CONTRIBUTION OF INDIA TO GLOBAL GHG EMISSIONS
- PAST, CURRENT & FUTURE

Abstract

Climate change is one of the most important global environmental challenges with implication for food production, water supply, health, energy etc. Addressing climate change requires a good scientific understanding as well as coordinated action at national and global level. This paper addresses these challenges. Historically, the responsibility for green house gas emissions increase lies largely with the industrialized world, though the developing countries are likely to be the source of an increasing proportion of future emission. The efforts made by the UNFCCC and Kyoto protocol provisions are clearly inadequate to address the climate change challenges. The most effective way to address climate change is to adopt a sustainable development pathway by shifting to environmentally sustainable technologies and promotion of energy, efficiency, renewable energy, forest conservation, reforstation, water conservation etc. India and other developing countries will face the challenge of promoting mitigation and adaptation strategies, bearing the cost of such an effort, and its implications for economic development.

INTRODUCTION

Climate change is one of the most important global environmental challenges facing humanity with implications for food production, natural ecosystems, fresh water supply, health etc., According to the latest scientific assessment, the earth’s climate system has demonstratily changed on both global and regional scales since the pre industrial era. Further evidence shows that most of the warming (of 0.1° per decade) observed over the last 50 years, attributable to human activities. The Inter governmental panel and climate change (IPGC) project that the global mean temperature may increase between 1.4 and 5.8 degree Celsius by 2100. This unprecedented increase is expected to have serve impact on the global hydrological systems, ecosystems, sea level, crop production and related processes. The impact would be particularly severe in the tropical areas, which mainly consist of developing countries including India.

The climate change issue is part of the larger challenges of sustainable development. The impact of climate variability and change, climate policy responses, and associated socio-economic development will affect the ability of countries to achieve sustainable development goals. The pursuit of these goal will in turn affect the opportunities for, and success of, climate policies. In particular, the socio-economic and technological characteristics of different development paths will strongly affect emissions, the rate and magnitude of climate change, climate change impacts, the capability to adapt, and the capacity to mitigate.
II. CLIMATE CHANGE PROBLEM AND CONTROVERSY

The Kyoto reduction is inadequate to achieve a stabilization of climate change by 2100. Even if stabilization of greenhouse gases is achieved, global warming will still continue to rise for several centuries. IPCC studies make it abundantly clear, that industrialized countries alone cannot achieve this reduction. Even if their emissions were reduced to zero in the near future, the current trend of growing emissions from developing countries alone could force the atmospheric concentration to exceed stabilization levels of 550 ppm. The participation of all countries, including the developing countries such as India, is essential for a successful world wide effort to arrest the growth of greenhouse gas emission.

India, the fifth largest emitter of greenhouse gases from fossil fuel in the 1990’s has suggested that the ‘right’ to pollute the atmosphere be apportioned to all countries on the basis of their population. Using this gauge, China and India, the only countries with population in excess of a billion each, could legitimately emit greenhouse gases to a greater extent, than other countries with lesser population for some decades.

The impact of climate change is projected to have different effect within and between countries. Developing countries have to carefully evaluate the need for and the roles of global and national institutions in promoting both mitigation and adaptation Programmes. Mitigation and adaptation actions can if appropriately designed, advance sustainable development and equity both within and across countries and between generation.

III. FACTORS CONTRIBUTING TO CLIMATE CHANGES - GHG EMISSION

The global carbon cycle involves interaction among the atmosphere, oceans, soil and vegetarian and fossil fuel deposit. It is the increasing concentration of atmospheric CO2 that is the cause for concern about global climate change. The combustion of fossil fuel and other human activities are the primary reasons for increased concentrations of CO2 and other greenhouse gases. Climate change is thus determined by historic current and future emissions.

IV. IMPACTS OF CLIMATE CHANGE: IMPLICATIONS FOR DEVELOPING COUNTRIES

Developing countries are faced with immediate concerns that relate to forest and land degradation, fresh water shortage, food security and air and water pollution. Climate change will exacerbate the impacts of deforestation and other economic pressures, leading to further water shortages, land degradation and desertification. Increasing global temperatures will result in rising sea levels. Populations that habit small islands and/ or low-lying coastal areas are at particular risk of severe social and economic disruptions from sea-level rise and storm surges that could destroy cities and disrupt large coastal livelihoods. The widespread retreat of glaciers and icecaps in the 21st century will also lead to higher surface temperatures on land and increasing water stress. By 2025, as much as two-thirds of the world population, much of it in the developing world, may
be subjected to moderate to high water stress. Estimates of the effects of climate change on crop yields are predominantly negative for the tropics, even when adaptations and direct effects of CO₂ on plant processes are taken into consideration. Ecological productivity and biodiversity will be altered by climate change and sea level rise, with an increased risk of extinction of some vulnerable species.

Even though the ability to project regional differences in impact is still emerging, the consequences of climate change are projected to be more drastic in the tropical regions. This is true for all sectors that are likely to bear the brunt of climate change - sea level, water resources, eco systems, crop production, fisheries, and human health. The populations of the developing world are more vulnerable as their infrastructure is not strong and extensive enough to withstand a deleterious impact.

