
European Climate Platform (ECP)

An Initiative of Mistra's Climate Policy Research Programme (Clipore) and the Centre for European Policy Studies (CEPS)


# POSITIVE INCENTIVES FOR CLIMATE CHANGE ACTION:

## SOME REFLECTIONS

**Christian Egenhofer, Bo Kjellén, Sivan Kartha & Vivek Kumar**

A paper based on discussions at the ECP Seminar on Positive Incentives in Madrid, 17-18 April 2008

For presentation at SBSTA, Bonn
Tuesday, 10 June 2008 at 18:00 to 20:00
Venue: Solar
Ministry of the Environment

**ECP Report No. 5**
**June 2008**

## About this report

This report is based on three background papers that were discussed at a seminar on "Positive Incentives" in Madrid on 17 & 18 April 2008, organised under the auspices of the European Climate Platform (ECP), which is a joint initiative of CLIPORE (Climate Policy Research Programme) and CEPS. The seminar was co-chaired by Frank Convery, Heritage Trust Professor of Environmental Policy at the University College Dublin, and Bo Kjellén, Senior Research Fellow at the Stockholm Environment Institute and former Swedish Chief Climate Change Negotiator. For further information on the ECP, please see the back cover of this report or visit: http://www.ceps.be/Article.php?article_id=484.

This report was prepared for presentation at the 28th session of the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) of the United Nations Framework Convention on Climate Change in Bonn on 10 June 2008. The report, which examines positive incentives in detail, has two parts: a summary of the analysis and key findings (Part I) and the three Background Papers (Part II). A separate Executive Summary highlights the key recommendations for policy-makers.

The programme and a list of participants at the seminar can be found at: http://www.ceps.eu/Article.php?article_id=588.

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The authors wish to thank Surya Sethi for useful comments on the draft paper.

Disclaimer: The Background Papers were circulated for discussion by participants of the ECP seminar in Madrid, 17 & 18 2008. Although findings were discussed during the seminar, the report's recommendations do not necessarily reflect the positions of seminar participants or the institutions with which they are associated. The text is the sole responsibility of the authors.

ISBN 978-92-9079-798-2

Available for free downloading from the CEPS online bookshop (http://shop.ceps.eu)

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# Positive Incentives for Climate Change Action: Some Reflections


## Christian Egenhofer, Bo Kjellén, Sivan Kartha & Vivek Kumar



### ECP Report No. 5/June 2008


## *Executive Summary*


The Bali Action Plan has provided a structure, timelines, building blocks and key words to accelerate the negotiations on a future climate change regime. Despite this progress, however, positions between the different parties still remain far apart. The European Climate Platform (ECP) held a small high-level meeting in Madrid on 17 & 18 April 2008, to bring together senior negotiators, policy-makers, researchers and stakeholders from both developing and developed countries in order to develop analytical tools, increase understanding and frame the key trade-offs to start narrowing this gap.

Background papers served as an introduction to the discussions. This enabled us to go beyond the well-trodden paths and brought to light some interesting pointers and several new ideas. This report presents the main themes and conclusions from the seminar. It covers four areas:

- the state of the negotiations;
- an analytical framework for identifying "measurable, reportable and verifiable" mitigation commitments by developed countries, i.e. implementation of Art. 1(II) b of the Bali Action Plan;
- the potential for a bottom-up approach for India and
- the weakening rationale for the Annex I/non-Annex I differentiation in globally trading energy-intensive sectors and global sectoral approaches.


## *Conclusions & Key Messages*

### *The state of the negotiations*

1. A successful conclusion of the Copenhagen negotiations in December 2008 will require unequivocal political leadership. The technical complexities and the overarching equity equation appear to be too great to be solved at the technical negotiations level only. This observation is significant because it has implications both for governments' strategies to approach the negotiations and also for the need to mobilise civil society.
2. The current distinction between Annex I and non-Annex I countries masks both important differences within and similarities between the two categories. Instead the idea of a three-category distinction could emerge:
    - Category I (e.g. OECD) with 13.5 t/$CO_2$ emissions per capita on average in 2005 = some 1 billion population;
    - Category II (non-OECD above 3t/$CO_2$ emissions with 5.5 t/CO2e per capita on average in 2005 = some 2 billion population (this includes most fast-growing emerging economies but not India, for example, because of its low emissions); and

- Category III (e.g. least developed and other comparable countries) below 1 t/$CO_2$ emissions per capita on average in 2005 = some 3 billion population.

This leads to three immediate policy implications:

a) Given the low per capita emissions of category III, almost all of the absolute emissions reductions will need to be undertaken by categories I + II. At the same time, Annex 1 reductions will not suffice to meet climate change objectives. See also Background Paper No. 1. Responsibility for emissions reductions, including payment into global funds, would clearly lie with countries in categories I and II.

b) Another important, yet worrying, implication is that the stringency of a global target implicitly rules out the required headroom for increasing emissions of category III countries. If one assumes a per capita allowance of around 1.2 t/$CO_2$ – a figure broadly estimated to be in line with the 2° C target and a 2050 $CO_2$ emissions level equal to 50% of the 1990 level of $CO_2$ emissions – category I countries would need to reduce $CO_2$ emissions by around 88% of their 2005 level, and category II by around 76% by 2050. And even such steep reductions would allow category III countries to increase their emissions by a mere 107%. The latter, in fact, would leave very little headroom for these countries to combat poverty and improve living conditions (if one assumes that some increase in emissions is necessary to improve living conditions). This situation starkly illustrates how absolutely critical it is that these countries are provided the extensive technological and financial support needed to enable development to proceed along a low-carbon pathway.

c) A third implication is that the offsetting of category I (and to an extent of category II) emissions, e.g. through the CDM, will continue to be difficult due to scale limitations and a lack of physical reduction potential in category III countries with an average of 1 metric tonne per capita. In other words, even if it were hypothetically possible to virtually eliminate category III emissions through offset activities, it would not eliminate the need for dramatic emissions reductions in category I and even category II countries. Offsetting mechanisms such as the CDM – to the extent that it enables Annex I countries to continue emitting – is at odds with long-term climate change targets.

The only way to address the issues raised under b and c above is to create additional headroom for category III countries in need of additional headroom for development. This can be done only if category I countries are actually assigned a *negative* emissions allowance and category II countries maintain the stringent cuts of 70-80%. See Background Paper No. 1. Alternatively, the headroom can be increased by relaxing the 2° C target – an option that was not regarded as prudent.

To keep developing countries engaged in the global carbon market and even to scale up carbon markets, new mechanisms are needed. Different ideas are emerging such as sector-based approaches, 'no-lose targets'[1] for developing countries, sustainable development policies & measures worldwide, binding sectoral targets and instruments to deal with REDD and adaptation. The CDM is an important tool to establish an international framework including developing countries for carbon markets. Yet improving the current CDM may be a second-best option not only due to its nature as an offsetting mechanism but also because of many design and institutional issues.

[1] Developing countries take voluntary targets and receive credits – to be sold in the global carbon market – if they meet their commitment. See Background Paper No. 3.

### *The Greenhouse Development Rights Framework to implement Art. 1 (II) b of the Bali Action Plan*

3. The central principle of Greenhouse Development Rights (GDR) is the *right to develop*, rather than a right to emit. Emissions are taken as merely instrumental, as having importance only insofar as they contribute to development. As a result the concept defines a 'development threshold'. Individuals below this level are not expected to share the burden of mitigating the climate problem, but rather are rightfully enabled to give priority to development. With respect to those above the development threshold, it identifies a burden-sharing framework based on the two underlying UNFCCC principles: capacity and responsibility. Taken together, they allow the calculation of national obligations under a climate regime. Despite the numerous methodological questions and the expected political difficulty inherent in agreeing such a framework, there is major value in it as any burden-sharing agreement will need to be rooted in analytical work. GDRs have considerable value in two areas:

    - As a strong analytical framework to indicate the possible shape of an equitable global climate change agreement; as such the framework could shift the starting point from which to start negotiations and put them onto a more evidence-based and fair footing. It was interesting to note that the Mexican proposal for a Multinational Climate Change Fund arrives at similar results to the GDRs, although using different parameters.
    - While emissions targets are unlikely to be set by a scientific method such as the GDRs, the framework could nevertheless be used to approximate the contribution that each country has to make to global climate change funds.

### *A bottom-up approach for India*

4. Bottom-up approaches allow a focus on creating and designing (the right) incentives for concrete actions, mainly but not exclusively at country-level, in an international coordinated way. Such bottom up-approaches will however need to be backed up by top-down approaches in developed countries to re-direct necessary financial flows. Bottom-up sector-specific identification of mitigation (and adaptation) options provides important information to negotiators as it helps create an understanding of country-specific situations. However, its use for GHG reductions reaches its limits when the policy drivers are energy security and access to energy. Bottom-up approaches – like top-down approaches – depend on reliable monitoring, reporting and verification; hence capacity-building becomes indispensible. The biggest obstacle is lack of data, however. On the other hand, possibly the greatest value of bottom-up approaches is their focus on 'opportunities' (and/or 'positive incentives') rather than on 'burden'-sharing, which makes negotiations difficult. Bottom-up approaches were seen as a means for developing countries both to prove engagement on climate change for the negotiations and to start reducing emissions.

### *A weakening rationale for Annex I/non-Annex I differentiation in globally trading energy-intensive industries and the role of sectoral approaches*

5. Major companies of globally trading sectors in Annex I and non-Annex I countries are, broadly speaking comparable, except for country-specific resources (e.g. availability of gas versus coal or availability of raw material inputs) and technology endowments. Where the resource and technology endowments are also similar, the case for differentiation within the globally traded industrial sectors between Annex I and non-Annex I is weakened. One of the tentative conclusions of the seminar was that differentiation of responsibility should be applied to globally trading industrial sectors only to the extent that the resource endowments are different, and even then incentives must be put in place to remove some of the differences, including variations in applied technologies. As a result, one might think of

dividing the national economies into globally-trading sectors (e.g. steel, aluminium, cement, paper and pulp, etc.) and non-globally trading sectors (i.e. the rest of the economy). Identifying the sectors will not be easy and will necessitate a political deal. Yet it could be based on a simple calculation such as the share of carbon costs in variable costs of production costs of a sector. While for the rest of the economy (i.e. everything that is not trading globally), the 'differentiation' approach of the UNFCCC would fully apply: globally-traded sectors would be subject to a sector-wide global (sectoral) policy or agreement that duly recognises resource and technological differences. A similar approach was taken by the EU when dividing up the respective shares of its member states as a means to meet the 20% GHG reduction targets. It is interesting to note that even in the EU ETS sector, there was differentiation in the form of a redistribution of auctioning rights from richer to poorer member states to compensate for disproportionately higher costs. However, it was recognised that applying the same principles on a global basis would raise significant issues with regard to competition and trade.

6. This raises the question of which sectoral approach model could address the differentiation issue. To date, we can distinguish three different – notional – models of sectoral approaches, *Sector-wide transnational* (global industry) approaches, bottom-up *country commitments* and top-down *sectoral crediting* as an incentive mechanism. All these models share a number of common elements, including: i) the collection of data and information about the sector to establish performance indicators or benchmarks, ii) the sharing and diffusion of 'best practices' within companies and iii) attempts to engage major companies of emerging economies, where most emissions growth and reduction potential lie. At the same time, global sectoral industry approaches as well as sectoral approaches in general, face five major challenges: i) technical issues related to data definition and collection; ii) risk of anti-competitive behaviour; iii) calibrating the sectoral performance across countries to reflect differences in resource endowments and technology; iv) identifying workable incentives for companies and governments from developing countries, mainly emerging economies, to engage in sectoral approaches; and v) forming a suitable governance structure. Sectoral approaches will also need to fit into domestic and global climate change policy priorities. We formulate below some conclusions.

