreze, 2011. Putting Growth in its Place. Outlook, November 14. (7) Christoph Bohringer and Patrick Jochem, 2005.Measuring the Immeasurable: A Survey of Sustainability Indices, Centre for European Economic Research, Mannheim; (8) S. Mukherjee and D. Chakraborty, 2009. Do Non-Economic Factors Influence Environmental Performance of a Country? Recent Empirical Evidence, mimeo.**

traditional inefficient fuel for cooking and lighting. As per the National Sample Survey Organization (NSSO) survey 2004-05, around 45 per cent of rural households depend on inferior fuels like kerosene or candle light for lighting and 84 per cent have to rely primarily on biomass comprising fuel wood, dung cake and agro-waste for cooking fuel. Finally, urbanization is proceeding very rapidly, creating new issues of affordable housing, access to safe water and sanitation, solid waste disposal, transport, and air quality. Prices, incentives, regulations and taxes could be designed to help respond to these areas.

Figure 12.1 Three summary outcome indicators of sustainable development



Note **: LMIC- Lower and middle income countries; LIC- Low income countries**

12.4 At the same time, there is a strong sense of progress made at community level, where it matters. India has made remarkable gains so far in sustainable development, as measured, for example, in three summary 'outcome' indicators. One is life expectancy, where India has achieved a decade's gain, which is a broad indicator of economic well-being with social justice. There has also been a rise in forest cover despite the pressures on land use, which is a measure of environmental sustainability. Satellite data confirms that not only has India been able to control deforestation, but its forest cover has also been increasing between the 1990s and 2010. India is one of the few developing countries where forest cover has increased over the last 20 years and continues to increase, although a slight dip is reported in the latest data for 2011. A third summary indicator is gains in literacy among younger women, an indicator of future generations' well-being (Figure 12.1). On all three counts, India has outpaced the 'deltas' on global averages, although it could have done even better. Apart from this, the success of its services sector has driven growth. The economy transitioned from being mainly dependent on agriculture and manufacturing to a services-oriented one over the 1990s. The share of this sector in India's GDP grew from approximately 38 per cent in 1980-81 to 57.7 per cent in 2010-11.

12.5 Along the way, valuable experience has been gained with many different approaches. These have cemented the institutional foundations for the future. Sustainable development in terms of environmental concerns has been a recurring theme in Indian policy and planning. A dedicated and independent Ministry of Environment and Forests has been functioning with increasing responsibilities since 1985. The Constitution itself and recourse to many specific laws, multiple actors, markets, and numerous government programmes and policies have also helped. The Constitution of India and relevant amendments that have been incorporated over the years, reinforce the policy and legal basis of sustainable development in India. The pillars of sustainable development are embedded in the fundamental rights guaranteed by the Constitution, which lay down the framework for social justice in India. Article 21 conferring the Right to Life has been assigned the broadest interpretations by the judiciary to encompass the right to a clean environment, right to livelihood, right to live with dignity, and a number of other associated rights. The National Environment Policy 2006 has attempted to mainstream environmental concerns in all developmental activities. The Government of India, through its various policies, has been factoring ecological concerns into the development process so that economic development can be achieved without permanently damaging the environment. The challenges ahead are, nevertheless, large. Meeting rising energy needs in an energy-poor country with still limited access is a huge challenge, along with accelerated urbanization and manufacturing to create more jobs.

12.6 The Ministry of Statistics and Programme Implementation has also initiated the process in 2010 of putting in place a green national accounting system, to more appropriately take into account the environmental costs of development and reflect the depletion of natural resources in generating national income. Comprehensive environmental

statistics are being published since 1997 by the Central Statistics Office (CSO). It is expected that the depletion of stocks of natural resources will be worked into the standard national accounts to estimate a green GDP at the level of states and the country as a whole in about five years. Pilot projects have already been initiated at the level of states and a high-level advisory group has been formed. The information will further integrate sustainable development into the development process. It is important to note here that the distribution of gains and losses is also important. To the extent that depletion of natural resources is transformed simultaneously into improved human capital endowments and capabilities, especially for the poorest communities who depend on natural eco-systems the most. More careful measurements of inclusion and sustainability considered together will enhance development choices and decisions. Green development has to take into account the need to accommodate faster rates of traditional growth that are more inclusive—such as modern energy needs of poorer households. For example, converting (depleting) abundant 'dirty' coal into clean electricity will represent a valid choice, provided the distribution of such benefits is more skewed towards the energy needs of poorer, unconnected households, and not if it is to meet subsidized energy needs of richer households, whether in urban or rural areas. Analogous arguments apply globally.

12.7 India will therefore need to find (save) and devote (spend) even more resources for meeting economic well-being needs with greater environmental sustainability. Broad-based economic and social development is ultimately the answer. Economic pricing of energy and other resources will be a key to switching to a more sustainable development path (Box 12.2). New technologies will be crucial, mostly in the private sector. But social justice will also require stepped-up public spending in many areas. Managing energy needs for a rapidly growing economy will be at the heart of the response and India's voluntary endeavours towards climate change.

12.8 India has pledged to reducing the energy-intensity of its growth path. To deal with it, fair burden sharing globally, measured in terms of per capita emissions standards, and global financing are a must—so that already developed countries do not use up all the carbon space at the cost of the developing world. The recent Durban Decisions have included steps towards post 2020 arrangements to reduce greenhouse gas (GHG) emissions without sacrificing the needs of developing countries and for the setting up of a global Green Climate Fund (GCF) that promises stepped-up global financing. The proof of developed country commitments on financial support will be in their rapid implementation of the GCF.

Climate Change

12.9 Climate change is a global environmental problem which has been receiving intense political attention both at domestic and international levels. The United Nations Framework Convention on Climate Change (UNFCCC) defines 'climate change' as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. The major characteristics

Box 12.2 : Are Diesel Prices too Low in India?

Diesel is a key energy price. Diesel price adjustments have lagged international prices in recent years, and budgetary subsidies have ballooned. At the same time, such low prices and subsidies are providing incentives for misuse, shifts to diesel use such as luxury sports utility vehicles (SUVs), escalating imports in an energy-insecure country, and increased pollution loads. Diesel is a heavy contributor to particulates and black soot and to asthma, cancer, and heart disease. On the other hand, political economy arguments are that diesel is a widely used fuel for public transport, budgetary subsidies are offset by central and state value-added tax (VAT), excise and sales taxes, and finally diesel prices in India are high relative to incomes. Is there merit in these arguments? One way of testing for this formally is to compare diesel prices in India with those prevailing in other countries, adjusted for PPP incomes, as well as relative energy abundance. Other things being equal, countries that export oil (such as the Middle Eastern ones) or are relatively diversified, energy- abundant countries (such as Canada and the United States) can afford to keep domestic prices lower than energy-insecure countries (such as India). The evidence shows that just such a predicted relationship indeed holds. But even accounting for this, diesel prices were already 20 per cent below predicted levels for India in 2010; the divergence has since doubled as global oil prices have surged 45 per cent (from US$ 80/barrel Brent prices in 2010 to US$ 120 currently), while domestic price adjustments have not followed. Diesel prices need a large adjustment now (as China, for example, has recently undertaken), given subsidies, pollution and public health costs. Charging high road and vehicle taxes is another option (that Singapore uses).

of climate change include rise in average global temperature, ice cap melting, changes in precipitation, and increase in ocean temperature leading to sea level rise. The efforts needed to address the climate change problem include mitigation of GHG emissions on one hand, and building of adaptive capacities on the other in developing countries to cope with the adverse impacts of climate change on various sectors of the society and economy enabled and supported by technology and finance.

Science And Economics of Climate Change

Science of Climate Change

12.10 The atmosphere carries out the critical function of maintaining life-sustaining conditions on earth. The sun radiates solar energy on earth and a large part of this energy, about one-third is radiated back into space, the balance being absorbed by the surface and atmosphere. GHGs like carbon dioxide (CO_2) and water vapour re-emit some of this heat to the earth's surface. If they did not perform this useful function, most of the heat energy would escape, leaving the earth cold and unable to support life. In this manner the atmosphere creates a natural greenhouse effect which helps sustain life on earth. However, ever since the Industrial Revolution began about 150 years ago, man-made activities have added significant quantities of GHGs to the atmosphere.

12.11 Climate change is primarily caused by the building up of GHGs in the atmosphere. GHGs which are responsible for global warming are both short and long lived, with their residence time in the atmosphere varying from few hours, weeks, months, years to several hundred years. Warming potential of any GHG is reckoned with CO_2 as the standard and for methane (CH_4) it is roughly twenty one times and several thousand times for fluorocarbons. According to the Intergovernmental Panel on Climate Change (IPCC), the global atmospheric concentrations of CO_2, CH_4, and nitrous oxide (N_2O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial levels. The global increases in CO_2 concentration are primarily due to fossil fuel use and land use changes, while those of methane and nitrous oxide are primarily due to agriculture. According to the Fourth Assessment Report of the IPCC (IPCC AR4 2007), atmospheric concentrations of CO_2 increased from a pre-industrial value of 278 parts per million (ppm) to 379 ppm in 2005, and the average global temperature rose by 0.74°C. Projections indicate that global warming will continue and accelerate.

Box 12.3 : Key Findings of IPCC AR4 2007

- Warming of the earth's climate system is unequivocal.
- CO_2 atmospheric concentration--280 ppm in 1750 rose to 379 ppm in 2005.
- Direct observations of changes in temperature, sea level, and snow cover in the northern hemisphere during 1961–90 indicate increased temperatures, rise in the mean sea levels, and decreasing snow cover.
- Global average sea levels rose by 1.8 mm/year over 1961–2003.
- Eleven of the twelve years—1995-2006—rank among the twelve warmest years since 1850.
- Both the hemispheres have observed a decline in the mass of mountain glaciers and snow cover. Precipitation has been found to be more variable, with increased frequency of heat waves, droughts, heavy precipitation events, and floods.
- Projected changes in the climate indicate an increase in global temperatures in the range of 1.8°C to 4.0°C over the twenty-first century and sea level rise is projected to be between 0.18 m and 0.59 m by 2100.

