FEDERAL OFFICE FOR THE ENVIRONMENT FOEN

PER CAPITA EMISSION PATHS FOR DEVELOPED AND DEVELOPING COUNTRIES
A SWISS CONTRIBUTION TO DISCUSSION IN AWG-LCA

Summary of results of a study on the implications of the "Indian Proposal" (Final Draft)
Zurich, 08 December 2008

Othmar Schwank, Jürg Heldstab, INFRAS, Switzerland
Ben Matthews, Université catholique de Louvain, Belgium

1776C-CONSTRAINEDEMISSIONPATHS-081208_R.DOC

BEN MATTHEWS
INSTITUT D'ASTRONOMIE ET DE GÉOPHYSIQUE - G. LEMAÎTRE
UNIVERSITÉ CATHOLIQUE DE LOUVAIN
2, CHEMIN DU CYCLOTRON
B-1348 LOUVAIN-LA-NEUVE, BELGIUM
T: +32 10 47 33 65,
F: +32 10 47 47 22
MATTHEWS@CLIMATE.BE

INFRAS

BINZSTRASSE 23
POSTFACH
CH-8045 ZÜRICH
t **+41 44 205 95 95**
f **+41 44 205 95 99**
ZUERICH@INFRAS.CH

MÜHLEMATTSTRASSE 45
CH-3007 BERN

WWW.INFRAS.CH

EXECUTIVE SUMMARY

The fourth IPCC Assessment Report provides scientific evidence for human induced interference with the global climate system. In order to prevent the risk of dangerous interference with this climate system within the 21st century, there is widespread political consensus that global warming should be limited to 2 degrees. The Bali Action Plan has acknowledged these findings and invites the Parties to the Convention to enhance national/international action on mitigation of climate change. A “shared vision for long-term cooperative action, including a long–term goal for emission reductions to achieve the ultimate objective of the Convention” is among the key objectives to be reached within the framework of the ongoing negotiations under the Bali Action Plan.

The Prime Minister of India has announced at the Delhi Summit on Sustainable Development 2008 that India would not exceed at any time in future the average per capita emissions of developed countries. This proposal, applied to all developing country parties is in the following text referred to as “the Indian Proposal”.

This report investigates options for enhanced national/international action on mitigation of climate change addressing in particular action 1b(i) undertaken by industrialized country Parties (G8 plus OECD 1990) taking the lead and action 1b(ii) by developing and particularly newly industrialized country Parties which would deviate from baseline on a voluntary basis as long as level of the economic development has not reached thresholds stipulated by the "Indian Proposal" followed by a phase in which relative/absolute caps would become gradually applicable after the critical threshold has been reached. In this study, the total global emissions are constrained by a stabilization scenario defined such that the global average temperature does not rise above 2°C compared to preindustrial level. An exploration is hence done of emissions paths deviating from baseline as a result from action under 1 b (i) and 1 b (ii) of the Bali Action plan. The study considers global emissions constrained by an IPCC scenario (below 2°C) and ways of reaching stabilisation by lowering per capita emissions on different paths. The top-down 2°C constraint is then used to calculate reductions in regional emissions. For the scenarios investigated in this study, countries are grouped in 16 “regions” (countries or country groups). From these 16 regions, depending on the scenario, all or a subset of the 16 region increasing over time participate to appropriate emission reduction action (“participating group”). **Indicators** triggering participation are **per capita GHG emissions** reaching the average of the participating group or **per capita income** crossing a threshold significantly higher then the member with the lowest GDP/cap of the participating group. The emissions budget for this participating group is calcu-

lated by taking the global budget (from the 2°C scenario) and subtracting the unmitigated emissions of the non-participating regions. This budget is shared within the participating group, such that emissions per capita converge gradually from their starting levels, to be equal in 2100 (taking into account population changes). By 2050 they reach a corridor of 2–3 ton CO_2 eq per cap:

- In a first scenario "full participation", serving as a theoretical reference case, all the 16 regions belong to the participating group and start converging towards equal per capita emissions immediately[1]
- In the second scenario ("Indian Proposal") developing regions emissions initially follow their baseline scenarios, and then join the participating group only after one of two criteria, whichever is fulfilled first, triggers their participation to "group appropriate" emission reduction actions.
  - they have reached the average per capita emissions of developed country (participating) parties,
  - they have reached a critical per capita income of 20,000 US$ (year 2000 US$, calculated using evolving purchasing power parity exchange rates).

For all regions, there is a constraint on the "deceleration" of emissions growth in order to smooth the transitions and allow for temporary overshooting, but no constraint on the annual rate of emissions reduction.

The following diagram illustrates the point of departure with regard to per capita emissions in the regions specified in Figure (i).