   - Given the diversity of sectoral approaches, general statements on sectoral approaches in a generic sense are misleading. Instead, discussions on sectoral approaches first need to define the specifics of the model in question;
   - Sectoral approaches, especially when industry-led, may provide a more accurate picture of the economic reality within which business operates than the UN-based concept of sovereignty. There was a general acknowledgment that negotiators need to 'find a space' to introduce the new business reality.
   - Sectoral approaches can be designed in such a way as to allow a distinction between globally-trading sectors and non-globally trading sectors (i.e. the rest of the economy).
   - There is no doubt that developing countries will oppose any attempts to use sectoral approaches to move climate change negotiations from the UN to a non-UN body. On the other hand, the potential of sectoral approaches – irrespective of the model – to assist in improving data, share best-practice, aid technology transfer and generally increase developing country capacity is highly appreciated.

# *Part I. Analysis and Key Findings*

## 1. Introduction

The European Climate Platform (ECP) convened a two-day seminar in Madrid, 17-18 April 2008, with a number of high-level climate change negotiators, policy-makers and stakeholders from developed and developing countries to meet with researchers to discuss the challenges of a future climate change agreement. The focus of the discussion was the potential of 'positive incentives'. Participants investigated whether positive incentives are more than just a slogan, whether they can be designed in such a way as to advance international climate change negotiations and if so, what would be the optimum conditions to achieve this?

Discussions were supported by three substantive Background Papers. The first by Sivan Kartha and Bo Kjellén dealt with a possible step forward to implement the so-called 'Bali Developing Country Paragraph', (i.e. Art. 1(B) II of Decision 1/CP.13 ii) by providing analytical support. The second background paper by Vivek Kumar et al. proposed a bottom-up approach for India and the third, written by Christian Egenhofer, considered whether sectoral approaches could be a way forward and under what preconditions. The seminar was concluded by a discussion on the (perceived) state of negotiations after the Bangkok meeting and a summing-up session.

The background papers prepared for the ECP seminar were based on research undertaken by the Clipore research project, complemented by CEPS and other research. They are annexed in Part II and will also be published, slightly revised, in the Special Edition on low-carbon technologies of the *European Review of Energy Markets* (EREM) to appear later in 2008.

As expected, the discussions did not yield unanimous or unambiguous conclusions. But many interesting pointers and a number of new ideas emerged from the discussions. This report presents the most important themes and conclusions as we saw them and covers four areas: the state of the negotiations, an analytical framework for identifying 'measurable, reportable and verifiable' mitigation commitments by developed countries (i.e. implementation of Art. 1(II) b of the Bali Action Plan), the potential for a bottom-up approach for India and sectoral approaches.

## 2. The State of the Negotiations: The bar trembles, will it fall?

Given the background of the participants present, it was no surprise that a broad range of issues was raised. This report however focuses on the state of negotiations, the changing landscape for differentiation, the CDM/post-2012 mechanisms and competitiveness.

The Bali agreement breaks new ground by setting out a structure, specific time line, building blocks and key words for climate change action. The general analysis and understanding of the key areas is gradually increasing. Notwithstanding this progress, differences on controversial areas remain unresolved. G77 and China especially remain wary of non-UNFCCC initiatives such as the Major Economies Meetings (MEM), mainly because of 'asymmetric governance'[1] structures. Equity remains an equally sensitive issue and it appears that the enabling political positions for a far-reaching global deal are still being crafted. The discussions on competitiveness are just one example of the minefield of controversial issues surrounding the climate debate. Without finding a solution to competitiveness concerns in developed countries,

[1] By this term we mean the disproportionate influence exercised by OECD countries as a result of their ability to dedicate more resources to such meetings. The fact that the participation of G8+5 or MEM is based on 'total emissions' reinforces the overrepresentation of OECD countries, compared for example to 'population' as a criterion for choosing participants.

there is little hope for a global deal, either from the US or the European perspective. The same holds for developing country commitments.

G77 plus China is equally suspicious of Annex I countries' progress on the key elements of an equitable response by Annex I to climate change. Some of the concerns voiced include:

- climate change is happening and urgent action is needed in Annex I countries;
- emissions reduction should first occur in Annex I countries;
- the need to ensure that developing countries can proceed unimpeded towards poverty alleviation and sustainable human development;
- the primacy of adaptation for the developing world;
- measures to deal with technology transfer and capacity-building;
- making new and additional funding available over and above normal ODA;
- preventing carbon and climate-related conditionality from creeping into ODA; and
- ensuring that the principal motivation for new initiatives, such as sectoral approaches is not competitiveness.

While the meetings in Bali were seen as problematic but nevertheless promising in terms of its response to these concerns, the same sense of urgency was largely absent in Bangkok. As technical negotiations continue, the key political questions remain un-addressed.

The conclusion was that without political leadership to address the delicate equity-related issues outlined above, there is little chance of reaching agreement. Negotiators will most likely not be able to reach a deal on their own. The need for political leadership, however, would need to be first acknowledged and then supported by civil society, especially in Annex I countries. A clear indication by politicians of what a Copenhagen Protocol will need to agree upon would be helpful.

## *2.1 Overcoming the Annex I/non-Annex I divide*

Participants agreed that the current Annex I and non-Annex I distinction is misleading and counterproductive. It is well understood that there are important differences within the categories as well as, to an extent, similarities between the categories. Most importantly, there is a major distinction within non-Annex I countries in terms of per capita income, poverty and per capita emissions. Throughout the seminar participants relied on a three-part distinction as being a helpful rubric, based on per capita emissions, which *to an extent* can be used as a proxy for wealth. Such a three-part division divides the world into three categories as outlined in the box below. Category I comprises some 1.1 billion people, category II some 2.2 billion while category III encompasses around half of the world's total population, i.e. 3.2 billion.

*Box 1. Alternative country grouping, based on carbon emissions*

- Cat I (OECD and alike) with 13.5 t/$CO_2$ emissions per capita on average in 2005 = some 1 billion population.
- Cat II (non-OECD) with 5.5 t/$CO_2$ emissions per capita on average = 2 billion. This includes most fast-growing emerging economies but for example not India because of its low per capita emissions.
- Cat III (e.g. least developed and other comparable countries) with 1t/$CO_2$ emissions per capita on average in 2005 = 3 billion population.

This division of the world's nations leads to three crucial implications:

- First, given the low per capita emissions of category III, almost all of the absolute emissions reductions will need to be undertaken by the OECD countries and the countries in category II, which includes some but not all emerging economies. Emissions reduction by Annex I countries alone will not be sufficient to meet climate change objectives. This is documented in Background Paper No. 1. The costs for emissions reductions would almost exclusively fall on these two categories, with a disproportionate obligation on Category I. By extension, this would also mean that contributions to global funding, e.g. along the lines of the proposal by the Mexican president for a Multinational Climate Change Fund that would mobilise at least $10 billion annually would also fall overwhelmingly on Category I + II countries. Given the development profile of Category III, this group of around 3 billion people would undertake sustainable development policies (SD-PAMs) and not contribute to a Multinational Climate Change Fund. This theme is further developed in section 3 and Part II.
- An even more striking implication is that the target level of emissions that the global community will accept as being 'safe' say by 2050 will determine the available emissions headroom for development and raising access to energy and consequently reducing poverty and building adaptive capacity in category III countries. If one assumes a per capita $CO_2$ emissions endowment of around 1.2 metric tonnes per capita in 2050 – a figure broadly estimated to be in line with the 2° C target and a 2050 $CO_2$ emissions level equal to 50% of the 1990 level of $CO_2$ emissions – category I countries would need to reduce $CO_2$ emissions by around 88% while Category II by around 76% over their respective 2005 levels of $CO_2$ emissions. And still, even such steep reductions would only allow category III countries to increase their emissions by a mere 107%, which in fact leaves very little emissions headroom for these countries to combat poverty (if one assumes that some increase of emissions is necessary to improve living conditions). This situation starkly illustrates how absolutely critical it is that these countries are provided the extensive technological and financial support needed to enable development to proceed along a low-carbon pathway.
- A third implication is that the offsetting of category I (and to an extent of category II) emissions e.g. through the CDM will not be possible due to scale limitations. There is not enough physical reduction potential in category III countries with an average of around 1 metric tonne per capita (even if for 3 billion people) for one billion people with average per capita emissions of 13.5 and another 2 billion with average per capita emissions of 5.5 metric tonnes. In other words, even if it were hypothetically possible to virtually eliminate category III emissions through offset activities, it would not eliminate the need for dramatic emissions reductions in category I and even category II countries.

The only way the issues raised under the second and the third bullet points above can be addressed is to create additional headroom for countries in need of additional headroom for development. This can be done only if wealthier countries are actually assigned a *negative* emissions allowance. Alternatively, the headroom can be increased by relaxing the 2°C target – an option that was regarded as imprudent.

## 2.2 Post-2012 mechanisms and the CDM

This leads us to the question of the reform of the CDM (clean development mechanism). Essentially the CDM has been seen as a tool to build up the institutional framework for a carbon market in developing countries and to provide a carbon signal. However, simple offsetting mechanisms – to enable Annex I countries to continue emitting – are increasingly at odds with long-term climate change imperatives and emission targets. A strategy based solely on

offsetting will render it impossible to get near to halving global emissions by 2050. There was a belief that it is important to find the means to scale up participation among developing countries, for example to transform the CDM into a crediting instrument. Proposals include, for example, sector-based approaches such as the 'no-lose targets'[2] for developing countries, sustainable development policies & measures worldwide, binding sectoral targets and instruments to deal with REDD and adaptation. Improving the CDM[3] may be difficult not only because of its nature as an off-setting mechanism but also due to many design and institutional issues. Developing countries tend to be aligned along either 'no-lose targets' – most support the CCAP approach – or sustainable development policies and measures.

## 2.3 Differentiation and competitiveness

Also related to this is the differentiation between Annex I and non-Annex I countries, which raises a fundamental issue that, even with the further refinement of categories, would not disappear. Distinctions will need to be broad – in order to keep the relative simplicity of any scheme adopted – but at the same time they should not mask important similarities that exist among sectors. Major companies of globally trading sectors in OECD and developing countries are broadly comparable except for country-specific resources (e.g. availability of gas versus coal or availability of raw material inputs) and technology endowments. Where the resource and technology endowments are also similar, the case for differentiation between Annex I and non-Annex I countries for globally traded industrial sector is considerably weakened. It becomes clear that competitiveness concerns will need to be addressed for Annex I countries to be able to make a deal. However, if competitive concerns are the driving force behind any new mechanism, the mechanism would need to calibrate the differences in resources and technology endowments to address non-Annex I concerns.

A possible solution could be to divide parties' economies into globally trading segments and non-trading segments. While full differentiation would apply to the non-trading segments, there would be differentiation for the trading segments if justified, such as imbalances in resource endowments and/or technology. While such an approach would broadly keep intact the Annex I and non-Annex I categorisation, it would do away with distortions that arise from asymmetric climate policies. A similar approach is applied by the EU, which divided the economies of its member states into trading (i.e. EU ETS) and non-trading sectors. The task of distinguishing between trading and non-trading sectors will be very difficult in reality, but ongoing work in the Asia-Pacific Partnership on Clean Development and Climate Change (APP) or industry-led sectoral approaches will most likely provide lessons (see section 5 on sectoral approaches). However, it was recognised that applying the same principles on a global basis would raise significant issues in relation to competition and trade.

It should be emphasised that while section 2.3 talks about the differentiation between Annex I and Annex II countries, the general consensus was that these two categories did not paint the full picture and needed further refinement.