12.12 IPCC AR4 has more firmly established the scientific basis of climate change and raised concerns related to climate impacts. Key findings of IPCC AR4 are given in Box 12. 3. IPCC AR5 is well under way now and will contain more comprehensive and consistent peer reviewed scientific information. The IPCC has, also, come out with various special reports. In 2011, it has completed its special report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, in which there were several important findings.

12.13 With climate change, the type, frequency, and intensity of extreme events, floods, and droughts are expected to increase. Thus climate change represents additional stress on ecological and socio-economic systems that are already facing tremendous pressure due to rapid economic development. Hence, addressing climate change is a major challenge in terms of policies and resources needed to address it at domestic and international levels.

Economics that Follows the Science

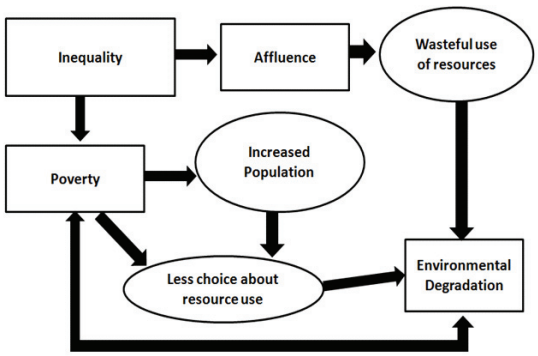
12.14 There is now overwhelming scientific evidence and growing quantitative assessment of risks to establish that human activities are changing the composition of the atmosphere and its properties. This realization brings to the fore ways and means of addressing the challenge and associated resources, which in turn brings us to economics. Science suggests that the impacts of climate change are serious and broad ranging, with economics implying that they interact with other market failures and economic dynamics, giving rise to complex policy issues. To put it briefly, climate change is a global externality associated with the emission of GHGs, which has long, persistent and, beyond a level, irreversible effects. These emissions impose a cost on both the present and future generations, which are not fully recouped from the emitters of these emissions. Hence, there is need for policy intervention as markets alone fail to account for these failures.

12.15 This forms the starting point for the international climate change negotiating regime, suggesting a need for globally coordinated policy action as the incremental impact of a ton of GHG on climate change is independent of where in the world it is emitted, and because the nature of GHG emissions is such that it affects the environment with a lag. This characteristic shapes some important features of climate change policy framework, namely historical responsibilities and inter- and intra-generational equity (Box 12.4). The requisite policy hence should balance the distribution of outcomes within and across generations. Every effort for conservation must be carried out early to protect our future generations by providing them with a better quality of life including productive resources for the future. Along with this we also have to safeguard our reasonable interests and concerns as environmental issues cannot be delinked from our efforts to provide the present generation with the basic necessities and a better quality of life. Also, there has to be a cooperative endeavour to protect the climate and environment along with development imperatives. Put together, combating climate change ultimately boils down to a complex economic policy issue with very difficult choices involving rates of economic growth, volumes of emission, probable increase in temperature, and adverse impacts and costs of addressing climate change.

Box 12. 4: Inter- and Intra-generational Equity

Equity has two dimensions – inter-generational and intra-generational. In the specific context of climate change, inter-generational refers to the spatial distribution of global GHG emissions budgets, GHG emissions rights, implicit costs and benefits, and impacts of climate change inflicted by each generation on its successors, across generations. Intra-generational equity relates to the allocation of utilization of resources among members of the present generation.

The Vicious Circle of Environmental Degradation with Poverty and Affluence



Source: University of Wollongong- New South Wales, Australia

Quite often, in climate change debates the emphasis is on inter-generational equity. However, we cannot overlook intra-generational equity. The stake of developing countries in growth and poverty eradication cannot be questioned. Developed countries, being responsible for causing climate change, owing to their historical as well as current emissions should take actions as committed, to stabilize and reduce their emissions of GHGs and also provide financial and technological support to enable developing countries in addressing the challenge of climate change. The social discount rate is crucial for a cost-benefit analysis reflecting society's relative valuation on today's well-being versus well-being in the future.

Integrating the Science and Economics

12.16 It follows from the earlier discussion that there are difficult technical and conceptual policy questions to be tackled. The most important is to choose a stabilization level of GHG emissions and time-frame for emission peaking, keeping in mind the principle of equity (in access to global atmospheric resources) and common but differentiated responsibilities (CBDR). Article 2 of the UNFCCC calls for stabilization of atmospheric GHG concentrations at levels and within a time frame that would prevent dangerous interference with the climate system. The understanding on dangerous interference with the climate change system ultimately is social, political, economic, and technical in nature. Table 12.1 shows the results of modelling for different levels of global mean temperature increase above pre-industrial levels at

Table 12.1 : Different Levels of Global Mean Temperature Increase above Pre-industrial Levels

Category	Additional radiative forcing (W/m^2)	CO_2 concentration (ppm)	CO_2-eq. concentration (ppm)	Global mean temperature increase above pre-industrial at equilibrium, using 'best estimate' climate sensitivity (°C)	Peaking year for CO_2 emission	Change in global CO_2 emission in 2050 (% of 2000 emissions)	No of assessed scenarios
I	2.5-3.0	350-400	445-490	2.0-2.4	2000-2015	-85 to -50	6
II	3.0-3.5	400-440	490-535	2.4-2.8	2000-2020	-60 to -30	18
III	3.5-4.0	440-485	535-590	2.8-3.2	2010-2030	-30 to +5	21
IV	4.0-5.0	485-570	590-710	3.2-4.0	2020-2060	+10 to +60	118
V	5.0-6.0	570-660	710-855	4.0-4.9	2050-2080	+25 to +85	9
VI	6.0-7.5	660-790	855-1130	4.9-6.1	2060-2090	+90 to +140	5
							(Total =177)

Source **: Contribution of Working Group III to IPCC AR4.**

equilibrium and their corresponding peaking year for CO_2 emissions and concentration range to stabilize at these levels.

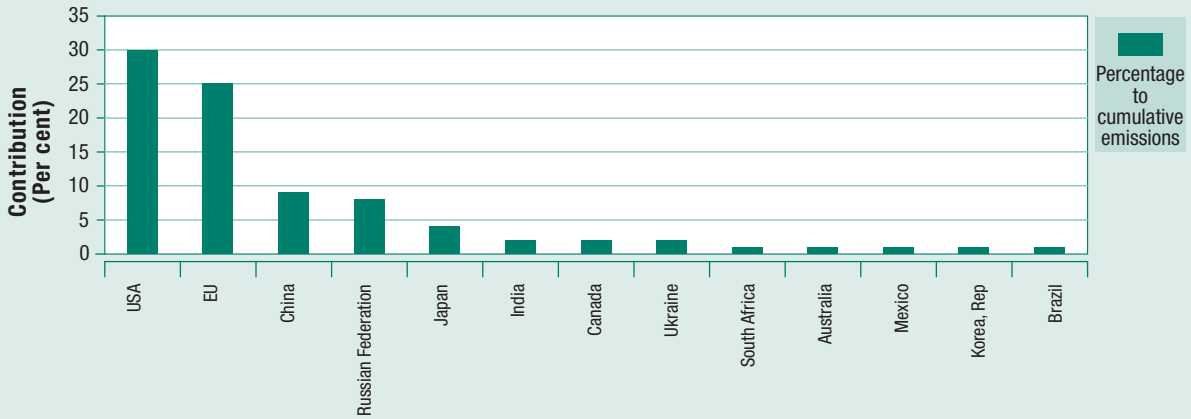
GHG Emission Trends Globally

12.17 GHG emissions have risen sharply since 1945. As per a working paper published by the World Resources Institute (World Greenhouse Gas Emissions in 2005, WRI), total GHGs were estimated at 44,153 million metric tons CO_2 equivalents in 2005. This is the most recent year for which comprehensive emissions data are available for every major gas and sector across countries. Total global GHG emissions grew by 12.7 per cent

Box 12. 5 : World GHG Emissions and Historical Responsibilities

The largest share of historical and current global emissions of GHGs has originated in developed countries. While the worldwide emissions of GHGs have increased since 1945, with the largest increases taking place in CO_2 emissions, scientists attribute the global problem of climate change not to the current GHG emissions but to the stock of historical GHG emissions. Most of the countries, particularly the industrialized countries, having large current emissions are also the largest historic emitters and the principal contributors to climate change. Industrialized countries with the largest total emissions also rank among those with the highest per capita emissions.

Percentage contribution to cumulative emissions 1900-2005



Source : Earth Trends (http://earthtrends.wri.org) Searchable Database Results Provided by the World Resources Institute (http://www.wri.org)

between 2000 and 2005, an annual average of 2.4 per cent. CO_2 was the predominant gas (with long life exceeding 100-150 years), accounting for 77 per cent of world GHG emissions in 2005 followed by methane (15 per cent) and nitrous oxide (7 per cent). In 2005, North America accounted for 18 per cent of world GHG emissions, China 16 per cent, and the EU 12 per cent. India's share stood at 4 per cent. Equally important are the figures for the cumulative emissions which are responsible for the current rise in global temperature (Box 12.5).

