

2. Problem Description & Research Questions

Introduction

The international community has been grappling with the climate challenge for the past two decades. In 1988, the World Meteorological Organization and the United Nations Environment Programme established the Intergovernmental Panel on Climate Change (IPCC), to assess the scientific, technical, and socio-economic information relevant to understanding climate change risks, potential impacts, and mitigation and adaptation options. The most broadly-supported international agreement on climate change, the United Nations Framework Convention on Climate Change (UNFCCC), was opened for signature in 1992 and entered into force in 1994.

The 1992 United Nations Framework Convention established the principle of “*common but differentiated responsibilities*” (CBDR) for mitigation of global climate change threat. But the world had to wait 5 years for an actionable agreement in the form of the Kyoto Protocol.

The Kyoto Protocol (UNFCCC, 1997) adopted in Kyoto, Japan, on 11 December 1997, entered into force on 16 February 2005 and ratified by 184 Parties of the Convention to date, representing 61.6 percent of developed countries' GHG emissions, has become the cornerstone of the emission mitigation policy dialogue. The United States signed the Protocol but has not ratified it.

The basic principle which governs the Protocol is that of the 'Common but differentiated responsibility' (CBDR), though the commitments of the developed countries under the protocol are diluted by the so called '*Flexibility mechanisms*' involving *carbon market, clean development mechanism* and *Joint implementation*. These allow Annex I countries to meet their commitments by purchasing GHG emission reduction credits. This implies a prominent role for market mechanisms involving the private sector in the emission reduction regime.

The Protocol focuses on developed countries in reflection of the fact that they are the source of most GHGs emitted to date. It commits the industrialized countries to an overall reduction of 5.2% (Dresner, 2005) in their collective emissions of the main GHG during the commitment period of 2008-12 compared to 1990 levels, although these countries are allowed to fulfill their reduction commitments partially through projects to reduce or avoid GHG reductions in developing countries.

Kyoto Protocol covering only 40 percent of global GHG emissions through the year 2012, without U.S. participation became more or less ineffective to address the challenge of climate change. More than 12 years after the Kyoto Protocol was agreed to, no substantial progress has been achieved on the emission reduction front. Only UK and Germany have achieved reasonably large emission reductions during the past decade. Even if the protocol is fully implemented, a projected temperature rise of 2°C by 2050 would be shaved only by 0.07°C (Johansen, 2006). According to Johansen, global emissions of CO₂ increased by 13% above 1990 levels by 2000, whereas the emissions of US increased by 17.8%,

Japan by 11%, Australia by 18% and Canada by 20% during the same period. In this context, Bali Action Plan (UNFCCC, 2007) called for 'measurable, reportable and verifiable nationally appropriate mitigation commitments or actions by all developed country Parties, while ensuring the comparability of efforts among them.'

The recent Copenhagen Conference (December 1999) was widely expected to agree on binding reduction commitments for the post-2012 period, but failed to produce substantial, actionable and binding commitments, as the disputes regarding emission reduction commitments or financing mechanisms could not be settled by the negotiating blocks, mainly comprising of developed and developing countries. The conference ended with some declarations of voluntary action followed by a political document called 'Copenhagen Accord'.

The voluntary approach to emission capping has been discussed in Schmidt (2008). A sectoral approach to GHG emissions reductions in developing countries is proposed where ten highest-emitting developing countries pledge to meet voluntary, 'no-lose' GHG emissions targets in emission intensive sectors. Emissions reduction achieved beyond the target level earn reduction credits. It is reported that such an approach significantly improves the probability for 450ppm stabilization by the end of the century.

But the efficacy of voluntary approach to address the challenging issues of climate change is quite doubtful. Lyon (2003) analyzes the impact of voluntary approaches to emission reductions in the US as against mandatory programs and comes to the conclusion

that voluntary programs cannot achieve the same level of environmental protection as mandatory programs. Measured in terms of outcomes, voluntary programmes tend to score low as actions are not often well-coordinated and sufficiently focused. Moreover, if a voluntary program appears likely to follow the defeat of proposals for mandatory programs, industry tends to resist mandatory controls even more. Market is a poor protector of common goods.