The following sections summarise the essence of the background papers and highlight the key findings of the discussions.

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[2] Developing countries take voluntary targets and receive credits – to be sold on the global carbon market – if they meet their commitment.

[3] See ECP Report No. 1, *Improving the Clean Development Mechanism*, Christian Egenhofer, Louise van Schaik & Deborah Cornland, December 2005.

## 3. Linking developing countries' measurable, reportable and verifiable mitigation actions to measurable, reportable and verifiable financial and technical support

This paper by Kartha and Kjellén attempts to provide some useful indicative results as to what the Bali Action Plan might mean with the words "measurable, reportable and verifiable" and "adequate, predictable and sustainable" by applying the Greenhouse Development Rights (GDR) framework.

### *3.1 The Greenhouse Development Rights Framework*

The central principle of the GDR framework is the *right to development*, rather than a right to emissions. Emissions are taken as merely instrumental, as having importance only insofar as they contribute to development. The right to develop is a right to a certain level of welfare beyond the mere satisfaction of basic needs, but well short of today's levels of 'affluent' consumption.

- As a result, the GDR framework defines a 'development threshold'. Individuals below this level are not expected to share the burden of mitigating the climate problem, as they have little responsibility for the climate problem and relatively little capacity to invest in solving it. They are instead enabled to pursue their rightful priority of human development.
- With respect to those above the development threshold, the approach defines a burden-sharing framework. This is based on the same two principles that underlie the UNFCCC: capacity and responsibility.

From this starting point, it is then possible to indicatively quantify national obligations under a climate regime. One can examine in an explicit and quantitative manner the question of the international support raised by the aforementioned clauses 1(b)ii and 1(e)i in the Bali roadmap. The results are quite predictable: see Table 1 for a representative set of countries and regions.

*Table 1. Global shares of population, income, capacity, cumulative emissions, responsibility, and obligation (RCI) for selected countries and groups of countries (%)*

| | Population | Income | Capacity | Cumulative Emissions (1990-2005) | Responsibility | Obligation (RCI) |
|---|---|---|---|---|---|---|
| **US** | 4.7 | 22.2 | 33.7 | 23.7 | 38.2 | 36.0 |
| **EU27** | 7.6 | 23.2 | 30.0 | 17.8 | 23.5 | 27.4 |
| **UK** | 0.9 | 3.4 | 4.7 | 2.5 | 3.6 | 4.3 |
| **Germany** | 1.3 | 4.5 | 6.1 | 3.8 | 5.4 | 5.9 |
| **Russia** | 2.2 | 3.0 | 2.0 | 7.4 | 5.1 | 2.9 |
| **Brazil** | 2.9 | 2.8 | 2.2 | 1.3 | 1.1 | 1.7 |
| **China** | 20.4 | 10.0 | 2.3 | 13.8 | 3.4 | 2.7 |
| **India** | 17.0 | 4.2 | 0.1 | 3.8 | 0.1 | 0.1 |
| **South Africa** | 0.7 | 0.7 | 0.6 | 1.6 | 1.3 | 0.8 |
| **LDCs** | 11.6 | 1.5 | 0.1 | 0.4 | 0.0 | 0.0 |
| **All High Income** | 15.6 | 59.1 | 83.4 | 52.7 | 79.4 | 82.3 |
| **All Middle Income** | 47.7 | 33.5 | 16.5 | 41.1 | 20.5 | 17.6 |
| **All Low Income** | 36.7 | 7.4 | 0.1 | 6.2 | 0.1 | 0.1 |
| **World** | 100% | 100% | 100% | 100% | 100% | 100% |

*Source:* Kartha & Kjellén (2008), ECP Background Paper No. 1.

The US has somewhat less than a third of the total global obligation, the EU27 have somewhat less than one-quarter, China has 6% (more than, for example, Germany) and India less than 1%. The implication is that all countries – in both Annex I and non-Annex I − are obligated to invest in bringing emissions under control, but that those with greater capacity and responsibility are obligated to invest much more, and that these investments must be made in the form of domestic mitigation as well as technology and finance to support and enable mitigation in other countries. A clear conclusion is that commitments being considered thus far by Annex I countries are inadequate. Further details are provided in Background Paper No. 1 in Part II.

### *3.2 Policy implications and conclusions*

The analysis clarified what the phrase "measurable, reportable and verifiable" and "adequate, predictable and sustainable" international support could mean in practice. Each party's national obligation would amount to its share of the global obligation times the global total cost of adaptation and mitigation. These calculations of national obligation explicitly account for the wealth and poverty in each country, and its distribution within each country. They reflect the presence in each country (each Annex I country, China, India, even the LDCs) of a sub-population that is part of the global consuming class and that rightfully has obligations under an international climate regime. They also reflect the presence in each country of individuals who have not yet attained a decent standard of living, and who thus are not expected to contribute to their country's obligations.

Despite the inevitable political difficulty to actually agree on such a framework and the thorny methodological issues that would need to be resolved, analytical work has found the framework to be of high potential for the post-2012 negotiations.

- As a regime architecture, it directly reflects the underlying structure of the linked development and climate challenges confronting us, and it presents a path forward that reconciles the two.
- While actual national obligations will inevitably be established through negotiations that involves many political factors, the GDR framework can nevertheless serve as a reference framework. It can serve as a principle-based and quantitatively transparent analytical framework that indicates the shape of a global climate change agreement that would be politically viable by virtue of the fact that it explicitly recognises and safeguards a right to development. As such, the framework could shift the point from which negotiations start and put them onto a more evidence-based and fair footing. It can thus be used to establish, for example, the contribution that each country must make to global climate change funds such as Mexico's proposal for a Multinational Climate Change Fund. It is notable that the Mexican figures for parties' contributions are similar to the ones identified by Kartha and Kjellén.

## 4. A bottom-up sectoral approach for India

Background paper No. 2 by Kumar et al. discussed how a bottom-up approach may provide better incentives for India to engage in a global agreement to combat climate change than a purely top-down approach.

### *4.1 Creating and exploiting incentives*

The starting point of the analysis was that a bottom-up approach focuses on creating and designing (the right) incentives for concrete actions, mainly but not exclusively, at country-

level, in an internationally coordinated way. This is different from a top-down approach, which imposes GHG emissions targets on a Party level and leaves the implementation details to the countries themselves.

New energy infrastructure investments in developing countries, upgrades of energy infrastructure in industrialised countries and policies that promote energy security can, in many cases, create opportunities to achieve GHG emission reductions. A bottom-up approach can – under certain conditions – ensure efficient utilisation of energy and resources in the infrastructure being added in developing countries along with addressing environment and climate change issues. The developing countries may be concerned by a restraint on economic growth as a result of a top-down approach. A bottom-up approach to an international climate agreement may provide better incentives for India to engage in such a global agreement to combat climate change. The basic rationale is that such an approach could offer better opportunities to ensure that the mechanisms of the agreement are aligned with the priorities identified at the country level in India.

No country has substantially reduced poverty without massively increasing its use of energy. Given the strong correlation between economic activity and growth in energy and infrastructure, it is evident that the energy requirements of a country would increase rapidly. The challenge facing India is to meet its energy needs in a sustainable manner. This would require an introduction of energy conservation and energy efficiency improvement across different sectors. Bottom-up approaches can serve this purpose if such approaches are able to address the key barriers such as lack of funding, access to technologies, confidence in technology, awareness generation and capacity-building, etc. Some of these barriers could be tackled through domestic policy interventions while for others additional support through bilateral collaboration may be helpful.

## *4.2 Policy implications and conclusions*

Bottom-up, sector-specific identification of mitigation (and adaptation) options provides important information to negotiators as it helps them to understand the situation in the different countries. A number of qualifications have to be made, however, as noted below:

- It is not always clear what are the drivers behind bottom-up approaches; in developing countries more often than not the driver is energy security and access to energy rather than climate GHG mitigation.
- Bottom-up approaches – similar to top-down approaches – depend on reliable monitoring, reporting and verification; hence capacity-building also becomes indispensible for bottom-up approaches.
- In many sectors there is a total lack of reliable data, if not a total lack of data.
- Sectors are very heterogeneous and their grouping together masks important differences.
- No-regret options do not materialise on their own but need to be supported by government policies.

There was a consensus that bottom-up, sector-specific measures at country level are a suitable option to engage in global climate change policy provided that the above limitations are overcome. Nevertheless, bottom-up approaches on their own do not work as it is top-down approaches that impose a carbon constraint, trading mechanisms that ultimately direct financial flows. The discussions also revealed important differences in the role of sectoral approaches in the two AWGs. While AWG-KP sees bottom-up measures as a tool for target-setting, the

AWG-LCA acknowledges 'country-specific bottom-up sectoral approaches' as a suitable measure in their own right.

Possibly the most important outcome of the discussions was to focus on 'opportunities' (and/or positive incentives) rather than on top-down burden-sharing, which makes negotiations difficult. Bottom-up approaches were seen as a means for developing countries both to prove their engagement with climate change for the negotiations and to start reducing emissions.

## 5. Which of the different sectoral approaches can be implemented?

The final background paper deals with sectoral approaches. In particular, it asks which of the different basic models has the best chance of being implemented and what the enabling conditions would be.

### *5.1 Sectoral approaches and the way forward*

The paper distinguished between three different – notional – models of sectoral approaches:

- *Sector-wide transnational* approaches, e.g. transnational *industry-led* approaches that aim to engage a sector on a broad international basis or global sectoral industry approaches ('global sectoral industry approaches');
- Bottom-up *country commitments*, possibly combined with no-lose targets; and
- Top-down *sectoral crediting* as an incentive mechanism, e.g. a sectoral Clean Development Mechanism (CDM).

The focus was on so-called 'sector-wide transnational', i.e. industry-led or as the International Energy Agency (IEA) calls them, *global sectoral industry* approaches such as the Cement Sustainability Initiative (CSI). The initiatives under the International Iron and Steel Institute (IISI), the International Aluminium Institute (IAI) and the Asia-Pacific Partnership on Clean Development and Climate Change (APP) have all significant progress. These models share a number of common elements, including

1) the collection of data and information about the sector to establish performance indicators or benchmarks;
2) the sharing and diffusion of 'best practices' within companies to enhance monitoring, reporting and verification of emissions and operational efficiency, including diffusion of technology within the sector; and
3) engaging major companies of emerging economies, where most emissions growth and reduction potential lies.

At the same time, global sectoral industry approaches as well as sectoral approaches in general, face four major challenges:

- technical issues related to data definition and collection;
- risk of anti-competitive behaviour;
- identifying workable incentives for companies and governments from developing countries, mainly emerging economies, to engage in sectoral approaches; and
- forming a suitable governance structure.

If sectoral approaches are taken further in the EU and elsewhere, they will need to fit into domestic and international policy priorities. Turning to the EU, from an EU perspective,

potentially the strongest link between national sectoral approaches and EU policies are with the EU ETS and the global carbon market. Benchmarks could play a useful role for cap-setting (i.e. agreeing overall targets) and/or allocation, i.e. distribution of the allowances among installations, for the development of global carbon markets and finally as a means to engage developing countries.

## 5.2 Policy implications and conclusions

Given the diversity of sectoral approaches, general statements on sectoral approaches are misleading. Instead, discussions on sectoral approaches need to define the specifics of the model in question first.