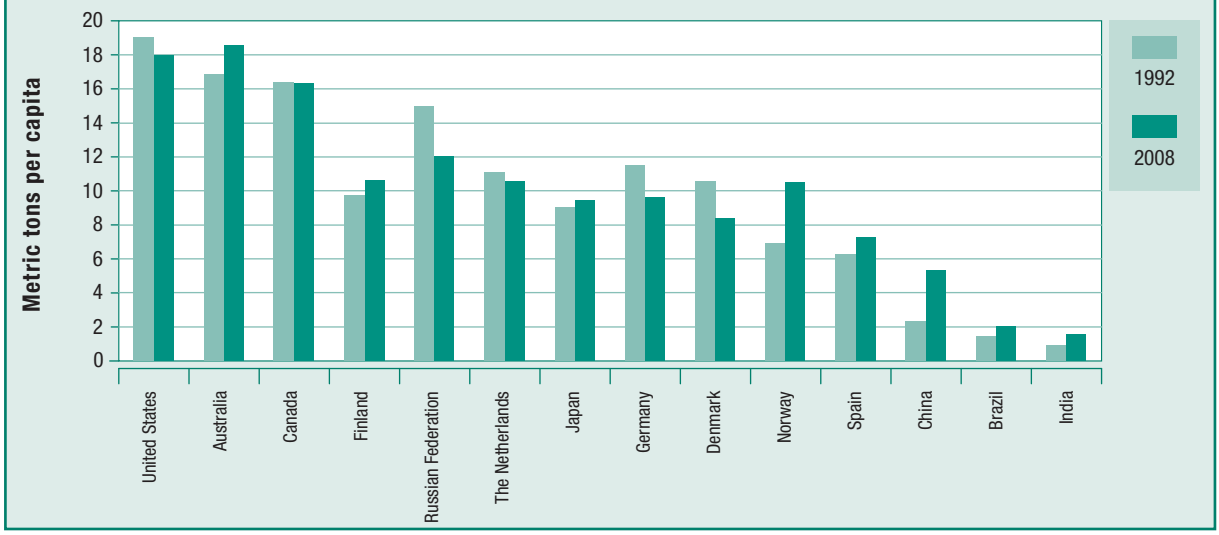
12.18 The World Bank database has CO_2 emissions data estimate up to the year 2008. As CO_2 is the most predominant GHG, an analysis of CO_2 emissions across countries in absolute and per capita terms in 2008 compared to 1992 is worthwhile. The absolute emission level of United States in 1992 was the highest at 4876 million metric tons of CO_2. China with 2695 million metric tons of CO_2 stood at the second place and was followed by Russia, Japan, Germany and India. Whereas in 2008 China had the highest absolute emission at 7031 million metric tons of CO_2 and United States stood second at 5461 million metric tons of CO_2. India's absolute emission levels were at 1742 million metric tons of CO_2 which was closely followed by Russia, Japan, Germany and Canada.

12.19 Per capita emissions, which are more important, reflect a different picture. Both in 1992 and 2008, Qatar had the highest per capita CO_2 emissions at 54.89 and 49.05 CO_2 tons. In 2008, Qatar was followed by countries like Trinidad and Tobago (37.39 CO_2 tons), Kuwait (30.11 CO_2 tons), Brunei Darussalam (27.53 CO_2 tons), and United Arab Emirates (24.98 CO_2 tons). Whereas, countries like China (5.30 CO_2 tons) and India (1.52 CO_2 tons) ranked among the middle and bottom with 68 and 122 ranks, respectively. Some of the developed countries like Australia (rank 9), United States (rank 10), Canada (rank 13) and Germany (rank 31) had one of the highest per capita CO_2 emission levels which is also reflected in their absolute emissions. (Figure 12.2)

International Framework

12.20 The issue of climate change is now firmly on national and international agendas, subject to scrutiny by public and media, and is even shaping the strategies of a number of businesses. Internationally the UNFCCC (Convention) was set up in 1992 and entered into force in 1994. This was a crucial step towards putting in place the institutions and processes for the world's governments to take coordinated and effective action. As on date, 195 countries are Parties to the Convention. The ultimate objective of the Convention is to stabilize the concentrations of GHGs in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Although global in scope, it differentiated the commitments/ responsibilities of Parties on the basis of their respective capabilities, economic structures, resource capacities and on the basis of the principle of 'equity' which is at the core of the climate change debate. Hence, any discussion on stabilization of the concentrations of GHGs in the atmosphere should be preceded by a paradigm for equitable access to global atmospheric resources that determines the development space of nations. The Convention lays down legally binding commitments for the developed countries, taking into account their

Figure 12.2 CO_2 emissions of some major countries (for 1992 and 2008)



historical responsibilities. These commitments are to be implemented in the form of reduction of GHG emissions by the developed countries with reference to 1990 levels and provision of support to developing countries in terms of finance and technology so as to enable them to take voluntary mitigation and adaption measures. The Convention recognizes that economic and social development and poverty eradication are the 'first and overriding priorities' of the developing countries.

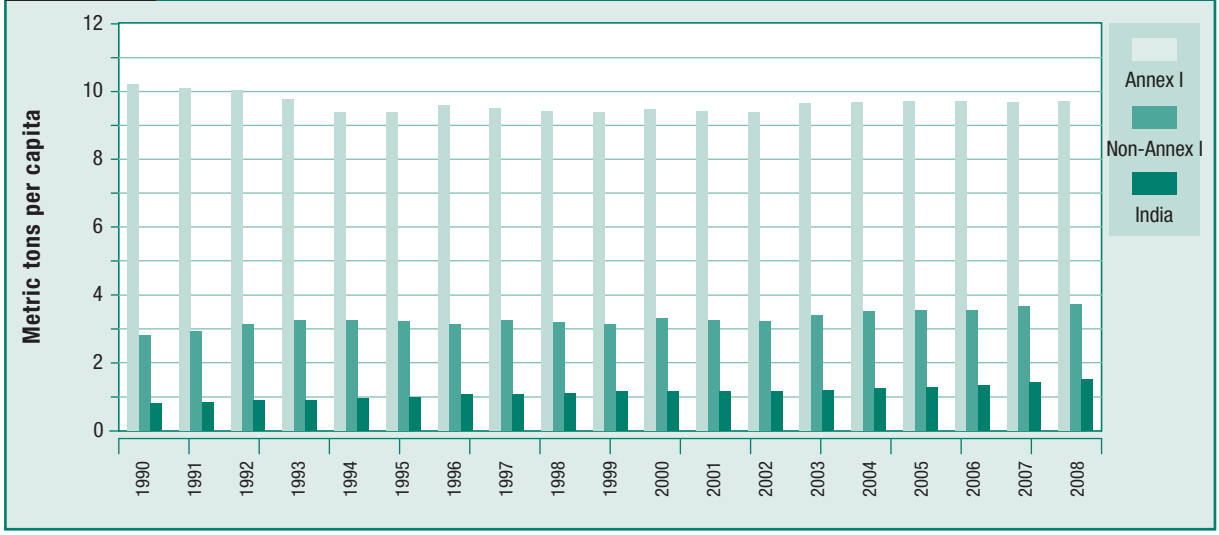
12.21 The Convention laid the groundwork for concerted international action, which in 1997 led to the adoption of the Kyoto Protocol containing a legally binding quantitative time-bound target for developed countries. The Kyoto Protocol set a target for developed countries (individually or jointly) to reduce overall emissions by an average of 5 per cent below 1990 levels in the first commitment period (2008-2012). Recognizing that relying on domestic measures alone to meet the target could be onerous, the Kyoto Protocol offers considerable flexibility through three mechanisms: Clean Development Mechanism (CDM), Joint Implementation (JI), and Emissions Trading (ET). Through the CDM, industrialized countries can finance mitigation projects in developing countries contributing to their sustainable development. Credits received from such projects can be used to meet commitments under the Kyoto Protocol. Through JI, industrialized countries acquire emissions credit by financially supporting projects in other industrialized countries. ET allows countries that expect their emissions to be above target to buy unused quotas from other countries. All major countries except the United States (US) have ratified the Kyoto Protocol.

Emission Analysis of Annex I Countries, Non-Annex I Countries, and India

12.22 The UNFCCC differentiates countries into Annex I and Non-Annex I. Though it does not explicitly identify developed countries as Annex I and developing as Non-Annex I, broadly in the climate change literature Annex I Parties means industrialized countries that have committed themselves to reducing GHG emissions. Non-Annex I Parties are developing countries as well as Least Developing Countries (LDCs) which do not have any obligation to reduce emissions. Under the Kyoto Protocol, 37 countries committed themselves to a reduction in GHG emissions, namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). At the negotiations, all Annex I Parties (including the United States) collectively agreed to reduce their greenhouse gas emissions by 5.2 per cent on average for the period 2008-2012. This reduction is relative to their annual emissions compared to 1990 levels. Since the US has not ratified the protocol, the collective emissions reduction of Annex I Kyoto countries falls from 5.2 per cent to 4.2 per cent below the base year.

12.23 Figure 12.3 shows a comparison of average CO_2 emission levels (in per capita terms) between Annex I, Non-Annex I, and India. For the years 1990-2008 we can see that collectively Annex I Parties had the highest average level of emissions at 10.2 CO_2 metric tons per capita in 1990, reaching at 9.7 CO_2 metric tons per capita in 2008. For Non- Annex I Parties the average emission levels were around 2.8 CO_2 metric tons per capita in 1990, which increased to increasing to 3.7 CO_2 metric tons per

Figure 12.3 Comparison of CO_2 emission levels for Annex I, Non-Annex I and India



capita in 2008. For India, the emission levels per capita have been one of the lowest ranging from 0.81 CO_2 metric tons per capita in 1990 to 1.52 CO_2 metric tons per capita in 2008.