No single option has emerged yet as a follow-on, but it appears that the next phase of global action against climate change will have to take a longer-term approach, addressing the apportionment of reduction commitments in a just, reasonable and fair manner, evolving financing and technology transfer mechanisms to help developing countries to grow on a low carbon trajectory and developing technologies and processes for emission reduction.

The Copenhagen Accord

The Copenhagen accord (UNFCCC, 2010) recognizes that combating climate change will be based on the principle of common but differentiated responsibilities and respective capabilities. This is the first UN document that mentions the 2°C target with reference to pre-industrial levels. This target requires radical reduction of emissions urgently. In that light, the Accord calls for emissions to peak as soon as possible, and that the time frame for peaking will be longer in developing countries to enable social and economic development and poverty eradication.

Both Annex I and Non-Annex I parties were to submit their emission targets for 2020 by 31 January 2010, the former with

commitment to implementation⁹. For Least Developed Countries (LDCs) and Small Island Developing States (SIDS), these actions are voluntary and on the basis of financial support. There is no mention in the Accord of long-term mitigation targets for the year 2050. Developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.

Funding and improved access will be provided to developing countries to enable and support enhanced action on mitigation, including substantial finance to reduce emissions from deforestation and forest degradation (REDD-plus), adaptation, technology development and transfer and capacity-building. For the short-term, developed countries collectively committed to a sum of \$30 billion for the years 2010-2012, with adaptation funding prioritized for the most vulnerable developing countries. Developed countries also committed to a goal of collectively providing \$100 billion per year by 2020. A 'Copenhagen Green Climate Fund' will be established to deal with the flow of funding. The Accord supports using markets to promote mitigation and the need to have financial incentives for developing nations to achieve low carbon growth.

The accord features a Technology Mechanism to accelerate technology development and transfer in support of action on adaptation and mitigation. Technology transfer will be supported by finance from the proposed Copenhagen Green Climate Fund. The implementation of the Accord will be assessed by 2015 by

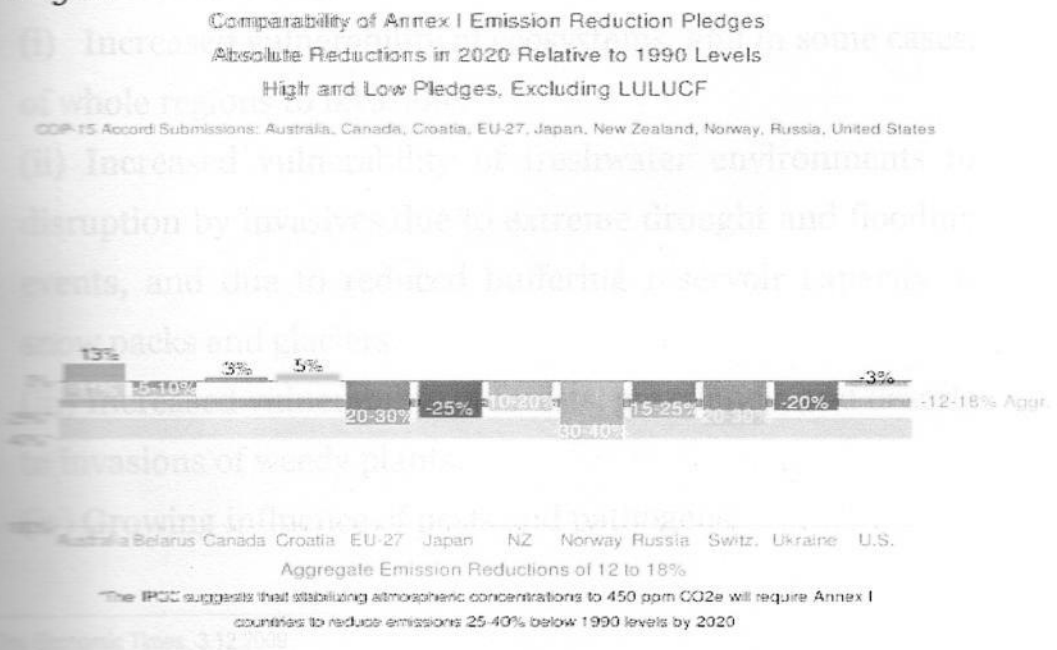
⁹ See Ballesteros(2010) for a summary of pledges made by developed countries