One of the tentative conclusions has been that the differentiation of responsibility may not apply to globally trading industrial sectors. As a result, one might think of dividing the national economies into the globally-trading sectors (e.g. steel, aluminium, cement, paper and pulp, etc.) and non-globally trading sectors (i.e. the rest of the economy). Identifying the sectors will not be easy and will necessitate a political deal. Yet it could be based on a simple calculation such as the share of carbon costs of variable costs of total production costs of a sector. While for the rest of the economy (i.e. everything that is not trading globally) the 'differentiation' approach of the UNFCCC would fully apply: globally-traded sectors would be subject to a sector-wide global (sectoral) policy or agreement. A similar approach was taken by the EU when dividing up the respective shares of its member states to meet the 20 GHG reduction target. The EU ETS (trading) sector has been subjected to an EU-wide sectoral policy, i.e. the EU ETS based on an EU-wide cap and EU-wide harmonised allocation methodologies while within the non-EU ETS sectors, differentiated targets based on relative wealth have been agreed (although details still need to be confirmed). It is interesting to note that *even in the EU ETS sector*, there has been differentiation in the form of a redistribution of auctioning rights from richer to poorer member states to compensate the poorer member states for disproportionately higher costs. Such differentiation could for example take the form of different baselines for less developed countries in, for example, a sectoral crediting scheme, possibly along the lines of a 'no-lose' target. However, such a sectoral crediting mechanism would need to rely on an ambitious baseline, in order to ensure a carbon (price) signal in the form of 'opportunity costs', thereby avoiding the situation whereby a crediting mechanism degenerates into a pure subsidy mechanism.

For the period 2013-20, before a single global carbon market is expected to be in place, the EU foresees the development of a global carbon market through a linking of the EU ETS with other domestic emissions trading schemes. Linking may require adjustment in design options between different schemes however. It may be facilitated and accelerated by the convergence of central design options such as MRV,[4] cap-setting and (free) allocation. Sectoral approaches, including benchmarks, could facilitate such a convergence.

Experiences from data collection and benchmarking exercises under sectoral approaches could possibly become a tool to give concrete meaning to the Bali Developing Country Paragraph. Both 'measuring, reporting and verification' of 'actions' to which developing countries have signed up in the Bali Action Plan and 'measurable and verifiable' assistance in financing and technology transfer by developed countries may be more easily implemented at sectoral level.

Sectoral approaches, especially if industry-led, may provide a more accurate picture of the economic reality within which business operates than the UN-based concept of sovereignty. The perceived dichotomy between Annex I and non-Annex I business no longer holds for globally

[4] Monitoring, Reporting and Verification of emissions.

trading sectors such as steel, cement or aluminium. Companies headquartered in non-Annex I countries have on many occasions significant operations in Annex I countries and vice-versa. This trend is most likely to accelerate. Sectoral approaches may be a tool to capture this new reality.

For sectoral approaches to work, there is a need for a global political deal within the UN negotiations. Provided that the challenges of global sectoral industry approaches and sectoral approaches can be met in terms of data collection, risks of anti-competitive behaviour, engaging developing countries and governance, equity issues are at present under a sectoral approach-based scheme as they are in the climate change discussion. There is no doubt that developing countries will oppose any attempt to use sectoral approaches to move climate change negotiations from the UN to a non-EU body. On the other hand, the potential of sectoral approaches – irrespective of the model – to assist in improving data, sharing best-practice, aid technology transfer and generally increasing developing country capacity is highly appreciated.

## 6. Final remarks

The Bali Action Plan has provided us with a structure, timelines, building blocks and key wording in the field of climate change. Despite this progress, however, the Bangkok meeting made clear once again that positions between the different parties remain as far apart as ever and that extra efforts in developing analytical tools, increasing understanding and framing the key trade-offs are needed.

The ECP meeting in Madrid aimed to contribute to these extra efforts in all three areas by presenting authoritative background papers and bringing together senior negotiators and policy-makers with researchers and stakeholders.

Many interesting ideas and avenues were explored at the ECP seminar in Madrid, as highlighted in this Executive Summary. If there is an overall conclusion, it is that a successful conclusion of the Copenhagen negotiations in December 2008 will require unequivocal and far-seeing leadership by political leaders. The technical complexities and the overarching equity equation appear too big to be solved at the level of technical negotiations alone. Such leadership however will only come forward if civil society holds its leaders in all parts of the world accountable for finding an adequate global solution to climate change.

# *Part II. Background Papers*

# LINKING MEASURABLE, REPORTABLE AND VERIFIABLE MITIGATION ACTIONS BY DEVELOPING COUNTRIES TO MEASURABLE, REPORTABLE AND VERIFIABLE FINANCIAL AND TECHNICAL SUPPORT BY DEVELOPED COUNTRIES

## *ANALYTICAL NOTES IN SUPPORT OF THE IMPLEMENTATION OF ART. 1(B)II OF DECISION 1/CP.13*

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**Background Paper No. 1**

**Prepared for the ECP Seminar on Positive Incentives**
**17-18 April 2008, Madrid**

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# LINKING MEASURABLE, REPORTABLE AND VERIFIABLE MITIGATION ACTIONS BY DEVELOPING COUNTRIES TO MEASURABLE, REPORTABLE AND VERIFIABLE FINANCIAL AND TECHNICAL SUPPORT BY DEVELOPED COUNTRIES

## *ANALYTICAL NOTES IN SUPPORT OF THE IMPLEMENTATION OF ART. 1(B)II OF DECISION 1/CP.13*

## Background Paper No. 1

**Sivan Kartha,[♣] Bo Kjellen,[♣] Paul Baer[♦] and Tom Athanasiou[♦]**

## 1. Introduction

The COP-13 negotiations in Bali can be celebrated as a major step and a welcome success. It has delivered us a Roadmap, guidelines for negotiating, a two-year deadline for an agreement and the earnest involvement of all parties. This is indeed what many observers hoped for as the best possible outcome of the COP.

Yet, at the same time, we have to concede that the Bali consensus was portentously indistinct and rather fragile. It included no explicit guidance on a global emissions objective. It referred to "commitments" for industrialised countries only coupled with the compromising phrase "or actions," (although we can have faith that most Annex I countries interpret "commitments" in the sense of binding reduction requirements). And, on the critical matter of developing country actions, Bali was a vital step forward, but it moved the negotiations only as far as the edge of a veritable minefield, and it pointed only vaguely in the direction of a way through it.

That minefield is the phrase "Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" [1(b)(ii), Decision 1/CP.13]. This dry clause embodies the very nexus of contention of the Bali talks. It is this clause that brought the negotiations to a tense overtime confrontation that ultimately saw the United States' negotiators reverse an initial position that would have blocked a unanimous recognition of historical necessity.[1]

The reason that "technology, financing and capacity-building" are so critical and so contentious is that the control of emissions in the South is an undeniable scientific necessity, yet, at the same time, the South justifiably takes as its utmost priority its ongoing struggle against poverty. The South is thus understandably apprehensive of any climate agreement that would require reductions, without at the same time ensuring that those reductions will not impede its development. This tension – between the demands of our threatened climate and the

[♣] Stockholm Environment Institute.

[♦] EcoEquity.

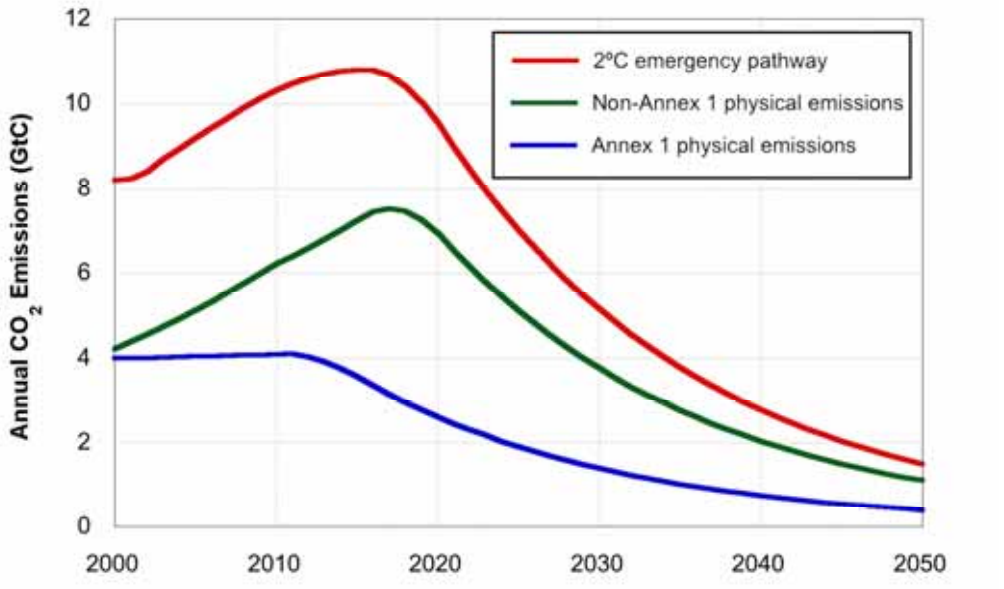
[1] That is, a historical necessity that is already clearly embodied in the UNFCCC, most clearly in Art. 4.7.

development of the South – is at the very centre of the global climate negotiations predicament. The loaded clause 1(b)(ii) of the Bali roadmap, in linking reductions in the South to support from the North, offers the only plausible resolution of this tension.[2]

## 2. A thought experiment

Figure 1 below illustrates the centrality of this tension to the climate problem. The figure conveys a simple 'thought experiment' consisting of a bit of science, a bit of conjecture and a bit of arithmetic. The **red line** ('Global') in Figure 1 is the science; it shows a global emissions trajectory that declines rapidly and deeply enough to preserve a reasonable likelihood of keeping the global temperature rise within the widely endorsed 2ºC threshold for maximum tolerable warming (Meinshausen, 2006; Baer & Mastrandrea, 2006). Clearly, such a path calls for extremely rigorous mitigation, sufficient to force global emissions to peak before 2015 and to fall by at least 80% below 1990 levels by 2050.[3] Still, even this ambitious trajectory might not be enough. It subjects the earth to a worrisome 15-30% risk of exceeding the 2ºC threshold,[4] and, recent science suggests that stabilising the climate and avoiding catastrophic climate disruption may require an even more stringent course, one sufficient to return emissions ultimately to zero (Matthews & Caldeira, 2008) and to stabilise atmospheric $CO_2$ concentrations no higher than 350 ppm (Hansen et al., 2008).

*Figure 1. A thought experiment, showing the global emissions budget*




[2] This clause is further strengthened by clause 1(e)(i), which in the context of both mitigation and adaptation calls for "Improved access to adequate, predictable and sustainable financial resources and financial and technical support, and the provision of new and additional resources, including official and concessional funding for developing country Parties."

[3] The trajectory shown includes $CO_2$ only, including approximately 1.5 GtC of emissions from land use in non-Annex 1 countries in 2000. The radiative forcing from non-$CO_2$ gases is assumed to decline by about 50% by mid-century.

[4] In the language of the IPCC, it is "likely", but not "very likely" to keep warming below 2ºC (IPCC, 2006; AR4 WGI Chapter 1, Box 1.1, p. 120).

The **blue line** ('Annex 1') in Figure 1 reflects a simple conjecture. It shows the emissions trajectory that would result if all Annex 1 countries quickly adopted an ambitious programme that forced their emissions to drop to 90% below 1990 levels by 2050, by falling by nearly 6% annually from 2010 onwards. It would require intense and concerted effort, and is just barely within the bounds of what can be considered politically plausible today. Indeed, it exceeds the objectives of even the strictest of the bills now in play in the US Congress (the House of Representative's *Safe Climate Act* and the Senate's *Global Warming Pollution Reduction Act*), and the various aspirational targets put forward by EU members states. As such, this line does not represent the maximum rate of emissions reductions that may be technically feasible; it is merely a reflection of what level of Annex I reductions can be considered politically plausible today, though just barely.