Kyoto Targets and Demonstrable Progress by Annex I Countries

12.24 The first commitment period of the Kyoto Protocol is coming to an end in 2012. It is a good time to take stock of the progress of the Annex I countries in reaching their targets. Each Annex I Party has a specific emissions target, relative to its emissions of GHGs in its base year 1990 (inscribed in Annex B to the Kyoto Protocol). The Annex B emissions target and the Party's emissions of GHGs in the base year determine the Party's initial assigned amount for the Kyoto Protocol's five-year first commitment period (2008–2012). The quantity

Table 12.2 : Quantified Emission Limitation or Reduction Targets of Major Kyoto Parties (excluding EITs) and their Demonstrable Progress

S. No.	Party	1990 GHG emission (in Gg) excluding emissions/removals from land use, land-use change, and forestry	Quantified emission limitation or reduction commitment (percentage of base year or period)	2009 GHG emission levels in Gg CO_2 equivalent	Change from 1990 to 2009 (%)	Deviation from the Kyoto Target as in 2009 (%)
1.	Australia	418470	+8	545858	30.4	22.4
2.	Austria	78171	-8	80059	2.4	10.4
3.	Belgium	143344	-8	122440	-13.2	-5.2
4.	Canada	591262	-6	691834	17.0	23.0
5.	Denmark	69391	-8	62323	-10.2	-2.2
7.	Finland	70369	-8	66344	-5.7	2.3
8.	France	565987	-8	522403	-7.7	0.3
9.	Germany	1247901	-8	919698	-26.3	-18.3
10.	Greece	104565	-8	122724	17.4	25.4
11.	Iceland	3441	+10	4649	35.1	25.1
12.	Ireland	54820	-8	62395	13.8	21.8
13.	Italy	519157	-8	491120	-5.4	2.6
14.	Japan	1266553	-6	1209213	-4.5	1.5
15.	Leichenstein	230	-8	247	7.8	15.8
16.	Luxembourg	12827	-8	11684	-8.9	-0.9
17.	Monaco	108	-8	91	-15.7	-7.7
18.	Netherlands	211852	-8	198872	-6.1	1.9
19.	New Zealand	59112	0	70564	19.4	19.4
20.	Norway	49767	+1	51292	3.1	2.1
21.	Portugal	59424	-8	74660	25.6	33.6
22.	Spain	283168	-8	367548	29.8	37.8
23.	Sweden	72536	-8	60069	-17.2	-9.2
24.	Switzerland	53122	-8	51949	-2.2	5.8
25.	United Kingdom of Great Britain and Northern Ireland	779387	-8	570066	-26.9	-18.9
26.	United States of America*	6166812	-7	6608227	7.2	14.2

Source **: UNFCCC.**

Notes **: *Country which has declared its intention not to ratify the Kyoto Protocol; Gg is gigagrams, EITs is Economies in Transition.**

of the initial assigned amount is denominated in individual units, called Assigned Amount Units (AAUs), each of which represents an allowance to emit one metric ton of CO_2 equivalent (t CO_2 eq.). Table12.2 shows the quantified emission limitation or reduction targets as contained in Annex B to the Kyoto Protocol along with the demonstrable progress showed by the Annex I countries (excluding Economies in Transition).

12.25 If the emission data of 2009 is any indication, it can be seen that except a few, many Parties may miss even the modest Kyoto target for the first commitment period. The emissions of many Parties have actually gone up compared to 1990 levels, which is a very bad news for the global climate. For example Canada, which has a target reduction of 6 per cent, has actually increased emissions by 17 per cent in 2009, which means a deviation of 23 per cent from the Kyoto Target. Hence, in spite of the commitment by the developed world to reduce emissions so that developing countries get their fair share of carbon space to grow, it has actually increased its emissions during the period 1990-2009. Developing countries (Eg. Brazil, China, India & Mexico) that have undertaken efforts for reasons other than climate change have reduced their emissions growth over the past three decades by approxmately 500 million tons CO_2 per year, that is more than the reductions required from Annex I countries by the Kyoto Protocol. (Contribution of working Group III to IPCC AR4).

A Look at Small Island Developing Nations (SIDS), Least Developed Countries (LDCs), India, and Others

12.26 From the view of climate change negotiations at the UNFCCC and also in other international forums, countries often unite themselves into groups or regional bodies to represent their mutual interests and to establish common negotiating positions. With differing interests and issues faced by different countries, these groups often play a catalytic role in the dynamics of the negotiations. Hence certain Non-Annex I countries form coalitions and line behind some positions which may be unacceptable to other developing country groups. The Durban negotiations also demonstrated these dynamics and pressures. SIDS and LDCs are two country groups that are very proactive in the climate change negotiations

Table 12.3 : Comparisons of SIDS, LDCs and Other Countries of the World (for the year 2007)[1]

Country name/Regions/ Groups	GDP per capita, PPP (current international $)	CO_2 emissions (metric tons per capita)	GDP per unit of energy use (constant 2005 PPP $ per kg of oil equivalent)	Electric power consumption (kWh per capita)
East Asia & Pacific	8116	4.85	4.74	2642
Europe & Central Asia	23069	7.89	6.26	5558
European Union	30710	8.01	8.02	6391
High income: non OECD	32610	14.31	5.55	8450
Middle East & North Africa	9621	5.42	4.59	2292
North America	45608	18.31	5.50	13955
OECD members	32998	10.73	6.72	8397
South Asia	2618	1.21	5.10	507
Sub-Saharan Africa	2054	0.85	3.21	553
India	2854	1.43	5.06	563
Least developed countries	1271	0.24	3.91	149
SIDS avg	10307	3.95	10.99	N.A
World	10276	4.74	5.42	2851

Source **: World Bank Data (data.worldbank.org/indicator).**

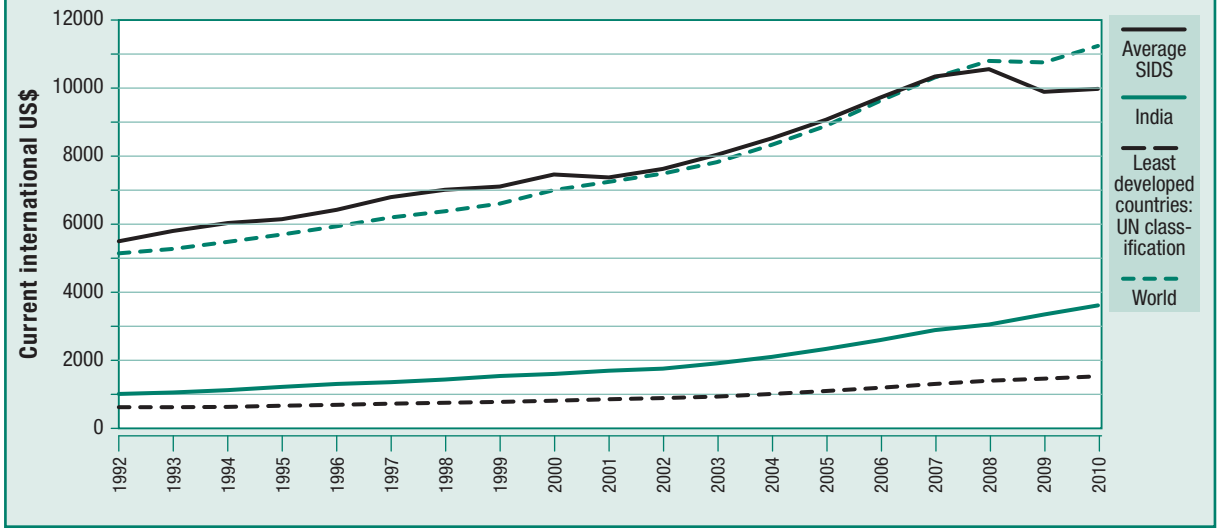
since they are considered most susceptible to climate change threats. SIDS consists of small islands and low lying coastal countries that share similar sustainable development challenges related to climate change. The majority of SIDS countries are also members of the Association of Small Island States (AOSIS) and 12 are listed as LDCs as well. The 50 countries defined as LDCs by the United Nations (UN) regularly work together in the UN system. They have become increasingly active in the climate change process, usually working together to defend their particular interests. Often in the negotiations, India's position on its vulnerability has not received due attention and coverage. India is highly vulnerable to adverse impacts of climate change with its long coast-line, large number of islands, dependence on primary sectors for livelihood, etc. Since India along with SIDS and LDCs is vulnerable to climate change impacts and is likely to suffer from it, so it would be a good idea to see how these countries have fared against other regions of the world, on the basis of the indicators such as GDP, CO_2 emissions, and energy consumption (Table12.3).

12.27 When we compare the per capita GDP of India and SIDS against that of the world, collectively SIDS members have a better showing with their GDP being closer to the world average. India's per capita GDP, on the other hand, is very low. Figures 12.4 and 12.5 clearly show that India and the LDCs have had lower per capita GDP as well as smaller per capita emissions than SIDS.

Figure 12.4 **CO_2 Emissions for SIDS, LDCs, India and world** [1]



Figure 12.5 **GDP per capita for SIDS, LDCs, India and world in PPP terms** [1]



Source **: World Bank data (data.worldbank.org/indicator).**

[1]Average SIDS in the case of per capita CO_2 emissions and per capita GDP represent data of 33 SIDS states out of the total of 52 and in the case of GDP per unit of energy use the average represents 31 SIDS states due to the limited data available.

Current State of Negotiations

12.28 The Conference of Parties (COP), which is the supreme body of the Convention, meets annually and reviews the implementation of the Convention. During the COP 13 held at Bali, Indonesia, in December 2007, a comprehensive process called the Bali Action Plan (BAP) to enable full, effective, and sustained implementation of the Convention through Long Term Cooperative Action, now, up to, and beyond 2012 was launched. The negotiations held at Cancún in December 2010 did result in a set of decisions that covered various areas of action: mitigation, adaptation, technology, and finance as outlined in the BAP. However, the Cancún agreements were widely perceived as a modest step forward and a reaffirmation of faith in the multilateral process.

12.29 The recently held Durban Climate Change Conference from 28 November to 10 December 2011 (COP 17) marks an important step forward in the climate change negotiations (Box 12.6). The Durban outcomes made significant contribution towards fulfilment of the Bali Road Map as they established the second commitment period of the Kyoto Protocol and operationalized some of the key Cancún agreements related to Green Climate Fund (GCF), Technology Mechanism (TM), and Adaptation Framework. The Durban outcomes also opened a window for discussions on the post 2020 arrangements for the global climate change regime for which a Durban Platform has been launched. Though India and other developing countries came under tremendous pressure at Durban, India took lead in ensuring that the new arrangements are firmly anchored in the Convention and are based on the principles of 'common but differentiated responsibilities' and 'equity'. The faith that the Parties had reaffirmed in a consensus-based multilateral regime for climate change deliberations in Cancún was reinforced in Durban. Unlike the Cancún agreements, which were adopted despite explicit rejection by Bolivia, the Durban outcomes were adopted unanimously. Durban has re-established the primacy of the UNFCCC negotiations as the multilateral forum for reaching decisions on climate change-related issues.