which time the goal of limiting a global temperature rise to 1.5°C will be considered.

The Copenhagen Accord has brought the climate change challenge to where it was at the time of Kyoto Protocol. It has not set emission targets for developed countries, finances for mitigation and adaptation actions in developing countries still need to be sorted out and the extent of the market mechanisms still needs to be determined. The various negotiating blocks were fiercely divided to have consensus on these issues. Yet there are optimistic signs that the accord is the first operational agreement on climate change that includes commitments from all parties (Yeager, 2010).

Based on the accord, the impact of commitments made by Annex-I parties, up to January 31, 2010 which aggregate to emission reductions of 12-18% below 1990 levels is shown in Figure¹⁰ 3.

Figure 3. Impact of Commitments made by Annex-I parties at Copenhagen



¹⁰Compiled by Barton, Maggie(2010) World Resources Institute, available at <http://www.wri.org/publication/comparability-of-annex-i-emission-reduction-pledges/chart>

There are commitments (Fransen,2010) by non-Annex I parties also. India has announced¹¹ efforts to reduce the emission intensity of its GDP by 20-25% by 2020 in comparison to the 2005 level through domestic mitigation actions. China has announced a reduction of 40-45%.

The 2°C temperature change from pre-industrial levels is a threshold which when crossed, the population affected by adverse impacts increases exponentially. Limiting the temperature within this range with 50% probability will require stabilization of greenhouse gases at concentrations of around 450ppm CO₂ equivalent (Human Development Report, 2007/2008). The likely stabilization target of 550ppm in the current scenario would raise the probability of breaching the threshold to 80%. However, a 550ppm target is considered to be unduly risky (Stern, 2008) as it may lead to a temperature rise of 2.9°C. It is indicated that if all commitments on the table at Copenhagen are honored, the world will still warm by 3.9°C by 2100. Yeager (2010) lists out some of the outcomes of this warming:

- (i) Increased vulnerability of ecosystems, and in some cases, of whole regions to invasions
- (ii) Increased vulnerability of freshwater environments to disruption by invasives due to extreme drought and flooding events, and due to reduced buffering reservoir capacity of snow packs and glaciers.
- (iii) Increased vulnerability of forests, grasslands, and deserts to invasions of weedy plants.
- (iv) Growing influence of pests and pathogens.

¹¹ See The Economic Times, 3.12.2009

Dimensions of Asymmetry

Though apparently the issue involves consensus on collective action for a common future, there are deeper questions of fairness and equity (Muller,2002) in the emerging global climate change architecture. Shukla et al. (2003) identifies multiple asymmetries in the climate change architecture:

- i. Separation between the historical sources of emissions and those vulnerable to its effects
- ii. Dual effects accentuating the risks for the poorer nations, namely, uneven natural distribution of impacts that causes greater damage to tropical regions and the lower adaptive capacity of poorer nations
- iii. Timing of the climate change phenomenon when developing countries are at the beginning of the growth trajectory whereas developed countries achieved growth unhindered by climate change externalities.

In terms of per capita emission rates, developing countries emit only small fraction of the total emissions. In view of the commitments to development and achievement of the human development index targets, these emission levels are justifiable. For example, India, with 17% of the world's population, contributes only 4% of the total global green house gas emissions as against 30% by the US and 25% by the EU countries. Table 1 compares per capita emissions of some countries.