The **green line** ('non-Annex 1') in Figure 1 is the arithmetic. It shows, simply by subtraction, what is left of the global budget (red line) after Annex 1 has consumed its indicated proportion (blue line). It is, in other words, the remaining space within which non-Annex I countries would be constrained to develop, and it is quite bracing. It peaks well before 2020, and is soon racing downward at nearly 6% annually. It is this green line that captures the truly daunting nature of the climate challenge. It is an ambitious trajectory in any event, but especially so in light of the fact that developing countries need to continue to expand energy services in order to meet basic development goals (World Bank, 2000; UNDP, 2002; UNDP, 2005). In the less than 15 years between now and 2020, incomes in developing countries will hopefully grow substantially; but even assuming optimistic growth rates, incomes will still be only one-third of *current* developed country levels on average. In other words, the developing world will still be struggling to eradicate endemic poverty, even while its emissions will need to be rapidly declining.[5]

This brings into stark focus the true nature of the climate challenge, and the source of the current climate predicament. *The climate crisis calls for a regime that can rapidly curb emissions globally, without impeding the prospects for developing countries to grow economically, expand access to energy services and earnestly combat poverty.* In other words, what is needed is a climate regime that, by its very design, preserves a *right to development*. Unless a climate regime preserves a right to development, it can not engender the necessary scale of developing country engagement, and is therefore not politically or practically feasible.

One can delineate, in fairly straightforward terms, the threefold objectives that would need to be met for a regime to plausibly preserve a right to development. The first objective is of course mitigation that is sufficiently rapid and global to avoid dangerous climate change, which itself would seriously undermine development. The second objective is adaptation, at a depth and to an extent that will keep gains in development from being lost in the face of the climatic changes that are now unavoidable. And the third objective – equal in import to the first two – is to achieve the first two objectives in a manner that does not itself undermine the development aspirations of the poor.

In other words, this third objective demands that a climate regime that preserves a right to development must not impose costs on poor communities and nations nor constrain the expansion of energy services in any manner that would impede human development and poverty eradication. It is this sentiment, of course, that is the basis of the hard-won agreement in Bali

[5] The flexibility in this trajectory is minimal. The North could perhaps cut emissions by even more than 90% – perhaps 100% – and reduce emissions to zero by 2050, or even earlier, say 2025. But it would not change things very significantly, insofar as it would not open up that much more environmental space for the South. And, relaxing the red pathway – taking yet greater risks of exceeding 2ºC – only makes a difference if it is relaxed so much as to give up on preserving a reasonable likelihood of keeping warming below 2ºC.

that developing countries would undertake mitigation actions only "in the context of sustainable development", and "supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner".

Estimates of total costs for mitigation and adaptation span a wide range, but tend to come out in the range of hundreds of billions to perhaps trillions of dollars annually. The following table cites some such estimates.

*Table 1. Range of cost estimates for adaptation and mitigation*

| *Source* | *Annual cost (billions)* | *Notes* |
|---|---|---|
| ***Adaptation*** | | |
| World Bank (2006) | *$10-40* | Costs to mainstream adaptation in development aid |
| Oxfam International (2007) | *> $50* | Costs in developing countries |
| UNFCCC Secretariat (2007a;2007b) | *$49-171* | Adaptation costs in 2030 (summarised in Table 65, p. 198) |
| UNDP (2007) | *$86* | Adaptation costs in 2015 |
| ***Mitigation*** | | |
| UNFCCC Secretariat (2007a;2007b) | *$380* | Costs in 2030 to return emissions to 2007 levels. (summarised in Table 64, p. 196). |
| IPCC AR4 (2007) (SPM Table 7.) | *<3%* | Costs as percentage of Gross World Product in 2030 for stabilising in 445 -535 ppm CO2eq range. |
| Stern (2007) | *1% (±3%)* | Costs as % of Gross World Product through the 2050 for stabilisation in the 500-550 ppm CO2eq range |

## 3. Burden-sharing: What's on the table?

One can then ask, what do the various climate regime proposals on the table imply with regard to ensuring that national mitigation actions are "supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" for developing countries from developed countries? To what extent do the various proposals provide frameworks within which resources that are "adequate, predictable and sustainable" could flow?

The first observation to make is that few frameworks explicitly highlight and transparently quantify the issue of support from North to South. It is therefore not really possible to do a framework-by-framework comparison on consistent and comparable grounds, at least not without making numerous additional quantitative assumptions, and some such analyses have been attempted (Höhne, 2006, Höhne et al., 2007; den Elzen, 2002). In this section, we will simply provide a capsule review of several well-known frameworks with regard to the question of international support. In the succeeding section, we elaborate on one of these frameworks – the Greenhouse Development Rights framework – with further quantitative detail.

### *3.1 Emissions rights approaches*

There are several approaches that are premised on allocating emission allowances based on the concept of equitable emission rights. Six of these that are broadly representative of the proposals on the table are: Equal Per Capita Emission Rights, Global Climate Certificate

System, Contraction and Convergence, One Standard/Two Convergence, Common but Differentiated Convergence, and the Vattenfall proposal.

- *Equal Per Capita Emission Rights* is a straightforward approach premised on the equal rights to the atmospheric commons. All countries would be awarded emission allowances in proportion to their population, and would be free to trade them. The total number of allowances granted globally would steadily decrease along a path consistent with an agreed climate stabilisation goal (Agarwal & Narain, 1995).
- *Global Climate Certificate System (GCCS)* is a variant of a per capita approach, in which trades are price controlled, so as to artificially limit the total revenues passing from allowance purchasing countries to allowance selling countries (Wicke, 2005).
- *Contraction and Convergence (C&C)* is a hybrid framework combining grandfathered emission rights with per capita emission rights, with a gradual transition from the former to the latter over a specified number of decades. Countries whose emissions start above the global average would receive allowances that gradually trend down to the global average, while countries whose emissions start below the global average would receive allowances that gradually trend up to the global average (GCI, 2008).
- *One Standard, Two Convergence* is a proposal by Chen et al. (2005), further elaborated by Gao (2007) that is based on the principle that countries should have access to equal per capita cumulative emissions, in order to allow sufficient space for development. It extends the principle of equal per capita emission rights to historic emissions. The name of the proposal refers to the fact that when the standard of equal per capita cumulative emissions is consistently applied across countries, then developing countries' emissions will rise above the global average (and above the emissions of some developed countries) before converging downward. Chen proposed some further adjustments to account for geographic circumstances, national energy endowment, economic structure, and international trade.
- *Common but Differentiated Convergence (CDC)* is a variant of Contraction and Convergence, in which nations starting below the global per capita emission level are permitted to exceed the global average for a limited time. Also, the poorest developing countries are exempt from the emission allowances system (and thus have no excess allowances to sell) (Höhne et al., 2006). This proposal reproduces some features of One Standard, Two Convergence, without explicitly taking equal per capita cumulative emissions as its foundation.
- *Vattenfall's proposal* is an emission rights proposal premised not on per capita emission equality at all, but on per unit of GDP equality. Based on this foundational principle, three main modifications are then introduced. First, poorer countries below a specified threshold are exempt from the emission allowances system. Second, poor countries above the threshold receive a modest 'cross-subsidy' of allowances from wealthier countries to account for the general observation that poorer countries tend to have higher carbon intensity. And third, Annex-1 (but not non- Annex-1) countries have maximum and minimum required rates of emission decline (Vattenfall, 2006).

In all of these frameworks, the primary means through which the "measurable, reportable and verifiable" and "adequate, predictable and sustainable" support would flow is the mechanism of market-based allowance trading. Countries whose emissions exceeded their allowances would purchase allowances from countries whose allowances exceeded their emissions. One key question, then, is whether this *type* of support is adequate, or if further mechanisms would be needed to ensure that in addition to the availability of finances, there were also technical

assistance and capacity-building needed to bring about the transition to a low-carbon economy with the necessary adaptation implemented.

The second key question is whether the *scale* of support is adequate, i.e., whether the flow of allowance revenue would provide sufficient support to enable developing countries to undertake the necessary scale of mitigation (and adaptation!) without compromising their development efforts. Roughly speaking, the proposals can be ranked in terms of the scale of the allowance revenue flow (assuming the same global climate objectives): Equal Per Capita Cumulative Emission Rights (One Standard, Two Convergence) leads to the greatest flow of allowance revenue, then Equal Per Capita Emission Rights, then CDC, then C&C, and finally Vattenfall's proposal, with the ranking of GCCS among the others depending on details regarding the fixed trading price compares to the actual mitigation costs.

### *3.2 Multi-stage proposals*

Multistage proposals categorise countries into different groupings, and assign them qualitatively different sorts of commitments. Generally, the richest and highest emitting countries (i.e., those with the greatest responsibility and capacity) are assigned the most stringent and legally binding commitments (such as emission reduction targets), while the poorest and lowest-emitting countries generally have no binding commitments.

- *Climate Action Network's "Viable Framework"* is a multistage proposal with three tracks, to which countries are assigned based on responsibility and capacity. The "Kyoto Track" has legally binding reduction commitments, the "Decarbonization Track" has various other forms of less rigorous commitments, and the "Adaptation Track" is for key vulnerable countries (such as LDCs) that would focus on adaptation. Convergence toward equal per capita emission is a stated objective. "Where technical or other assistance is required… this needs to be made available from the industrialized countries." (CAN, 2003).
- *South-North Proposal* is a proposal with six stages, based roughly on responsibility and capacity, including OECD countries (with stringent binding targets and requirements to provide funding), economies in transition (with binding targets), newly industrialised countries (quantified targets and access to partial funding), rapidly industrialising countries (quantified targets contingent on funding), other developing countries (non-binding targets and partial funding), and LDCs (with nonbinding targets and full funding) (Ott et al., 2004).

Both of these multistage frameworks explicitly refer to the requirement that technical and financial resources would be made available from wealthier countries to enable developing countries in certain stages to meet their commitments. Whether these resources are sufficient, then, will depend on how the frameworks were actually operationalised, and in particular on the criteria upon which graduation from one stage to the next were based (which determines which countries are eligible to receive support), and the nature and scale of this support.

## 4. Greenhouse Development Rights

Here, we examine one specific framework – the Greenhouse Development Rights[6] approach – in detail. It has been elaborated in a sufficient degree of detail elsewhere (Baer et al, 2007) that it is able to provide some useful indicative results as to what the Bali Roadmap might imply

[6] See Baer et al. (2007) for a full explication of the GDR framework. SK, PB, and TA are its developers, and BK has provided valuable input.

with the words "measurable, reportable and verifiable" and "adequate, predictable and sustainable".

### *4.1 A 'development threshold'*

The GDR framework, starts from a fundamentally different premise than the emission rights frameworks. It takes as its central principle the *right to development*, rather than a right to emissions. Emissions are taken as merely instrumental, as having importance only insofar as they contribute to development.[7] The right to development, on the other hand, is fundamental. It is, as Pan (2005) stressed, a right to a certain level of welfare beyond the mere satisfaction of basic needs, but well short of today's levels of 'affluent' consumption.

At this level of welfare, the GDRs framework defines a 'development threshold'. Individuals below this level are not expected to share the burden of mitigating the climate problem, as they have little responsibility for the climate problem and relatively little capacity to invest in solving it. Indeed, they have development as their rightful priority, and should not be saddled with the costs of keeping society as a whole within the starkly limited global carbon budget. Above the development threshold, on the other hand, individuals are expected to help shoulder the burden of solving the climate problem, including both the mitigation and adaptation costs. And, the further above the threshold, the larger their fair share of the burden.

The level at which such a development threshold would best be set is a matter for debate, but the key principle is clear: it should differentiate the global poor, who have pressing and legitimate unmet development needs, from the 'global consuming class,' which has reached a level of consumption that yields an appreciable contribution to the climate problem, and has similarly acquired enough capacity to help bear the costs of managing that problem.