Box 12.6 : Key Durban Outcomes

- The most significant achievement of the Durban Conference was to establish a second commitment period of the Kyoto Protocol, which will begin on January 1, 2013 and end either on December 2017 or December 2020. The quantified emission limitation and reduction objectives (QELROs) for developed country Kyoto Protocol Parties will be determined during 2012.
- Durban also made significant progress in operationalization of Cancún agreements related to GCF and the Adaptation Framework. It was decided to confer legal personality and legal capacity to GCF and that the Fund will function under the guidance of COP. It was also decided to expeditiously operationalize the Fund for which Global Environment Facility (GEF) and the UNFCCC Secretariat have been asked to set up an interim Secretariat to support the GCF Board
- Significant progress was made towards operationalization of the Technology Mechanism and its components viz. Climate Technology Centre and Network (CTCN) and Technology Executive Committee (TEC), established at Cancun.
- The transparency arrangements agreed in Cancún were elaborated in Durban and the reporting guidelines for developed countries viz. Biennial Reports (BRs) and the developing countries viz. Biennial Update Reports (BURs) were adopted. It was ensured that the reporting and Measurable, Reportable and Verifiable (MRV) obligations for the developing countries are not more onerous than the developed country parties.
- A significant outcome in Durban was to launch a Durban Platform to discuss the post 2020 arrangements for global climate change regime. It was decided that the post 2020 arrangements would be finalized by 2015 and implemented from 2020. India played a crucial role in ensuring that the new arrangements are not limited to either a Protocol or a legal instrument but also include an option of 'an agreed outcome with a legal force under the Convention'. Thus it was ensured that the outcome of negotiations to finalize the post 2020 arrangements is firmly rooted in the Convention and all its established principles including CBDR and Equity apply. A web-based registry was also agreed upon to be set up under the management of the UNFCCC Secretariat to serve as a platform for the developing countries to upload their Nationally Appropriate Mitigation Actions (NAMAs) for seeking international support or recognition of achievement of voluntary mitigation goals.
- Progress was made in Durban on issues relating to Reducing Emissions from Deforestation and Degradation and Sustainable Management of Forests (REDD+) with an agreement on guidance on systems for providing information about how safeguards are being addressed and respected and there was also agreement on modalities for forest reference emission levels and forest reference levels.

Critical Issues in the Negotiations

12.30 While the climate change conferences in Cancún and Durban have attempted to address in some measure some of the issues relating to the Bali Road Map, several critical issues have remained unresolved. The issues relating to equity, trade and technology–related intellectual property rights (IPRs) are significant in this context and their early resolution is important for the sustenance of an effective and cooperative climate change regime. In the wake of launch of a new process under Durban Platform, it is even more important that the unresolved issues are addressed upfront in the negotiations for enhancing global actions against climate change.

12.31 The principles of equity and CBDR are fundamental to any regime for addressing climate change. Considering the fact that it was agreed in Cancún to ensure "equitable access to sustainable development" while working towards a global goal of climate stabilization, the principle of equity needs to be properly articulated in the negotiations so as to fully protect the interests of developing countries. The post 2020 arrangements to be evolved under the Durban Platform have to be anchored in the principles of equity and CBDR.

12.32 The UNFCCC provides that the countries should promote open and supportive international trading regime while taking actions to address climate change and should not take any arbitrary actions. This issue is gaining importance in view of the current global tendencies to erect protectionists' barriers and use measures aimed at advancing and protecting trade interests in the name of climate change. Proposed sectoral measures like inclusion of civil aviation emissions in its emission trading scheme by European Union (EU) imposed unilaterally fall in such category. The multilateral framework for addressing climate change does not allow such unilateral and sectoral actions at the global level unless the principle of CBDR is squarely met. In the ensuing negotiations, it is important to ensure that trade issues are not mixed with environmental issues and to prohibit unilateral measures to address climate change taken in disregard of the principles of the UNFCCC.

12.33 BAP recognizes that development and transfer of climate friendly technologies is critical to enhancing developing country actions. Hence, BAP urges countries to take urgent actions to "accelerate deployment, diffusion and transfer of affordable environmental technologies". While a Technology Mechanism and Networks of Climate Technology Centers have been set up under the Cancun decisions, the critical issues relating to transfer of technologies and their IPRs have not yet been addressed. The institutional interventions agreed so far will at best help build capacity for deployment of existing technologies. They will not help in making technologies available on an affordable basis and facilitating their faster uptake. In the absence of a facilitative IPRs regime for such technologies, the objective of advancing nationally appropriate mitigation and adaptation actions at the scale and speed warranted by the Convention will not be achievable. The negotiations in future have to address this issue effectively and evolve an appropriate model for facilitating the development and access to such technologies.

India And Climate Change

India and GHGs

12.34 Although India ranks among top five countries in terms of GHG emissions, its per capita emissions are much lower than those of the developed countries even if historical emissions are excluded. Its high level of emissions is due to its large population, geographical size, and economy. The most recent data available for India come from the assessment carried out by the Indian Network for Climate Change Assessment (INCCA) in May 2010. The key results of the assessment are that total net GHG emissions from India in 2007 were 1727.71 million tons of CO_2 equivalent (eq.), of which CO_2 emissions were 1221.76 million tons, CH_4-20.56 million tons, and N_2O-0.24 million tons. In 1994, the total net GHG emissions for India were 1228.54 million tons of CO_2 eq. This represents a compounded annual growth rate (CAGR) of 2.9 per cent during the period 1994 to 2007 (Table 12.4). GHG emissions from the energy, industry, agriculture, and waste sectors in 2007 constituted 58 per cent, 22 per cent, 17 per cent, and 3 per cent of net CO_2 eq. emissions respectively. India's per capita CO_2 eq. emissions including land use, land use change, and forestry (LULUCF) were 1.5 tons per capita in 2007.

Climate Change Threats and Vulnerabilities for India

12.35 Climate change has enormous implications for the natural resources and livelihoods of the

Table 12.4 : A Comparison of GHG Emissions by Sector between 1994 and 2007

(in million tons of CO_2 equivalent)

	1994	2007	CAGR (per cent)
Electricity	355.03 (28.4)	719.30 (37.8)	5.6
Transport	80.28 (6.4)	142.04 (7.5)	4.5
Residential	78.89 (6.3)	137.84 (7.2)	4.4
Other Energy	78.93 (6.3)	100.87 (5.3)	1.9
Cement	60.87 (4.9)	129.92 (6.8)	6.0
Iron & Steel	90.53 (7.2)	117.32 (6.2)	2.0
Other Industry	125.41 (10.0)	165.31 (8.7)	2.2
Agriculture	344.48 (27.6)	334.41 (17.6)	-0.2
Waste	23.23 (1.9)	57.73 (3.0)	7.3
Total without LULUCF	1251.95	1904.73	3.3
LULUCF	14.29	-177.03	
Total with LULUCF	**1228.54**	**1727.71**	**2.9**

Note **: Figures in brackets indicate percentage emissions from each sector with respect to total GHG emissions without LULUCF in 1994 and 2007 respectively.**

people. It will have wide-ranging effects on the environmental and socio-economic and related sectors. Various studies indicate that the key sectors in India such as the agriculture, water, natural ecosystem, biodiversity, and health are vulnerable to climate change. This is happening precisely at a time when it is confronted with huge development imperatives. The INCCA report warns of impacts such as sea-level rise, increase in cyclonic intensity, reduced crop yield in rain-fed crops, stress on livestock, reduction in milk productivity, increased flooding, and spread of malaria. These changes are likely to increase the pressure on Indian agriculture, in addition to existing stresses of yield stagnation, land use, and competition for land, water and other resources. Any uncertainty in agriculture can considerably affect the food systems and thus increase the vulnerability of a large section of the resource-poor population. This calls for urgency of action in reducing vulnerability to adverse impacts of climate change and enhancing adaptive capacity through sector-specific interventions and efforts.

12.36 The food and nutritional security of India currently depends to a great extent on the production of wheat and rice which together constitute around 75 per cent of total food grain production. Simulation models suggest that in the absence of adaptation and fertilizer benefits, a 1°C increase in temperature alone could lead to a 6 million tonnes drop in wheat production. Production of milk, which is increasingly becoming an important item in the food basket, may also be adversely affected by the increased heat stress associated with global climate change to dairy animals. Reduced water availability, owing to glacier retreat and decreased rainfall, and a growing population will increase water stress. India's forests are likely to experience a shift in forest type, adversely impacting associated biodiversity and regional climate dynamics as well as livelihoods based on forest products. Health is also likely to be adversely affected by climate change. Heat stress, vector-borne diseases, water contamination are some of the projected health impacts of climate change. For example, similar to other tropical countries, India is predicted to have increased susceptibility to vector-borne diseases such as malaria which is also projected to move to higher latitudes and altitudes.

India's Voluntary Actions

12.37 India has already taken a number of actions on voluntary basis with own resources in pursuance of a sustainable development strategy. As per India's GHG Emissions Profile: Results of Five Climate Modelling Studies, a report published in 2009, India's per capita GHG emissions in 2030-31 would be between 2.77 tons and 5.00 tons of CO_2 eq. Four of the five studies estimated that even in 2031, India's per capita GHG emissions would stay under 4 tons of CO_2 eq. which is lower than the global per capita emissions of 4.22 tons of CO_2 eq. in 2005. This means that even two decades from now, India's per capita GHG emissions would be well below the global average of 25 years earlier.

12.38 Important measures taken by India are as follows:

(i) India has adopted the National Action Plan on Climate Change (NAPCC) in 2008 which has both mitigation and adaptation measures. The eight National Missions which form the core of the NAPCC represent multi-prolonged, long-term, and integrated strategies for achieving key goals in the context of climate change. Adaptation is the focus of the NAPCC. At the same time, Missions on Solar Energy and Energy Efficiency are geared to mitigation. Objectives in brief and cost estimates are given in the later sections (see Table 12.5).

(ii) India has announced a domestic goal of reducing the emission intensity of its GDP

by 20-25 per cent of the 2005 level by 2020. This will be achieved through a multi-sector low carbon development strategy. It is intended that lower carbon sustainable growth be a central element of our Twelfth Five Year Plan.

(iii) Apart from the NAPCC, all the states have also been asked to prepare state-level action plans. These plans are envisioned as extensions of the NAPCC at various levels of governance, aligned with the eight National Missions. Some states like Delhi and Gujarat and some Himalayan states have already taken the lead and been proactive in addressing climate change. Delhi launched a climate change action plan for 2009-2012 formulated on the lines of the NAPCC.