[1] This is no realistic proposition, but is provided for a comparison to the second scenario.

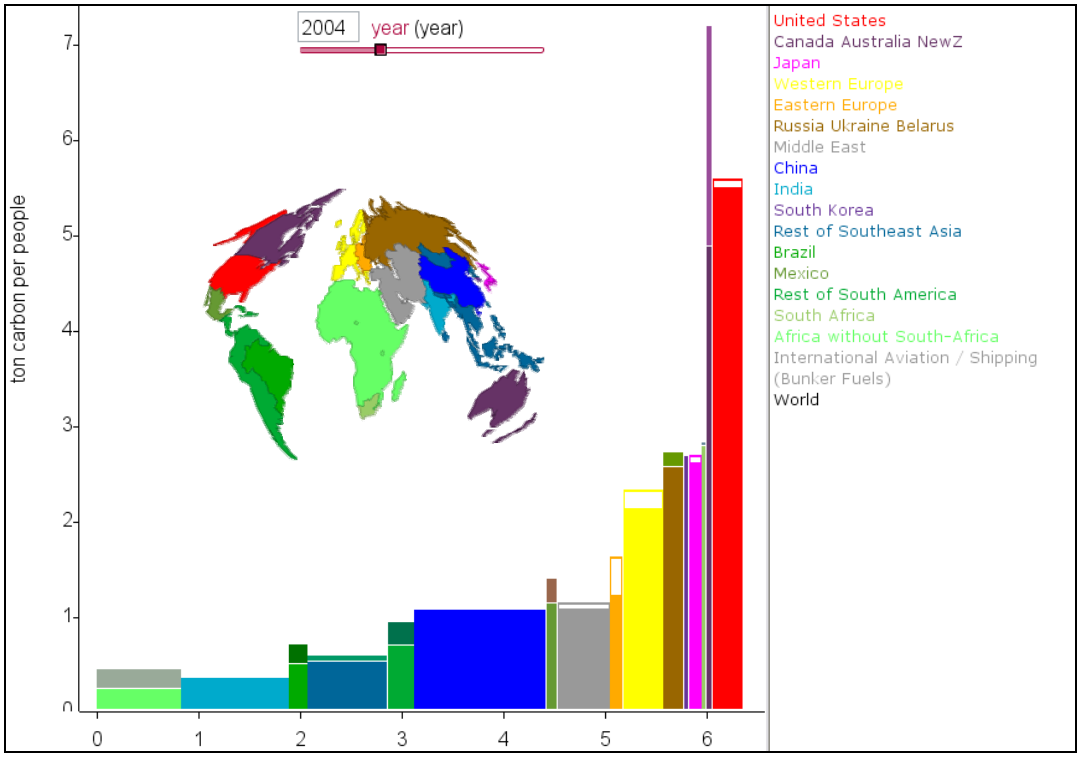

Figure I Histogram for 2004 emissions in tons of carbon per capita (y-axis) versus population (x-axis). Lower part of column: fossil fuel CO_2 emissions, upper part of column LULUCF CO_2 emissions/removals also given in tC/cap) versus population (in billion). Note that a coloured LULUCF part indicates net emissions whereas transparent LULUCF part indicate removals.

The analysis of these simulations for the scenario with differentiated transition to the participating group ("Indian Proposal") is displayed in Table 1 below.

› The timing of the onset of the "group" appropriate emissions reduction action varies widely between different regions: For developed regions from about 2010 onwards the per capita emissions decrease with different strengths, most rapidly for USA, Canada and Australia since these start from the highest level.

› Medium-income developing regions increase their per capita emissions until about 2030 and start then to decrease and converge with the developed regions.

› There is a broad tendency towards convergence of all regions to less than 2 tons CO_2 per capita after 2050-2060.

› For least developed countries which have also the greatest population growth, the onset of absolute emissions reductions is later, between 2040 and 2070.

Table 1 Scenario 2 "Indian Proposal": Region list showing the year of entering the participating group and the corresponding criterion (per capita emissions exceed average of developed regions or GDP per capita exceeds 20'000 $PPP).