Consistent with this principle, for the purposes of this indicative calculation, we set the development threshold at 125% of a global poverty line. This particular level is, of course, somewhat arbitrary, but its appropriateness is supported by the many other contexts in which a figure such as 125% of a poverty line is taken to define the upper boundary of 'exempt' or 'lifeline' income. These include starting points for income tax calculations, eligibility thresholds for social services, and criteria for defining 'economically vulnerable' or 'near-poor' populations. Thus, while it might be an underestimate, it is a plausible and indicative figure, and as a valid starting point for discussion. As a global poverty line, one can discard the typical figures of $1 per day or $2 per day (World Bank, 1990), as being too low; many people with incomes much higher than $2 per day still face pervasive exposure to the plagues of poverty: malnutrition, high infant mortality, low educational attainment, high relative food expenditures. A defensible global poverty line above which these plagues of poverty are greatly diminished can be investigated empirically. The evidence suggests that a global poverty line can reasonably be approximated by $16 per day (PPP adjusted),[8] or, equivalently, $6,000 per year (Pritchett,

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[7] Another approach that takes a development rights perspective is the proposal of Pan Jiahua (2005). Several key features that Pan's proposal shares with the framework presented in this paper will be highlighted below.

[8] According to Pritchett (2003) the use of this line 'is justifiable, more consistent with international fairness, and is a better foundation for the World Bank's organizational mission of poverty reduction.' See also Pritchett (2006). Note, these figures are on a purchasing power parity (PPP) adjusted basis, and therefore convert to a lower income level in a local developing country currency than if converted at market exchange rates. Different development thresholds are explored via a sensitivity analysis in Baer et al. (2007).

2003; 2006). Taking this figure as a global poverty line, we then have (multiplying by 125%) an indicative development threshold of $7,500 a year (PPP).

## 4.2 Burden-sharing

Having defined a development threshold, we can then define a consistent burden-sharing system, and use it to make an indicative calculation of national obligations under a climate regime. This allows one to examine in an explicit and quantitative manner the question of the international support raised by the aforementioned clauses 1(b)ii and 1(e)i in the Bali roadmap.

The GDR framework is based on the same two principles that underlie the UNFCCC: capacity and responsibility. The idea that burden sharing should be based on a systematic treatment of responsibility and capacity is reflected in most if not all contemporary burden sharing proposals.

Capacity in this context means having the financial resources to deal with the climate problem without sacrificing necessities. We calculate it as the aggregate sum of individual income in excess of the development threshold, summed across all the individuals in a country. Figure 2 illustrates this calculation for three countries: India, China, and the US. It shows the income distribution for each country, estimated on the basis of national per capita income and Gini coefficient (a measure of national income inequality).[9] These charts array each person along the X-axis from poorest (on the left) to wealthiest (on the right), and plots their (PPP adjusted) income. The development threshold at $7,500 is shown, cutting through each country's income distribution curve and thus dividing total national income into a fraction (yellow) below the development threshold, and a fraction (green) that the wealthier portion of the population earns in excess of the development threshold. The green area thus graphically reflects our estimate of each country's capacity. As it turns out, nearly 7% of India's population earns more than $7,500. These are the members of that burgeoning 'Indian middle class' that has so captured the attention of the media. In terms of sheer numbers, they comprise a large and growing consuming class, one that is roughly the size of the population of the consuming class in, say, the UK or France.[10] But this is there where the similarity ends. For these Indian consumers have a much lower aggregate income, and the amount of India's income in excess of the $7,500 development threshold is less than one-sixth as large.

Similar observations can be made about the approximately 27% of China's population that comprises its consuming class, which is as large as the US population, nearly all of which is above the development threshold. However, China's income above the development threshold is less than one-sixth of that of the US.

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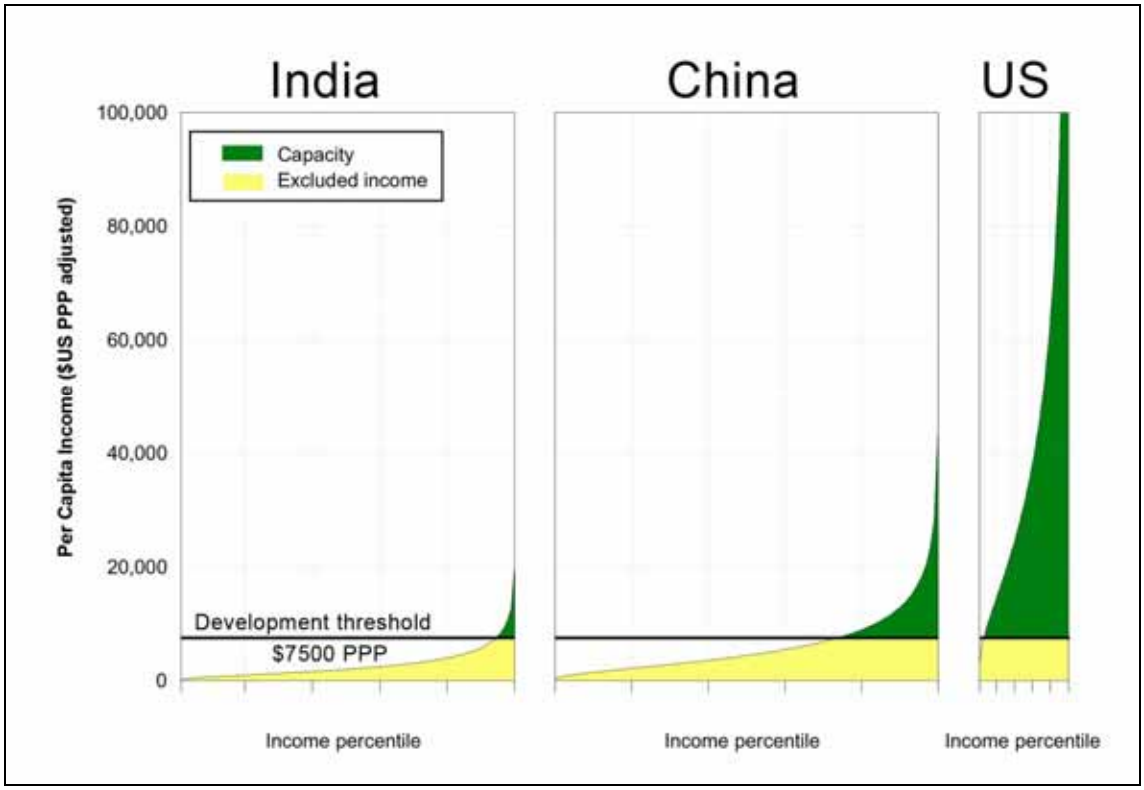
[9] We approximate the national income distributions as lognormal distribution using two country-specific parameters: the mean per capita income and the Gini coefficient. To provide results that are more relevant to a burden-sharing arrangement agreed in the near future, we based our calculations on incomes, populations, etc. that are the projected values in 2010. The charts have been scaled so that the length of the x-axis is proportional to population, and thus the areas of the different sections – e.g., the green section representing capacity – can be directly compared in absolute terms. For a full explanation, see the technical appendix in Baer, Kartha, Athanasiou (2007), although note that the calculations here have been updated using World Bank PPP income data released in 2008.

[10] This estimate is consistent with those produced by other analyses, e.g., NCAER (2005) and McKinsey (2007).

*Figure 2. Capacity*




*Note:* The curves are income distributions for India, China and the US, with the green area representing income above the $7,500 (PPP) development threshold, or national 'capacity'.

Responsibility, of course, is the central concept behind the 'polluter pays' principle, and is interpreted in terms of the greenhouse gases that nations have cumulatively contributed to the atmosphere. We define and calculate responsibility in a manner precisely analogous to capacity, i.e., with respect to the development threshold. Specifically, we calculate a country's responsibility as cumulative emissions *excluding* emissions corresponding to consumption below the development threshold. This definition is a recognition of the distinction between emissions arising from meeting basic needs, and emissions corresponding to discretionary consumption, and reflects the premise that these different types of emissions are of fundamentally different natures: in essence, basic emissions do not imply responsibility, whereas discretionary consumption does. It thus preserves a right to development insofar as it allows people to strive toward the development threshold unencumbered by the need to meet emissions constraints. (Note, there are indeed emissions constraints, and these must be met, but not at the expense of those below the development threshold.)

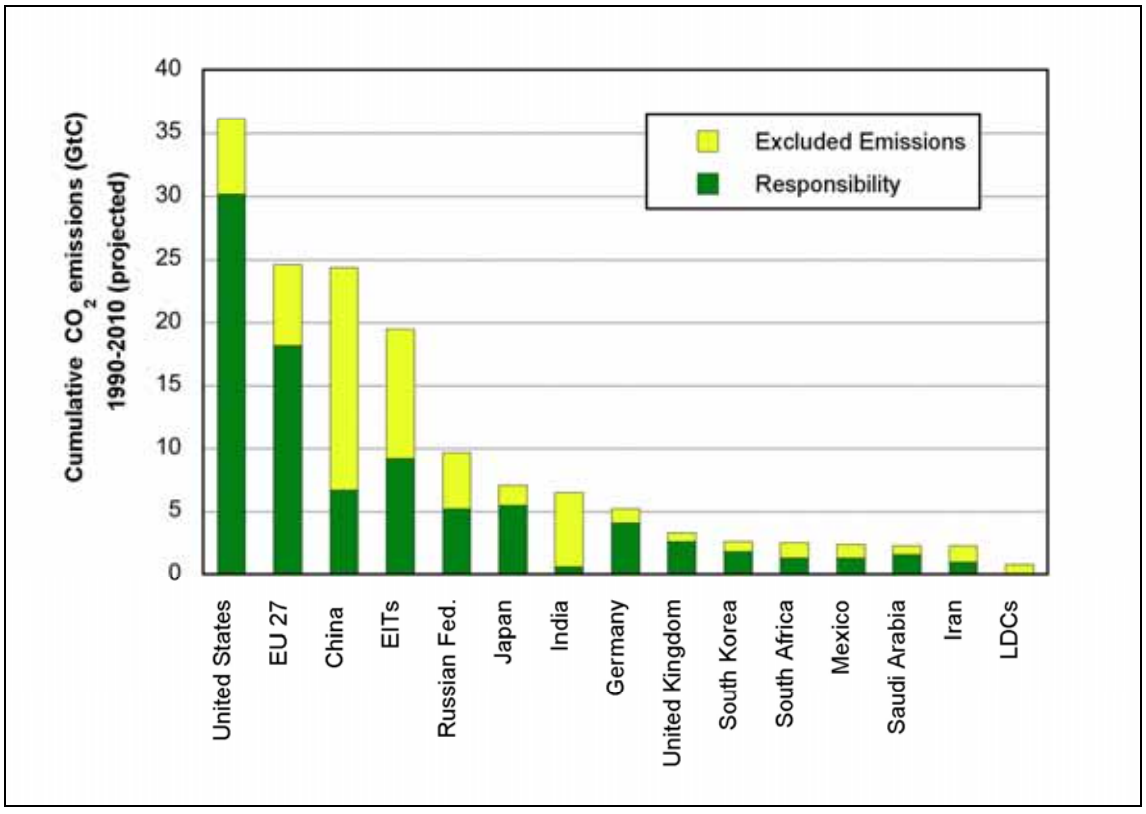
A detailed calculation of emissions by income class for each country is beyond the scope of our analysis, although it is possible and such analyses have indeed been done for some countries (See, for example, Metcalf, 2007 for the US, Brenner et al., 2007) for China, and Ananthapadmanabhan et al., 2007, for India). We make the simplifying assumption that (within any given country) emissions are proportional to consumption, which is in turn proportional to income.[11] One can then straightforwardly generate national responsibility graph analogous to the Figure 2 graphs of national capacity. To show more countries, however, we present in Figure 3 a condensed graph that shows several nations and regions, with the total height of each

[11] See the technical appendix of Baer et al. (2007) for further discussion.

bar reflecting the cumulative emissions since 1990. The yellow portion shows the emissions corresponding to consumption below the development threshold, and the green portion the aggregate responsibility. (These are analogous to the yellow and green portions of the graphs in Figure 2, except that they are not presented as a full distribution across the national populations.) Although our indicative calculation of responsibility takes 1990 as the start year, one can certainly argue that an earlier start year would be more appropriate. All things being equal, it would increase the relative responsibility of the Annex-1 nations, which began the process of industrialisation much earlier, compared to non- Annex- 1 nations.