12.39 The major policies and actions for climate change mitigation and adaptation cut across different sectors and areas of the economy. The initiatives in some of the major areas are as follows.

i) Energy Efficiency

The National Mission for Enhanced Energy Efficiency (NMEEE) is the key focus for government action for energy efficiency. The NMEEE is divided into four components: (a) Perform, Achieve and Trade (PAT), a scheme for trading in energy efficiency certificates that will cover about 700 industrial units and achieve a saving of almost 17,000 MWs of energy by 2017. This scheme is mandatory for all large industrial units and facilities in thermal power, aluminum, cement, fertilizers, chlor-alkali, steel, paper and pulp, and textiles, (b) Energy Efficiency Financing platform, (c) Market Transformation for Energy Efficiency, (d) Framework for Energy Efficient Economic Development. The NMEEE, by 2014-15, is likely to achieve about 23 million tonnes oil-equivalent of fuel savings in coal, gas, and petroleum products, along with an expected avoided capacity addition of over 19,000 MW. The CO_2 emission reduction is estimated to be 98.55 million tons annually. The NMEEE is not the first and only effort by the government to tackle energy efficiency. The Energy Conservation Act (2001) empowers the government to prescribe and ensure compliance with standards and norms for energy consumers and prescribe energy conservation building codes and energy audits. Apart from these, there are a range of programmes being implemented by the Bureau of Energy Efficiency (BEE) in key sectors of energy demand which have resulted in savings in avoided power capacity of 7665 MW during the first four years of the Eleventh Plan period.

(ii) Power Plants

For reducing emission intensity, 60 per cent of coal-based capacity addition in the Twelfth Plan and 100 per cent in the Thirteenth Plan shall be done by deploying super critical technology. Ultra super critical power plants operate at higher efficiency. The First ultra-supercritical power plant is expected in 2017. Large-scale adoption of this technology after a few years would further reduce the emission intensity of the Indian power sector. Also there are plans to retire old and inefficient coal-based power-generating units.

(iii) Renewable Energy

The Electricity Act 2003 together with the National Electricity Policy 2005 (NEP) and the Tariff Policy (TP) mandate promotion of electricity generation from renewable sources. The Electricity Act and these policies envisage regulatory interventions for promotion of renewable energy sources. The initiatives of the Central Electricity Regulatory Commission (CERC) range from determination of preferential tariff for renewable energy and creating a facilitative framework of grid connectivity through the Indian Electricity Grid Code to developing market-based instruments like Renewable Energy Certificate (REC). The REC mechanism is seen as a major initiative towards promoting renewable energy and encouraging competition in this segment. It addresses the twin objectives of harnessing renewable energy sources in areas with high potential and compliance with Renewable Purchase Obligation (RPO) by resource-deficit states. This important framework was formally launched in November 2010, heralding a new era in the development of green energy in India.

(iv) Nuclear Energy

India recognizes the importance of nuclear energy as a sustainable energy source. In this regard a three-stage nuclear power programme has also been chalked out. India's present nuclear installed capacity is 4780 MW and there are plans to install nuclear generation capacity of 20000 MW by 2020.

(v) Transport

India has taken substantial initiatives to make the transport sector less emission intensive. One of the major initiatives has been upgradation of vehicular emission norms such as Bharat Stage II, Bharat Stage III and Bharat Stage IV. The commercial

manufacture of battery-operated vehicles has begun in India with a view to promoting low/ no carbon emitting vehicles. Also in Delhi there has been a large-scale switchover from petrol and diesel to CNG, with over 50,000 vehicles already converted. In addition to this Integrated Transport Policy (2001) promotes the use of ethanol-blended petrol and bio-diesel. The National Urban Transport Policy emphasizes the development and usage of extensive public transport facilities (including non-motorized modes) over personal vehicles.

(vi) Agriculture and Forestry

One of the major policy initiatives under this head is India's National Mission for Sustainable Agriculture. Apart from this, there are also programmes for crop improvement and drought proofing. India is among the few countries where forest cover has actually increased over the past two decades. It has taken strong measures to conserve forests. India has launched an ambitious Green India Mission to increase the quality and quantity of forest cover in 10 million ha of land. Also an incentive-based additional special grant of US$ 1.2 billion had been announced by the central government to all states for sustainable forestry management. Other policies and programmes in the forestry sector include the National Forest Policy (1988), Participatory Forest Management/Joint Forest Management Programme, National Afforestation Programme, National Forestry Action Programme, and National Watershed Development Project for Rainfed Areas.

(vii) Marine and Coastal Environment

Ensuring stability in the coastal environment in India becomes imperative considering its densely inhabited, long coastline of more than 7500 km. Some of the major initiatives taken in this area are Coastal Ocean Monitoring and Prediction Systems (COMAPS),Land Ocean Interactions in the Coastal Zone (LOICZ),Integrated Coastal and Marine Area Management (ICMAM), and Society of Integrated Coastal Management (SICOM).

(viii) Initiatives for Enhancing Knowledge and Scientific Findings

Apart from the National Mission on Strategic Knowledge for Climate Change, India has established the INCCA which will carry out scientific studies of various aspects of climate change. The INCCA has recently carried out a 4x4 assessment of climate change in India covering four major sectors in four ecological regions of the country and an updated inventory of the GHG emissions for the year 2007.

(ix) Enhancing Adaptive Capacity

India's strategy for enhancing its adaptive capacity to climate variability is reflected in many of its social and economic development programmes. For developing countries like India, adaptation ultimately boils down to assisting the vulnerable population during exigencies and empowering them to build their lives and cope with uncertainties in the long run. Several of India's social-sector schemes, with their emphasis on livelihood security and welfare of the weaker sections, aim to do just that. India implements a series of central sector and centrally sponsored schemes under different ministries/ departments aimed at achieving social and economic development. Many of these schemes contain elements (objectives and targets) that are decidedly geared to adaptation. In other words, there is substantial adaptation orientation in many of the sectoral schemes currently under operation. An exercise has been carried out to measure the expenditure on adaptation-related programmes with critical adaptation components: (a) crop improvement and research, (b) poverty alleviation and livelihood preservation, (c) drought proofing and flood control, (d) risk financing, (e) forest conservation, (f) health, and (g) rural education and infrastructure. It has been found that India's expenditure on these adaptation-oriented schemes has increased from 1.45 per cent of GDP in 2000-01 to 2.82 per cent during 2009-10 This is a fairly impressive level of spending and is an obvious reflection of the multiplicity of economic and social welfare programmes under implementation in India.

Climate Change Finance

12.40 Climate change is a complex policy issue with major implications in terms of finance. All actions to address climate change ultimately involve costs. Funding is vital in order for countries like India to design and implement adaptation and mitigation plans and projects. The problem is more severe for developing countries like India, which would be one of the hardest hit by climate change, given its need to finance development. Most countries do indeed treat climate change as a real threat and are striving to address it in a more comprehensive and integrated manner with the limited resources at their disposal. But financial ways and means must be found to enable developing countries to enhance their efforts in this direction, especially enhancing their adaptive capacity. Thus, climate change is both an environmental issue and an economic costs and development issue.

12.41 Lack of funding is a large impediment to implementing adaptation plans. The scale and magnitude of the financial support required by developing countries to enhance their domestic mitigation and adaptation actions are a matter of intense debate in the multilateral negotiations under the UNFCCC. The Convention squarely puts the responsibility for the provision of financial support on the developed countries taking into account their contribution to the stock of GHGs in the atmosphere (Box 12.7).

12.42 Countries like India that are on the path of development would need access to finance and technology if the world is to achieve emission standards in line with the stabilization and sustainable development goals. The funds that are currently available under the Convention and Kyoto Protocol are small compared to the magnitude of need assessed by many studies. The UNFCCC has estimated a requirement of US$ 200-210 billion in additional annual investment in 2030 to return GHG emissions to current levels. Further, additional investment needed worldwide for adaptation is estimated by the UNFCCC to be annually US$ 60-182 billion in 2030, inclusive of an expenditure of US$ 28-67 billion in developing countries. As various estimates point to the enormity of funds needed for meeting the long-term finance requirements for adaptation and mitigation, developing countries including India have been arguing that a global mechanism for generating and accounting for additional resources, mainly from public sources, is essential. There should be a multilateral financial mechanism under the Convention that should be set up with resources provided by developed countries on the basis of assessed contributions.

12.43 Attempts are being made to design appropriate institutions and mechanisms for this purpose at global level. This is evident in the setting up of a GCF under the Convention, developed countries' announcement of US$ 30 billion as fast start funds, US$ 100 billion (to be mobilized) as long-term finance, etc. However, these attempts do not suffice to address the challenge. On the other hand, efforts are being made by some developed countries to shift the discussions on 'sources of long-term finance' to the G20 forum where the emphasis is on evolving new and innovative financial instruments involving both developed and developing countries. This idea is strongly resisted by many developing countries in the multilateral negotiations. The high-level panel appointed by the UN Secretary General in 2010 had attempted to address some of these issues but its recommendations which favour dependence on market-related instruments (not public funding) and private-sector resources have not found favour by many in the multilateral negotiations.

12.44 At Durban, a work programme on long-term finance has been launched, with the aim of

Box 12.7 : Some important articles on finance in the UNFCCC

Article 4.3: "The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures that are covered by paragraph 1 of this Article and that are agreed between a developing country Party and the international entity or entities referred to in Article 11, in accordance with that Article. The impliementation of these commitments shall take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties.''

Article 4.5: "The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties."

Article 4.7. "The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties."

Article 11.1."A mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology, is hereby defined. It shall function under the guidance of and be accountable to the Conference of the Parties, which shall decide on its policies, programme priorities and eligibility criteria related to this Convention. Its operation shall be entrusted to one or more existing international entities."

contributing to the ongoing efforts to scale up mobilization of climate change finance after 2012 and analyse options for the mobilization of resources from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources. The work programme will draw upon relevant reports including that of the High-level Advisory Group on Climate Financing and the report on mobilizing climate finance for the G20 and the assessment criteria in these reports.