Developed countries/regions (Annex I) participating from the beginning
United States
Canada, Australia, New Zealand
Japan
West Europe
Eastern Europe
Russia, Ukraine, Belarus

Further members in subgroups participating to reduction efforts, year of change from initial grouping, criteria for this change		
Region	**Year of change into participating group**	**Criteria for change (average in t CO_2/cap**
South Korea	joins 2013	GDP/cap > 20000 $
South Africa	joins 2020	emit/cap > avg (10.1 tCO_2)
China	joins 2025	emit/cap > avg (6.8 tCO_2)
Mexico	joins 2027	emit/cap > avg (6.3 tCO_2)
Rest of South America	joins 2028	emit/cap > avg (6.0 tCO_2)
Middle East	joins 2028	emit/cap > avg (6.0 tCO_2)
Brazil	joins 2030	GDP/cap > 20000 $
India	joins 2035	emit/cap > avg (4.3 tCO_2)
Rest of Southeast Asia	joins 2040	emit/cap > avg (3.6 tCO_2)
Africa without South-Africa	joins 2051	emit/cap > avg (2.4 tCO_2)

Table 2 Scenario 2 "Indian Proposal": Region list showing the average of reduction rates for fossil fuel CO_2 emissions within three periods between 1990 and 2050. The last column shows the year of entering the participating group as given in Table 1

Regions	**1990-2010**	**2010-2030**	**2030-2050**	**entering part. group**
	average reduction rate per year			
United States	0.8%	-4.0%	-4.3%	from start
Canada-Australia-New Zealand	1.4%	-4.0%	-4.2%	from start
Japan	0.7%	-3.4%	-3.4%	from start
Western Europe	-0.4%	-3.1%	-2.9%	from start
Eastern Europe	-2.3%	-2.6%	-2.6%	from start
Russia-Ukraine-Belarus	-2.1%	-3.4%	-3.3%	from start
South Korea	4.1%	-3.4%	-3.7%	2013
South Africa	1.9%	-1.5%	-3.0%	2020
China	6.4%	-0.4%	-3.9%	2025
Mexico	0.6%	2.4%	-3.6%	2027
Middle East	2.5%	2.3%	-3.5%	2028
Rest of South America	2.4%	4.3%	-3.6%	2028
Brazil	3.2%	5.6%	-3.4%	2030
India	4.8%	5.9%	-1.9%	2035
Rest of Southeast Asia	3.6%	3.0%	-1.2%	2040
Africa without South-Africa	5.0%	4.9%	2.9%	2051
World	1.9%	0.3%	-2.3%	

› The Indian Proposal outlines an interesting approach to policy analysis, if combined with carbon constrained emission paths under a 2 degree/450-470 ppm CO_2e scenario. It allows to identify the tail end of grace periods for developing country regions from "Annex I equivalent" emission reduction action. This concept, which is dependent on adoption of deep cuts in the emission budgets of current Annex I groups of countries, merits further discussion and investigation within the ongoing dialogue at AWG-LCA. However, when interpreted in this simple manner, the "Indian proposal" implies a rather abrupt transition from unmitigated baseline emissions growth to rapid emissions reduction after joining the participating group.
› This simple "Indian Proposal" also requires that the global emissions reductions are shared only among the participating ("developed") regions. Without any caps on the rate of emission reduction, this leads to very steep emission reduction paths in some developed regions, which historically have not been achieved by application of policy packages (incl. strong incentives).
› The participation threshold based on the average of the participating ("developed") region group also implies that per capita emissions of some developing regions (e.g. China) will substantially exceed those of some developed regions (e.g. Europe). This leads to the question, whether the continued partition of the world into only two groups (even with increasing participation) really implements the equity principle behind the Indian proposal.

The Indian Proposal is only sparsely specified in terms of a "shared vision". Further investigation on more elaborated scenario types than the "Indian Proposal" is needed. Such work can contribute significantly to strengthen the links to concepts/visions specifying in particular the scope and impact of emission trading (future role of CDM) or "early" nationally appropriate mitigation actions (NAMAs) under Bali Action Plan pillars technology transfer and finance setting a floor to GHG emission growth in economically advanced developing countries and hence resulting in a deviation from baseline in such developing country party regions.

REFERENCES

Garnault R. S Howses, F Jotzo and P. Sheehan (2008): Emissions in the Platinium Age: The Implications of Rapid Development for Climate Change Mitigation.

IEA (2007): World Energy Outlook.

IPCC (2007): 4th Assessment Report, Working Group 3, May 2007.

Jiang Kejung (2008): Low Carbon Societies in China: Challenges and Opportunities, Energy Research Institute, Beijing April 2008

Sethi Suyria P. (2007): Indian Perspective, Seminar of Goverment Experts, Bonn

The Netherlands Environmental Assessment Agency (2008): Global CO_2 emissions: increase continued in 2007

www.mnp.nl/en/publications/2008/GlobalCO2emissionsthrough2007.html

GLOSSARY

CDM	Clean Development Mechanism due to the Kyoto Protocol
CO_2	Carbon dioxide
GDP in $PPP	Gross domestic product in US dollar (2000) purchasing power parity (PPP)
G8	Group of Eight: Canada, France, Germany, Italy, Japan, Russia, United Kingdom, United States
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
LUC/LULUCF	Land Use, Land-Use Change and Forestry
OECD	Organisation for Economic Co-operation and Development