Capacity and responsibility can now be combined in a straightforward way to yield a combined indicator that can be used as the basis of a burden sharing allocation. We refer to this as a "Responsibility-Capacity Indicator" or RCI,[12] which amounts in essence to a progressive income/emissions tax. (Pan suggests a structurally similar approach, based on a "basic needs threshold" and a progressive emissions tax above the threshold. Not coincidentally, his detailed bottom-up calculation for a basic needs threshold for China which comes out very similar to the emissions level implied by our development threshold.)

*Figure 3. Responsibility*




*Note:* The total height of each bar gives the cumulative emissions since 1990, the yellow portion is the emissions corresponding to consumption below the development threshold, and the green portion is emissions corresponding to consumption above the development threshold, or national 'responsibility'.

[12] The RCI is constructed in a simple and generic manner that allows responsibility and capacity to be weighted differently: $RCI = R^{a} \bullet C^{b}$. The exponents *a* and *b* sum to 1, so that, as the paired weights go from *a=1* and *b=0* at one extreme to *a=0* and *b=1* at the other, the *RCI* goes from being exactly equal to responsibility (*R*) to being exactly equal to capacity (*C*). In our reference calculations we set a = 0.4 and b = 0.6, which is to say that we weigh capacity somewhat higher than responsibility. Again, this choice is subject to discussion. A different weighting, will not change the results dramatically.

It is worth stressing here that this burden-sharing framework allocates obligations at the national level, but that it derives these from information at the intra-national level regarding the distribution of wealth and emissions. As emphasised by Pan (2005), this need to look at intra-national disparities is a logical consequence of the premise that a viable climate regime must preserve a right to development, which is itself a right that adheres to individuals, not to countries.

## 5. Results

The results are not altogether surprising, as shown in Table 2 for a representative set of countries and regions. The US has slightly less than one third of the total global obligation (see rightmost column labelled "Obligation"), the EU27 has a bit less than one quarter, China has less than 7%, and India a fairly trivial 0.8%. While we have made various specific assumptions in generating this indicative quantification (e.g., setting the development threshold at $7,500 (PPP), and choosing 1990 as the start year for calculating responsibility) we argue that any system that quantifies responsibility and capacity in a manner that is premised on the need to preserve a right to development, will not yield dramatically differing results.[13]

*Table 2. Global shares of population, income, capacity, cumulative emissions, responsibility, and obligation (RCI) for selected countries and groups of countries (%)*

| | Population | Income | Capacity | Cumulative emissions (1990-2010) | Responsibility | Obligation (RCI) |
|---|---|---|---|---|---|---|
| Annex 1 | 18.8 | 57.2 | 75.1 | 56.5 | 73.4 | 74.6 |
| Non-Annex 1 | 81.2 | 42.8 | 24.9 | 43.5 | 26.7 | 25.4 |
| United States | 4.6 | 20.7 | 29.7 | 23.3 | 33.9 | 31.8 |
| EU (27) | 7.2 | 21.6 | 27.9 | 15.9 | 20.5 | 24.8 |
| United Kingdom | 0.9 | 3.1 | 4.2 | 2.1 | 2.9 | 3.7 |
| Germany | 1.2 | 4.1 | 5.6 | 3.4 | 4.6 | 5.2 |
| Russia | 2.0 | 3.2 | 2.9 | 6.3 | 5.9 | 3.9 |
| Brazil | 2.9 | 2.8 | 2.3 | 1.4 | 1.2 | 1.8 |
| China | 19.7 | 12.5 | 5.9 | 15.7 | 7.5 | 6.6 |
| India | 17.2 | 5.2 | 0.8 | 4.2 | 0.7 | 0.8 |
| South Africa | 0.7 | 0.7 | 0.6 | 1.6 | 1.4 | 0.9 |
| LDCs | 12.5 | 1.5 | 0.1 | 0.6 | 0.0 | 0.1 |
| All high income | 15.1 | 55.2 | 75.6 | 50.9 | 71.4 | 74.3 |
| All middle income | 46.7 | 36.4 | 23.4 | 42.2 | 27.8 | 24.8 |
| All low income | 38.2 | 8.5 | 1.0 | 6.9 | 0.9 | 0.9 |
| World | 100 | 100 | 100% | 100 | 100% | 100% |

These results help illustrate what might be implied by the phrases "measurable, reportable and verifiable" and "adequate, predictable and sustainable" international support. Each party's national obligation would amount to its share of the global obligation (rightmost column above)

[13] See Baer et al. (2007) for sensitivity analyses.

times the global total cost of adaptation and mitigation (see Table 1 for indicative total global costs). These calculations of national obligation explicitly account for the wealth and poverty in each country. They reflect the presence in each country (each Annex-I country, China, even India) of a sub-population that is part of the global consuming class and that rightfully has obligations under an international climate regime. They also reflect the presence in each country of individuals (for many developing countries the this is the majority) who have not yet attained a decent standard of living, and who thus contribute nothing to their country's obligations.

## 6. Implications

It is possible to look more closely at the concrete political implications of this burden-sharing framework, by expressing it in the familiar language of national emission reduction commitments. We can do this by considering the total volume of mitigation required globally, and allocating it to countries in accordance with their share of the global obligation (as shown in Table 2). The global mitigation requirement is defined as the volume of emission reductions needed to fully shift from a business-as-usual scenario, for which we take the recent *World Energy Outlook 2007* global energy scenario (IEA, 2007), to the 2ºC mitigation path (the red line) presented in Figure 1. We show this graphically in Figure 4, where the topmost line (the one rising above 12 GtC per year in 2025) is the WEO business-as-usual emission trajectory, the bottommost line is the same 2ºC mitigation path presented as the red line in Figure 1.

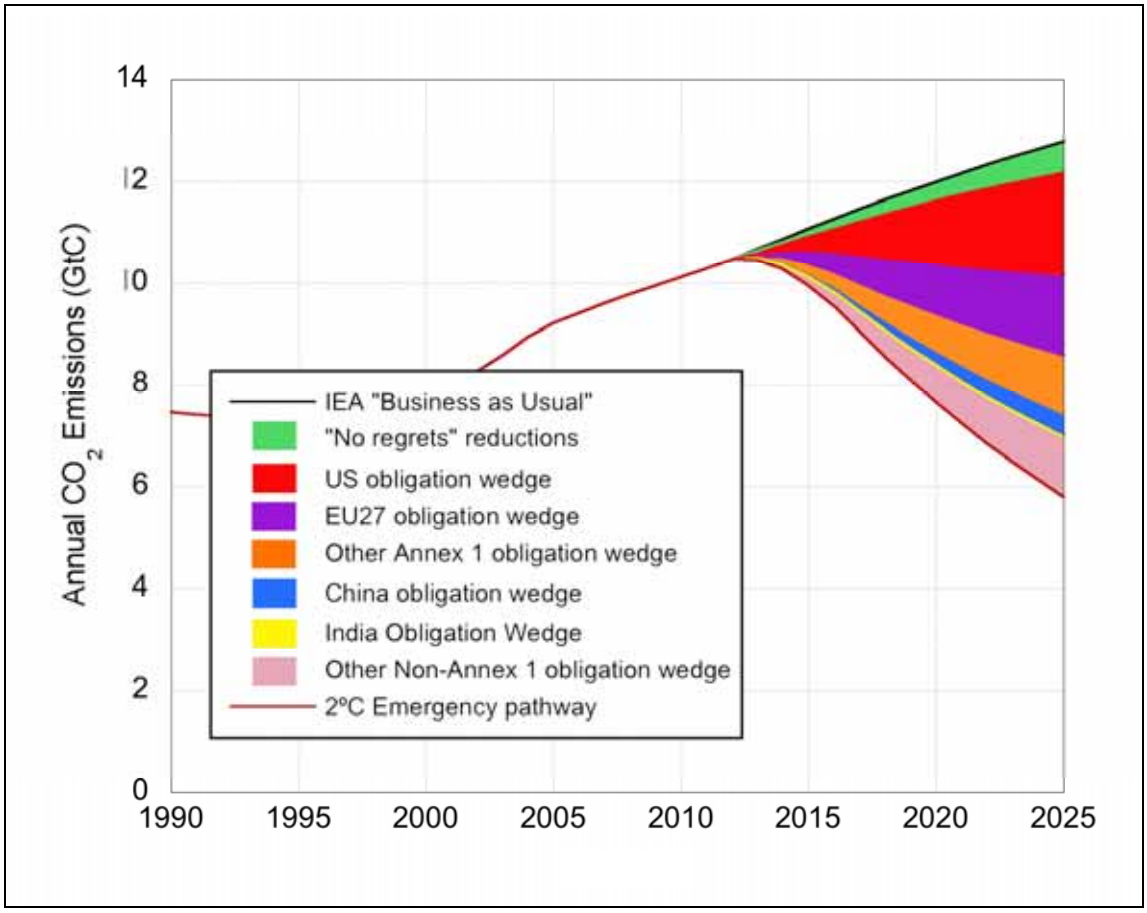
We first note the green wedge, labelled 'No-Regrets', which is an estimate of the negative- and zero-cost emissions reductions available globally.[14] The green wedge, in other words, represents free and profitable reductions – such as cost-effective energy efficiency – which are large, though not by any means large enough to bring emissions all the way down to the 2ºC path. From the perspective of a global burden sharing framework, these reductions should be treated differently from positive-cost options. Because countries can in principle exploit these opportunities to their benefit, one might argue that all nations should be responsible for capturing their own no-regrets reductions, and that only further reductions – those that actually have positive costs – should be considered part of the global mitigation requirement to be allocated among nations within the broader burden-sharing framework.

However, in practice, one cannot ignore the barriers preventing countries from achieving all their no-regrets reductions. These barriers are broad and high, and encompass structural, institutional, technological – and even financial – obstacles to otherwise cost-effective options. And while some no-regrets options might face barriers that can be overcome domestically, for example through institutional changes and policy reform, others face barriers that might well be insurmountable without external assistance such as concessionary financing and technological cooperation. Recognising these two fundamentally different cases, the GDRs framework obliges developing countries to only achieve the more accessible fraction of their no-regrets options, and folds the remainder into the global burden-sharing arrangement. The precise fraction of any country's no-regrets opportunities that might plausibly be achieved through domestic efforts will have to be determined on a country-by-country basis, in a manner that reflects differing national circumstances. For the purposes of our indicative analysis, we crudely estimate that the more accessible no-regrets opportunities amount to 50% of the total for non-Annex 1 countries. These are included in their national reference trajectories, and the remainder are added to the global mitigation requirement. (For Annex 1 countries, 100% of the estimated no-regrets opportunities are included in the national reference trajectories.) This apportioning of the no-regrets opportunities is reflected in Figure 4.