12.45 As a responsible country, India is willing to take actions at domestic level in accordance with the policy of sustainable development and to the extent its capacities permit. A substantial portion of its GDP is already being spent on addressing vulnerability to climate variability and related adaptation. At domestic level, the assessment of financial requirements and provision of resources for meeting the needs of a low-carbon inclusive growth in the country are also under discussion in various inter-ministerial fora. The Prime Minister's Council on Climate Change assesses the financial cost of actions proposed in the National Missions. Further work is underway to evolve specific Nationally Appropriate Mitigation Actions (NAMAs), policies, and programmes and estimate the financial requirement and policy support needed to implement them. The Planning Commission has constituted a Working Group on climate change with a view to identifying the sectoral priorities for the Twelfth Five Year Plan and the modalities for their implementation. The Working Group will determine the scale of funding necessary for the NAMAs and other adaptation actions in order to reflect them in the sectoral strategy of the Twelfth Five Year Plan. In the light of resource scarcity; prioritization is required across the sectors.

12.46 A major part of the adaptation and mitigation needs of developing countries can be met by accessing international finance. The mobilization of the requisite amount of climate finance for the developing countries will be one of the biggest challenges in the times to come. Though alternative sources including the private sector can be explored to fill the gaps between the demand and supply of climate finance, public finance should be at the core to ensure predictability and reliability of flow of funds to the developing countries.

12.47 In the current scenario, India has two broad channels available for financing climate change*:* 1) *domestic sources* and 2) *international sources.*

Domestic Sources of Finance

12.48 Currently, India is mostly utilizing and relying on domestic sources of finance, which are budgetary allocations for various sectors and the National Clean Energy Fund (NCEF) fed by a cess on coal at ₹ 50 per ton introduced in 2010. The NCEF will finance innovative projects in clean energy technologies and harness renewable energy sources to reduce dependence on fossil fuels. From the Fund, allocation of ₹ 200 crore has already been proposed for environmental remediation programmes and another ₹ 200 crore for the Green India Mission. The cess will also help pay for schemes to protect and regenerate forests and clean up polluted sites. It is estimated that an amount of ₹ 10,000 crore will be generated by 2015 from the clean energy cess on coal. Other fiscal incentives by the government include exemption of some parts of hybrid vehicles from customs and imposition of a concessional 5 per cent rate of excise duty to increase their domestic production, lower customs duty on light emitting diodes (LEDs) and solar lanterns, and subsidies to renewable energy projects. The NAPCC outlines a number of steps to be taken in critical sectors along with financial outlays (Table12.5). State Action Plans which are on the anvil also estimated costs which are significant by any standard for implementation of its various missions. For example, a rough and ready estimate puts the resource requirement at ₹17,000 crore over a period of five years for the state of Odisha.

International Sources of Finance

12.49 Given the magnitude of the task and the requirement of funds, domestic finances are likely to fall short of the current and projected needs. Global funding through the multilateral mechanism of the Convention will enhance domestic capacity to finance climate-related efforts. To facilitate financial support, the Convention established a financial mechanism to provide funds to developing country Parties. Currently, GEF which is an operating entity of the financial mechanism of the Convention provides grants to developing countries for projects that benefit the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods. With the COP finalizing the design of the GCF at the recent Durban conference after protracted negotiations, it is expected that the GCF will be the main channel of finances to address climate change needs in the developing countries in the future. There

Table 12.5 : Objectives and Financial Outlays under the Eight Missions:

Sl. No.	Name of the mission/ nodal agency	Salient features and status of the National Missions
1	National Solar Mission	Seeks to deploy 20,000 MW of solar electricity capacity in the country by 2020. The first phase (2010-12) is currently underway during which 1000 MW is planned to be installed. The total financial outlay during Phase 1 is estimated as ₹ 4337 crore. The requirement for Phase 2 will be assessed after review of implementation of Phase 1.
2	National Mission for Enhanced Energy Efficiency	Creates new institutional mechanisms to enable the development and Energy Efficiency strengthening of energy efficiency markets. Various programmes have been initiated, including the PAT mechanism to promote efficiency in large industries, and the Super-Efficient Equipment Programme (SEEP) to accelerate the introduction of deployment of super-efficient appliances. The total requirement projected under the Mission between 2010 and 2012 is ₹ 425.35 crore. This is intended to attract private-sector investment in the energy efficiency market.
3	National Mission on Sustainable Habitat	Promotes the introduction of sustainable transport, energy-efficient buildings, Sustainable Habitat and sustainable waste management in cities. The total cost projected in the Mission Document is ₹ 1000 crore.
4	National Water Mission	Promotes the integrated management of water resources and increase of Mission water use efficiency by 20 per cent As per the Mission Document, the total estimated additional fund required for implementing the Mission is ₹ 89,101crore during the Eleventh and the Twelfth Five Year Plan periods. This includes expenditure on schemes implemented through the State Plans and Central Plan.
5	National Mission for Sustaining the Himalayan Eco System	Establishes an observational and monitoring network for the Himalayan the Himalayan Ecosystem environment so as to assess climate impacts on the Himalayan glaciers and promote community-based management of these ecosystems For implementing the Mission activities, a total fund of ₹ 195 crore is required in the Eleventh Plan period. A total budget outlay of ₹ 1100 crore would be required in the Twelfth Plan period for initiating some broad Mission activities.
6	National Mission for Green India	Seeks to afforest an additional 10 million hectare of forest lands, wastelands and community lands. An expenditure of ₹ 46,000 crore is projected under the Mission for coverage of 10 million ha over the next 10 years.
7	National Mission for Sustainable Agriculture	Focuses on enhancing productivity and resilience of agriculture so as to reduce vulnerability to extremes of weather, long dry spells, flooding, and variable moisture availability. The proposed adaptation and mitigation activities under the Mission require an additional budgetary support of ₹ 1,08,000 crore out of which ₹ 91,800 crore will be required during the Twelfth Plan period.
8	National Mission on Strategic Knowledge for Climate Change	Identifies challenges arising from climate change, promotes the development Knowledge on Climate Change and diffusion of knowledge on responses to these challenges in the areas of health, demography, migration, and livelihood of coastal communities. Additional funds of ₹ 150 crore are required in the Eleventh Plan period for implementing the Mission activities. Provision of ₹ 1050 crore is required under the Twelfth plan period for achieving Mission/sub-Mission programme initiatives.

are specific funds established under the multilateral climate change regime (Box 12.8). There are also funds administered by the World Bank, Asian Development Bank, African Development Bank, etc. with clear climate change components.

Fast Start Finance and Long-Term Finance

12.50 During COP15 in Copenhagen in 2009, the developed countries pledged to provide new and additional resources approaching US$ 30 billion for

Box 12.8 : Funds established under the multilateral climate change regime

Special Climate Change Fund (SCCF): This fund is managed by the GEF and finances projects relating to: adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry, and waste management; and economic diversification.

Least Developed Countries Fund (LDCF): The Least Developed Countries Fund (LDCF) supports a work programme to assist LDC's in the preparation and implementation of National Adaptation Programmes of Action (NAPA's). As of December 2011, LDCF had approved some US $217 million for projects and mobilized more than US $919 million in co-financing.

Adaptation Fund (AF): This fund was established under the Kyoto Protocol to finance concrete adaptation projects and programmes in developing country Parties to the Protocol. The Adaptation Fund is financed from the 2 per cent share of proceeds on the clean development mechanism project activities and other sources of funding. The Adaptation Fund is supervised and managed by the Adaptation Fund Board (AFB). The most important characteristics of this Fund are that Parties have direct access which has led to increased country ownership over adaptation projects.

Green Climate Fund (GCF): At COP 17 held in Durban, South Africa, the COP established a Green Climate Fund (GCF) under the Convention to support projects, programmes, policies and other activities in developing nations. The Fund will start operating from 2013 where developed nations will provide the fund. Long term finance of $100 billion by 2020 has been decided by the nations and the GCF is expected to manage significant part of this. GCF is expected to be one of the most important sources of international finance. The important distinction of GCF is that it has an independent legal status and personality and nationally designated authorities have a paramount role to play. This has been achieved after many rounds of different negotiations.

Source : **UNFCCC**

the period 2010-12 with balanced allocation between mitigation and adaptation. The COP 16 in Cancún in December 2010 took note of this collective commitment by developed country Parties and reaffirmed that funding for adaptation will be prioritized for the most vulnerable developing countries, such as the LDCs, SIDS, and Africa. While the debate on climate finance continues, actual flow of money has been insignificant. According to Climate Funds Update, only about US$ 2.7 billion of the US$ 30 billion pledged, has so far been disbursed by the major climate funds to developing countries. However this includes only public source funding through multilateral channels.

12.51 Long-term finance is an issue that is very much part of the ongoing negotiations. The Cancún Agreements recognized the commitment of developed country Parties to a goal of jointly mobilizing US$ 100 billion per year by 2020 to address the needs of developing countries from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources. At the Durban conference, these issues were further deliberated upon. COP 17 decided to undertake a work programme on long-term finance in 2012 to make progress on this issue. Another point of concern is that various innovative sources of finance, for example aviation tax, being deliberated upon may have incidence on developing countries (Box 12.9). Hence the multilateral negotiations must ensure that incidence (of innovative sources of financing) should not fall on developing countries which is in violation of the principle of CBDR.

Private Finance Sources and CDM

12.52 Along with the provision of finance from the public sector, private finance could also be used to support various adaptation and mitigation projects. Funds could be directed towards climate proofing infrastructure and distribution and innovation of goods and services that reduce the vulnerability of individuals and communities towards climate change risks. Capital Markets can be utilized for channelling funds towards climate investment projects. Public-private partnerships and micro-financing schemes can be used in scaling up climate investment to service low income communities in developing countries along with the provision of insurance for healthcare and natural disaster risks associated with climate change.