Table 1: A comparison of per capita GHG emissions of some countries

Country	Per-Capita CO ₂ emissions (metric tons)
USA	20.01
EU	9.40
Japan	9.87
China	3.60
Russia	11.71
India	1.02
World Average	4.25

(Source: Bacon & Bhattacharya, 2007)

The inequity of the climate change phenomenon becomes apparent when we consider the vulnerability to climate change. World Development Report (2010) states that warming of 2°C could result in a 4 to 5 percent permanent reduction in annual income per capita in Africa and South Asia, driven by impacts on agriculture, besides bearing a high cost of the damages as opposed to minimal losses in high-income countries and a global average GDP loss of about 1 percent.

Stern (2008) identifies three key principles of the overall global policy framework: effectiveness, efficiency and equity. He suggests an international cap-and-trade scheme for implementation of the mitigation system. McManus (2009) looks at the CBDR principle which provides the 'the legal and philosophical basis' for the implementation of the Kyoto Protocol. It is pointed out that 'differentiated responsibility is based on both historical responsibility of States and differing capacities of States to address climate change.' It is fairness to all parties that is sought to be addressed via the concept of historical responsibility. This principle places the bulk of responsibility on those countries who have most

contributed to and benefited from the carbon emissions. It is further pointed out that 'differing capacities and needs of nations also underpin this notion of equity' and 'industrialized nations have the technical and economic capacity to address climate change' as compared to developing nations. Thus the CBDR principle implies that the developed countries shoulder the major responsibility of emission reduction, having accumulated emissions over a long period of time of about two centuries.

Research Questions

There are a number of equity principles suggested in the literature. The IPCC second Assessment Report (Bruce et al., 1995) suggests the following important components of equity for developing countries:

- differentiated standards for developed and developing country parties
- additional financial assistance to developing country parties
- technology transfer facilitated by protocol financial resources if necessary
- Developing country compliance was contingent on effective implementation of financial assistance and technology transfer obligations.

Cazorla (2000) summarizes many equity principles that apply to common burden sharing like the egalitarian, sovereignty, maximin, ability to pay, consensus, polluter pays, sovereign bargaining etc. There are overlapping elements in many of these arguments. Moreover, the principles are interpreted by different countries based on the impact on the respective countries and not on the

basis of a global or ethical perspective. However, often a plethora of principles are advanced to weaken the well accepted principles of equity be various interested parties. It is not uncommon that preposterous arguments not even remotely connected with equity and fairness, are advanced in the garb of respectable principles of equity to dilute or weaken the foundational maxims of justice. The sovereignty principle is a case in point. Principles of justice cannot be attributed to exhibit 'random walk behaviour.' It would be logical that any equitable framework for abatement of environmental pollution, including that of GHG gases, must take into account the responsibility of its generation, as proposed by Brazil in the negotiations¹² leading to Kyoto Protocol in 1997, as well as the ability for its mitigation as advocated by the greenhouse development rights framework (Baer, et al., 2008), which argues that it is unacceptable and unrealistic to expect the poor to commit their meager resources on the climate change crisis.

In this context, the research would address the following questions:

- i. What are the principles/considerations that must govern the apportionment of emission reduction commitments leading to an equitable global climate change mitigation architecture post 2012?
- ii. What would be an appropriate quantitative framework/model to implement them in the wake of the negotiations to develop the protocols post-2012 to address the global warming and climate change issues? What would be India's responsibility in such a scenario?

¹² See submission of Brazil to UNFCCC dated 28th May 1997 available at <http://unfccc.int/cop3/resource/docs/1997/agbm/misc01a3.htm>

The first question addresses the choice of principles for apportionment of emission reduction commitments from among a number of candidate principles suggested in the literature. While there can be different criteria for such a choice, universality and application in similar contexts in different temporal and spatial settings are important in the selection. Having selected the principles of apportionment, the second question addresses the implementation of the selected principles in a quantitative framework to draw meaningful conclusions. The role and responsibility of India has also been examined using the quantitative framework in comparison to other countries.