V. WHY SHOULD INDIA BE CONCERNED ABOUT CLIMATE CHANGE?

India is a large developing country with nearly 700 million rural population directly depending on climate - sensitive sectors (agriculture, forests and fisheries) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihoods. Further, the adaptive capacity of dry land farmers, forest dwellers, fisher folk, and nomadic shepherds is very low. Climate change likely to impact all the natural ecosystems as well as socio-economic systems as shown by the National Communications Report of India to the UNFCCC.

The latest high resolution climate change scenarios and projections for India, based on Regional Climate Modelling (RCM) system, known as PRECIS developed by Hadley Center and applied for India using IPCC scenarios A2 and B2 shows the following:

- An annual mean surface temperature rise by the end of century, ranging from 3 to 5°C under A2 scenario and 2.5 to 4°C under B2 scenario, with warming more pronounced in the northern parts of India.
- A 20% rise in all India summer monsoon rainfall and further rise in rainfall is projected over all states except Punjab, Rajasthan and Tamil Nadu, which show a slight decrease.
- Extremes in maximum and minimum temperatures are also expected to increase and similarly extreme participation also shows substantial increases, particularly over the west coast of India and west central India.

Some of the projected impacts of climate change in India are as follows:

**Water Resources**

The hydrological cycle is likely to be altered and the severity of droughts and intensity of floods in various parts of India is likely to increase. Further, a general reduction in the quantity of available run-off is predicted.

**Agriculture**

Simulations using dynamic crop models indicate a decrease in yield of crops as temperature increases in different parts of India. However, this is offset by an increase in CO₂ at moderate rise in temperature and at higher warming,
negative impact on crop productivity is projected due to reduced crop durations.

**Forests**

Climate impact assessments using BIOME-3 model and climate projections for the year 2085 show 77% and 68% of the forested grids in India are likely to experience shift in forest types under A2 and B2 scenario, respectively. Indications show a shift towards wetter forest types in the north-eastern region and drier forest types in the north-western region in the absence of human influence. Increasing atmospheric CO₂ concentration and climate warming could also result in a doubling of net primary productivity under the A2 scenario and nearly 70% increase under the B2 scenario.

**Coastal Zone**

Simulation models show an increase in frequencies of tropical cyclones in the Bay of Bengal; particularly intense events are projected during the post-monsoon period. Sea level rise is projected to displace populations in coastal zones, increase flooding in low-lying coastal areas, loss of crop yields from inundation and salinization.

**Human Health**

Malaria is likely to persist in many states and new regions may become malariaprone and the duration of the malaria transmission windows is likely to widen in northern and western states and shorten in southern states.

**Desertification**

Globally, about 1900 Mha of land are affected by land degradation, of which 500 Mha each are in Africa and the Asia-Pacific and 300 Mha in Latin America. Climate change leading to warming and water stress could further exacerbate land degradation, leading to desertification. The United Nations Convention to Combat Desertification (UNCCD) aims to address the problem of land degradation, which is linked to climate change.

It is important to note that the climate-sensitive sectors (forests, agriculture, coastal zones) and the natural resources (ground water, soil, biodiversity, etc.) are already under stress due to socio-economic pressures. Climate change is likely to exacerbate the degradation of resources and socio-economic pressures. Thus, countries such as India with a large population dependent on climate-sensitive sectors and low adaptive capacity have to develop and implement adaptation strategies.

**VI. CONTRIBUTION OF INDIA TO GLOBAL GHG EMISSIONS - CURRENT**

In recent years, the development planning in India has increasingly incorporated measurable goals for enhancement of human well being, beyond mere expansion of production of goods and services and the consequent growth of per capita income. Many developmental targets are even more ambitious than the UN Millennium Development Goals; several of which are directly or indirectly linked to energy and therefore to GHG emissions. India holds over 1 billion people, i.e. over 16% of global population. Endowed with coal, India’s energy system has evolved around coal. India’s share in global CO₂ emissions is still very small.

The contribution of India to the cumulative global CO₂ emissions from
1980 to 2003 is only 3.11%. Thus historically and at present India’s share in the carbon stock in the atmosphere is relatively very small when compared to the population. India’s carbon emissions per person are twentieth of those of the US and a tenth of most Western Europe and Japan.

VII. FUTURE DIRECTION AND IMPLICATIONS FOR INDIA

Since the goals of sustainable national development are favourable to the issue of climate change, the achievement of these goals would accrue a double dividend in terms of added climate change benefits. The cascading effects of sustainable development would reduce emissions and moderate the adverse impacts of climate change, and thereby alleviate the resulting loss in welfare. For developing countries, enhancing the economic well being of their citizens remains an urgent and pressing goal. To the extent the new climate architecture would be perceived as a barrier to this, it would be resisted and would fail to garner wide support so necessary for economic efficiency and co-ordination to derive multiple benefits. For coming decades, the GHG emissions per citizen from most developing countries would remain significantly below those in industrialized countries. For most developing countries, this is the century when majority of their citizens are likely to first experience economic prosperity. The next climate regime would succeed to the extent it would create instruments that align to sustainable development goals activities and processes in these nations. India is a large developing country with nearly two thirds of the population depending directly on the climate sensitive sectors such as agriculture, fisheries and forests. The projected climate change under various scenarios is likely to have implications on food production, water supply, biodiversity and livelihoods. Thus, India has a significant stake in scientific advancement as well as an international understanding to promote mitigation adaptation. This requires improved scientific understanding, capacity building, networking and broad consultation processes.

REFERENCES