12.53 However what is to be kept in mind is that the private sector driven by returns and profits could only play a supplementary role contributing mainly in mitigation projects; adaptation will and should be the responsibility of the public sector. Increasing awareness among the investor community and financial institutions towards climate change needs is essential along with the use of public finance to help re-direct private finance flows towards sustainable projects and investments contributing

Box 12.9 : A Note on the Advisory Group on Climate Change Finance (AGF) Report

The Secretary-General of the United Nations established the High Level AGF in February 2010 to identify sources of finance to generate the US $100 billion target to be raised by the developed countries. The advisory group has identified various sources and instruments under four broad heads which can help raise the required funds. This is based on the assumption of a certain minimum price of carbon ranging from US$10 to US$ 20-25 and US$ 50 per ton. The report emphasizes that a medium price scenario of US$ 20-25 per ton of carbon would be a key element in reaching the goal of US$ 100 billion per year. Following are the estimates provided based on a medium price scenario.

Primary sources	Instruments	US$ in bn (net)	US$ in bn (gross)	Remarks
1. Public sources	Auction of emission allowance	8-38		2-10% of the market
	Offset levies (levy of 2-10%)	1-5		
	Global international aviation and shipping tax	6-12		25-50% of total
	Carbon-related revenues	28-33		
	i) Carbon tax of US$ 1/t CO_2 equivalent 10			
	ii) Wire charges: at US$ 0.0004/ KWH or US$ 1/t of CO_2 equivalent 5			
	iii) Reduction of fossil fuel subsidies 3-8			
	iv) Redirection of fossil royalties 10			
	Financial Transaction Tax (rate between 0.001-.01 per cent)	2-27		25-50% of the total
	Direct Budget Contributions (Developed countries)	NA		
2. Private sector flows		20-24	200	
3. Carbon markets offsets		8-14	38-50	
4. Development Banks Instruments		11		For every US$10 bn in paid up capital, US$ 30-40 billion in gross flows could be generated
Total		**84-164**		

The AGF report is silent on many important issues of UNFCCC obligation. It does not indicate whether the developed country obligations should be met through assessed contributions or some other formula. An appropriate design for generation of revenues from each of the recommended sources is not spelt out clearly. The AGF recommendations are not designed to fit within the requirements that the finance to be mobilized should be entirely public or even channelled through a special multilateral institution acceptable to UNFCCC. Also one of the key issues that is not satisfactorily addressed is whether the target of US$ 100 billion per annum is to be viewed as the grant equivalent of all flows or the sum of the gross values of all flows.

The AGF does make an attempt to bring out a range of innovative sources and instruments for financing climate change and gives estimates of revenue potential excluding any likely primary incidence on developing countries. However, there still may be some secondary effects which the developing countries might have to face, for example deadweight losses or distributional impacts (international transportation and financial transaction tax). For example prices of imports may go up because of increase in transportation costs for some of the instruments. Therefore ensuring no net incidence for developing countries requires careful consideration of the real incidence of these charges—who is it that suffers a consequent loss of real income. A mechanism for refund of the revenues collected from developing countries will be needed and cannot be treated as climate change finance flow. With regard to instruments like carbon offsets and carbon export tax, the former violates the principle of the Convention as its incidence falls on developing countries and the latter should not qualify as a source of revenue if it leads to double counting of emissions.

Box 12.10 : India and CDM

As on 31 December 2011, 776 out of a total of 3797 projects registered by the CDM Executive Board are from India, which so far is the second highest for any country in the world. China leads with 1790 registered projects and Brazil has 200 projects registered. Also, as on 31 December 2011, the National CDM Authority (NCDMA) has accorded host country approval to 2160 projects facilitating an investment of more than ₹ 364,034 crore. These projects are in the sectors of energy efficiency, fuel switching, industrial processes, municipal solid waste, renewable energy, and forestry. If all these projects get registered by the CDM Executive Board, they have the potential of generating 711 million certified emission reductions (CERs) by the year 2012. At a conservative price of US$ 10 per CER, it adds up to an overall inflow of approximately US$ 7.11 billion in the country by the year 2012 if all the projects get registered. As on date CERs issued to Indian projects are 124 million.

Delhi Metro Rail Corporation (DMRC): World's first rail network to be registered under the CDM scheme:

The DMRC is the world's first rail network to be registered at the UNFCCC under the CDM scheme. The DMRC has registered two projects till date, namely: a) Emission Reduction by Low GHG Emitting Vehicles (also called Regenerative Braking project) registered on 29.12.2007 and b) Metro Delhi, India (also called Modal Shift Project) registered on 30 June 2011. It is expected that around an average 41,160 CERs per annum for next 10 years will be generated from Regenerative Braking Project and around an average of 5, 29,043 CERs per annum for next 7 years will be generated from the Modal Shift project.

in combating climate change. The key task for the decision-makers is to provide the right policy-incentives to help leverage private finance and also ensure that the private flows are in line with the national development objectives.

12.54 India has been a significant contributor and beneficiary of CDM under the Kyoto Protocol (Box 12.10).

Challenges and Outlook

12.55 Sustainable development is a difficult balancing act in countries with low incomes. Society has to simultaneously accomplish three things with trade-offs: improve economic well-being with social justice for the present generation, yet manage with more restrained use of land, air, forest, energy, and water resources, and protect future generations. The choices are more difficult in developing countries because they affect people's livelihoods. Such a 'stewardship' to succeed therefore needs to respond to people's needs, share information on choices and costs, and ensure participation and ownership.

12.56 India has done well on all such counts of stewardship over the past decades. Economic reforms since the 1980s have accelerated growth and incomes. Social well-being has improved broadly, as measured by gains in life expectancy. India has stepped up protection of its natural environment such as forests. Its particular development path has relied on fast-growing services–a low emissions-intensity path with accelerated literacy and education promising a better future. While India could have done even better, much has been accomplished. The reasons behind such progress are undoubtedly strong institutional underpinnings: democratic participation, constitutional protection of social justice, and a steady accretion of environmental laws and regulations, multiple actors, markets, and expanding government programmes and policies.

12.57 India will nevertheless need to save and spend even more to meet its objectives of economic well-being with environmental sustainability, while continuing to reduce its carbon intensity of growth. This is possible and doable. New institutional challenges are being posed by more intense pressures on land and agriculture, rapid urbanization, the quality of public services, public environmental health, and deteriorating air and water. Differential prices, incentives, regulations, and taxes will need to be supportive, especially on energy, to help shift to a more efficient and equitable development path. New non-carbon, renewable energy sources and technologies will be crucial, mostly led by the private sector. Social justice will require stepped-up public spending on energy access and other elements of the eight National Missions.

12.58 Turning to the global context, India has voluntarily endeavoured to reduce the energy intensity of its growth path by 2020. It is well on the way to accomplishing that goal. However, the global community needs to act on its commitment to equity and fair burden sharing: reducing the massive gaps in per capita emissions between rich and poor countries and enhanced financing for massive adaptation and mitigation efforts in developing countries---so that developed countries do not end using up all the carbon space at the cost of the developing world. The recent Durban Decisions have included a second round of country commitments to reduce GHGs and established a global GCF. Rapid implementation would help dispel the

widespread perception of wavering global commitment and wavering public financial support in North America, Japan and Europe, made worse by a difficult economic environment and threats of unilateral trade measures such as aviation and maritime taxes.

12.59 Though the Durban Conference has led to several positive outcomes, there are still some areas of concern in which further work will be needed to safeguard the interests of developing countries in future climate change deliberations.Some of the challenges and deliverables from India's point of view are: conversion of the targets of the second commitment period of the Kyoto Protocol into unconditional quantified emissions limitation and reduction objectives (QELROs); addressing issues such as proposed unilateral inclusion of the aviation sector in its domestic Emissions Trading Scheme by EU which applies to even non-EU airlines; and other issues which may arise if measures are used against the products and services of developing countries on grounds of climate change. Issues relating to equity and equitable access to global atmospheric resources will need to be addressed more adequately in order to resist pressure on India for an early emissions peak and legally binding agreement. The Protocol/Legal Instrument or an agreed outcome with legal force under the Convention that will be developed under the Durban Platform should respect the principles of CBDR and equity. Also we need to ensure that the Ad-hoc Working Group takes on board all unresolved issues particularly equity as these are integral to any new arrangements envisaged in the post 2020 era.The sources and channels of providing long-term finance by developed countries have not been clearly identified. It is necessary to expeditiously identify the sources of finance and provide initial capital to the GCF for its operations. Further, it is necessary to include the obligations of developed country Parties under the Convention to provide finance, technology, and capacity building as part of the new arrangements to be developed under the Durban Platform. Also the issues of mobilization and provision of necessary resources on a predictable basis and relationship of these mechanisms with the financial mechanism of the Convention remain to be addressed.It is important to continue to have a dialogue on the IPRs issue in the context of technology development and transfer. The Durban text is silent on the IPR issue.

12.60 Another challenge from India's perspective lies in preparing itself for enhanced actions on the transparency of its mitigation actions arising from the new regime of International Consultation and Analysis (ICA) and ensuring, in future negotiations, a space for equitable access of developing countries to atmospheric resources and guarantee against punitive actions embedded in the domestic legislation of developed countries. India will also need to institute necessary domestic mechanisms for effectively participating in and benefitting from the arrangements for advancing technology and forestry-related actions.

12.61 To sum up: climate change is a global phenomenon that we have to address in a spirit of cooperation taking into account the historical responsibilities and capabilities of countries. As a responsible and enlightened member of the international community, India showed flexibility along with other developing countries towards the success of the Durban Conference. At Durban, the world recognized India for its spirited defence of the interests of developing countries.India ensured that the objectives of social and economic development and poverty eradication will not be compromised in any way, whether upto 2020 or in the post 2020 arrangements that are to be negotiated and finalized by 2015. It is hoped that the developed countries will reciprocate the flexibility shown by India at Durban by addressing the concerns of developing countries on all outstanding issues. The negotiations should not prejudge the agreed outcomes. The legal nature of the outcomes under the Durban Platform shall be determined not by form but by their substance.

12.62 With the passage of time it has become hard to avoid a general sense of deep environmental vulnerability and insecurity. The direct fallout of this environmental decline will be borne by the poor and the already deprived. Therefore each action in this context must be seen from the perspective of the most underprivileged. The entire global community has to work towards this issue. More than a question of an agreed or a binding commitment it is more importantly a question of the division of fair responsibilities among nations considering historical responsibilities, development processes, the objective of poverty eradication, and capacities to provide resources of different countries.