Paper I.3

MODELLING
OF CLIMATE AND CLIMATE-RELATED ISSUES

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1. Introduction

There is a great deal of information exchange between climatologists and modellers throughout the world. Nonetheless interventions at the Potsdam conference, notably by representatives from PIK and TERI, suggested that a supplementary effort between India and Europe to exchange information and even develop models together could have great value.

2. Models on Climate change and its consequences

a) Global Models

Climate modelling is central to understanding the actual and potential impact of man made global warming, both globally and regionally. Climate models have enabled scientists to understand the interaction of the huge forces that shape the global climate and the changes that have been set in motion by human activity, especially the destruction of forests and the greenhouse gas emissions of the industrial world. Models form the basis of predictions about the consequence: warmer temperatures, melting ice and rising sea levels, the weakening of carbon sinks, extreme events and other instabilities and the chain reactions or feedback caused by these great changes. When events have shown modelled predictions of climate change to be correct or over cautious, this has added to the political impetus for action. Shortcomings in modelling have, by contrast, limited the impact of consensual warnings, for instance by the cautious decision of the 2007 report of the IPCC to exclude the impact on sea levels of probable melting of the Greenland and Antarctic Ice Sheets and other imminent tipping points. The warning footnotes do not get read. The consensual message does.

If Indian and European modellers establish agreement on global models, including the impact of the ominous tipping points[i] which are now imminent or underway, there will be a common and continually sharpening focus on the probable risks of climate change. This will underpin the growing consensus that very rapid cuts in global emissions will be needed if there is to be any hope of limiting average global temperature increase to 2 degrees centigrade and containing the concentration of greenhouse gasses in the atmosphere to some 450ppm of CO2 equivalent. The common requirement for timely and effective global action to meet the common challenge will be reinforced.

b) Regional Phenomena

Within global change, certain regional changes have a huge impact, both regionally and at a global level. Examples of such momentous regional shifts with global impact are:

(i) Hindu Kush- Himalayan – Tibetan glacier melting, its causes (see paper II.2),

consequences and feedback effects
(ii) Changes in Monsoon patterns (see paper II.2) and related ocean currents and weather;
(iii) Implications of these changes for agriculture and food supply, coastal populations, river basin flooding and management, water supply, disease patterns
(iv) Changes in the north Atlantic weather and ocean currents, with all the implications for European climate, European agriculture and the Greenland ice sheet.

c) Implications for Adaptation
Accurate modelling of these phenomena will be enormously helpful in planning and implementing the large scale adaptations that are becoming necessary, including adapting agriculture, its crops and cultivation methods, enhancing resilience of land and communities, handling of floods in river basins, health policies, and strategies for resettling populations, early warning and emergency systems.

3. Mitigation Models

Mitigation must be equitable, in accordance with the principle of differentiated responsibility agreed in the UNFCCC. At the Potsdam conference two guiding principles were accepted to put that concept into practice: convergence to equal per capita emissions and the historic responsibility of developed countries to help developing countries develop in a sustainable way that enables them to play their part in mitigating climate change[ii].

The Indian Prime Minister has made the commitment that India will not exceed the per capita emissions of developed countries[iii]. If developed countries fail to make the necessary reductions to play their part in reducing global emissions to the target level, this Indian commitment becomes less meaningful, increasing pressure on the rich north to act.

Models would be useful which:

(1) Assume certain global concentration targets e.g. of 450 ppm of CO2 equivalent (350 CO2) by 2050.

(2) Assume that the European Union meets what would be its share of global emissions (e.g. in 2050) to meet the global target if these are shared on the basis of equal emissions per capita of all world citizens, and draw the conclusions for the emissions curve of the EU and other developed regions and countries

(3) Assume that India's per capita emissions do not surpass those of the EU, and establish the curve (of growth, levelling out and falling), which might be necessary for India in practice to meet its commitment not to surpass the EU's per capita emissions.

(4) Draw practical conclusions for India's planning of development and climate policy, and the resources needed (including those of technology and finance from developed countries).

(5) Look at the implications of the per capita principle for other emerging industrial and developing countries

Models based on different assumptions (e.g. of a weaker target, or that developed countries would not meet their commitments, with consequent effects for India) would also be possible, and be useful in demonstrating the more serious climatic impacts of a failure to act.

Varying dates and curves to meet the overall target in different ways would also be possible

Mitigation models might be useful in planning energy policies and examining possible impacts of different carbon prices.

Models based on the assumptions in (1) to (3) above could be compared with:

A: A "Dynamic" model (on the lines proposed by the Confederation of Indian Industry in its report Building a low carbon Economy[iv]) which would show the progression of emissions if India's economy in coming years achieves a year by year improvement in energy and carbon usage per unit off GNP and

B: Existing models based on the per capita principle, such as Contraction and Convergence from the Global Commons Institute[v] and the Global Climate Certificates system[vi] from Professor Lutz Wicke. These models separate the convergence date to equal per capita Allowances from the actual date when per capita emissions converge, creating a potential tradable surplus for some developing countries offset against the deficit of richer developed ones.

C: Other models which take population into account without being strictly per capita such as the Global Development Rights Framework[vii].

4. Proposal

It is proposed that leading EU and Indian research institutes such as PIK and TERI collaborate together on developing models as under (1) and (2) above and network with other Indian and European centres of excellence in this field (e.g. the CNRS in France, Tyndall Centre in UK, and the NCAER in India).

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[i] Zaelke, D Abrupt Climate Changes Approaching Faster than Previously Predicted Fast-Track Climate Mitigation Strategies Needed. IGSD/INECE Climate Briefing Note, January 2009

[ii] http://www.climatecommunity.org/documents/PotsdamSeminar-finalreport_001.pdf

[iii] http://www.domain-b.com/economy/general/20080207_dr-manmohan.html

[iv] http://cii.in/documents/building_lowcarbon08.pdf

[v] http://www.gci.org.uk/

[vi] Wicke L, & Timm, G. *Beyond Kyoto – Preventing Dangerous Climate Change byContinuing Kyoto - or by the GCCS-Approach?* http://www.stabilisation2005.com/posters/Wicke_Lutz.pdf

[vii] P. Baer, T. Athanasiou, S. Kartha and E. Kemp-Benedict, *The Greenhouse Development Rights Framework, the right to development in a climate constrained world*, Heinrich Böll Foundation, Christian Aid, EcoEquity and the Stockholm Environment Institute (November 2008) http://www.seib.org/climate-and-energy/GDR.html