[14] This is estimated from the global abatement cost curves compiled by McKinsey and Company (2007).

The global mitigation gap is allocated to nations according to their proportion of global obligation[15] (as shown in Table 2). Accordingly, the US reduction obligation amounts to approximately 32% of the mitigation gap (the red wedge); the EU's is 25% (purple); China just under 7% (blue); and India less than 1% (yellow, barely visible).

*Figure 4. Global mitigation requirement, divided into 'reduction obligation' wedges that reflect national / regional shares of RCI*



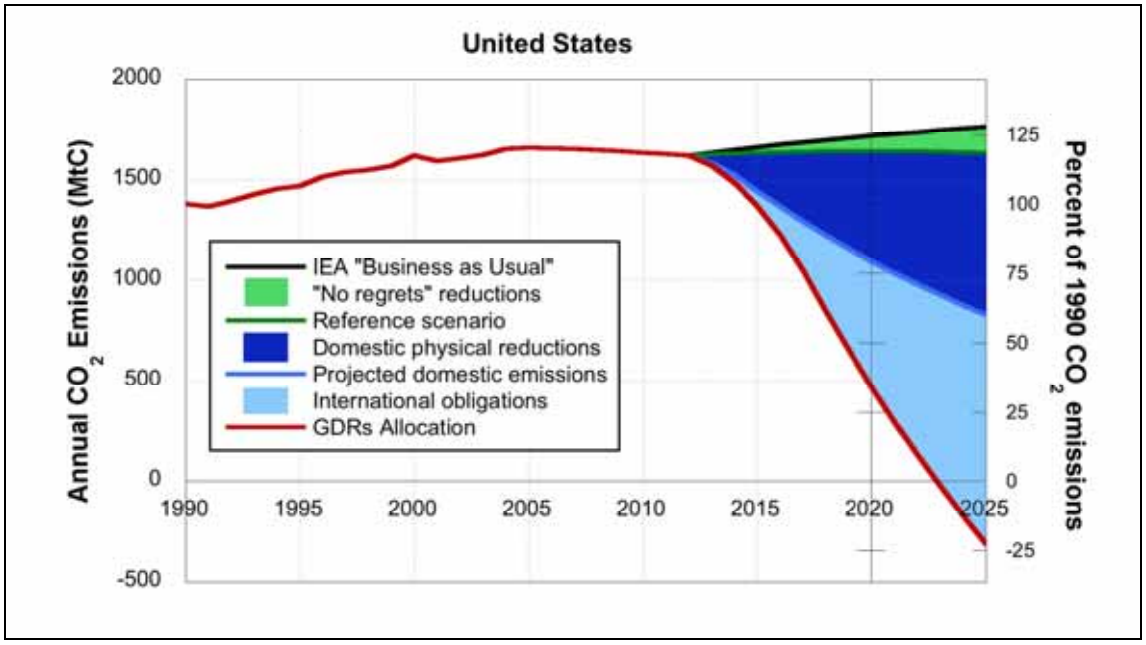

The implications of this burden sharing allocation are best revealed by 'zooming in' on individual countries. Doing this, it becomes evident that using the quite reasonable assumptions modelled in this study, wealthy and high emitting countries will very quickly come to have emissions reductions obligations that are larger than their projected domestic emissions. We demonstrate this with the case of the US.

Figure 5 shows the US business-as-usual path, along with three wedges of reductions. The first is the green wedge, which corresponds to the no-regrets reduction opportunities available in the US, which it is required to aggressively exploit. The other two wedges (the dark blue and light blue) together comprise the US' reduction obligation shown in Figure 4 (the red wedge equal to

[15] It is worth noting that this general approach is not novel. It is a direct descendent of the so-called 'Brazilian Proposal', although in that case national percentage shares of a global mitigation objective were to be divided among the Annex I countries alone, in proportion to their contribution to global temperature increase. That proposal would have produced a graph analogous in form to Figure 4.

32% of the global mitigation gap). The US' reduction obligation is divided into these two wedges to represent the fact that the US would choose to discharge some of its mitigation obligation through reductions *domestically*, and others would be undertaken *internationally*. The GDRs framework makes no intrinsic assumptions about the relative proportion of *domestic reductions* and *international reductions* that a country will choose in seeking to fulfil its mitigation obligations. With international purchases managed via a global cap and allocate system, say, a country would, at least in theory, be free to make any portion of its reductions domestically, and the remainder internationally, based on any nationally salient economic or political considerations. What is clear and striking is that even assuming very ambitious domestic reductions (about 6% annually, corresponding to a path heading toward 90% reductions by 2050, as shown by the red line in Figure 1), there is a need for substantial international emissions reductions concurrently.

*Figure 5. US allocation, showing no-regrets reductions (green), domestically discharged reduction obligation (dark blue), and internationally discharged reduction obligation (light blue).*

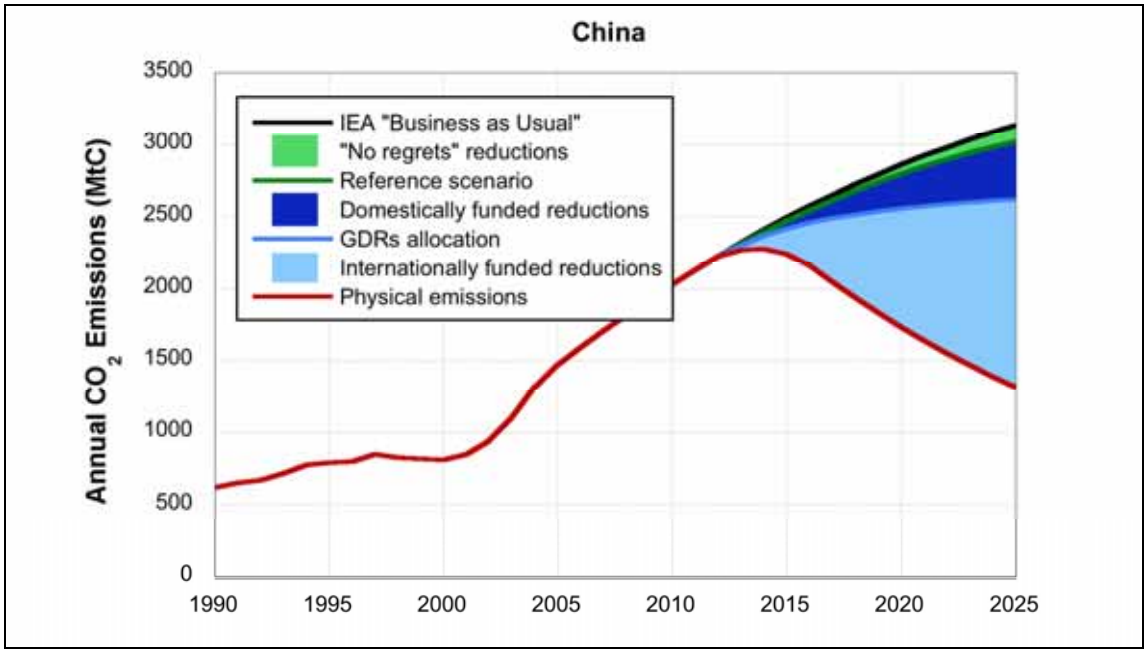



The developing country complement to the situations illustrated in Figure 5 is well illustrated by the case of China, shown in Figure 6. Again, the top path corresponds to China's business-as-usual path, and the green wedge to a portion of its no-regrets opportunities. The dark blue wedge corresponds to China's reduction obligation, (about 7% of the global mitigation requirement). The large light blue wedge shows a large additional set of emissions reductions made within China, but financed by countries (such as the US) seeking to discharge their own reduction obligations. The light blue wedge is, in essence, the converse of the light blue wedge shown in Figure 5.

These reductions are a natural and expected outcome of the GDRs framework, and a necessary feature of any climate regime that can possibly solve the climate problem. China's emissions are large, and fully exploiting its mitigation potential is essential if we're to keep within the emergency 2ºC trajectory. Recalling Figure 1, we reiterate that aggressive mitigation in the

South is a scientific necessity, but will only occur if it doesn't conflict with the South's urgent development needs.

*Figure 6. China allocation, showing no-regrets reductions (green), reduction obligation (dark blue), and further reductions supported and enabled by countries whose reduction obligations exceed their domestic mitigation potential (light blue).*




## 7. Institutions and mechanisms

Though we have illustrated above the implications of a GDRs allocation operationalised as a trading system, this is just a simplified example. In reality, much remains to be determined about how countries would actually pay their bills, or how their payments would be productively directed toward their objectives. Adaptation presents even greater challenges in this regard than mitigation.

The only thing that can be said for sure is that the scale and nature of the required financial assistance and technological cooperation is unprecedented, and that it will call for the expansion of existing institutions and mechanisms, as well as the creation of new ones that have not yet even been envisaged. Some of the adaptation funding could presumably be linked to conventional ODA, though not all of it. And some of the mitigation funding could presumably flow through market-based mechanisms like today's carbon trading systems, though not all of it. Any number of schemes might be called upon: progressive carbon and income taxes, trade-related levies, sectoral agreements, IPR concessions and so on. Beyond these, new as-yet unnamed channels for both international resource transfer and accounting would need to be conceived and implemented, inevitably posing an impressive set of challenges: how to scale-up? How to build absorptive capacity? How to ensure efficiency and avoid waste? How to institute credible governance?

These questions and others will be hotly debated, and this analysis provides no answers. Suffice it to say that the problems here are inadequately understood and extremely daunting, and that they are faced by the GDRs approach alone. In fact, they are shared by any climate regime that

purports to actually do something meaningful about mitigation and adaptation. In any case, the intention of this analysis is simply to draw attention to the enormity of the international cooperation that the climate problem demands, and to the magnitude of the financial assistance and technological cooperation that it implies for each country. By so doing, our hope is that a new discussion about international mechanisms can begin, one that is in line with the scale of the actual challenge.

## 8. Final Comments

The scientific evidence is bracing and demands a break with 'politics as usual'. The rapid rate at which reductions are needed globally means that carbon-based growth is no longer an option, neither in the North nor the South, and our response to the climate crisis must recognise that and make the alternative a reality.

A major commitment to large North-to-South assistance – financial and technological – is an inevitable part of that reality, as was agreed in Bali and codified in para 1 (b) ii of Decision 1/CP.13. Domestic reductions by the developed world, in other words, fulfil only part of its obligation. To be sure, the environmental community – and increasingly other stakeholders such as the private sector, civil society and forward thinking politicians – have done a spectacular job of putting the need for real *domestic* emission reductions onto the political agenda. But there's been precious little attention given to the underlying structure of the global climate-development problem, and to the consequent *international* responsibility of the industrialised countries to enable a rapid transition to a low-carbon world.

This will require a fundamental rethinking of many issues, be they political, social or economic. However, societies both in the North and in the South have grown accustomed to rather rapid and radical structural change in the past, and will certainly be able to do so also in the future. This is all the more important, since national societal enabling conditions are required to formulate negotiation instructions that will lead to robust and implementable international agreements.

For political reasons, if not for ethical reasons, a commitment from the wealthy of the South is also necessary. It unlikely that the working consensus to pay a large proportion of the total mitigation and adaptation costs could ever emerge in the North if the 'wealthy' minority among the Indian and Chinese populous were not also paying their 'fair shares'.

One can certainly ask whether such a framework, which makes the daunting climate challenge even more overwhelming by conflating it with developmental equity, is at all politically realistic. Well, as has been said by many others, the outer bounds of what is politically realistic today is far shy of the inner bounds of what is scientifically necessary. Political realism is rather labile, and it is much more likely that political realism will redefine itself (as climate impacts become more acutely felt) than that the science will fundamentally change. It is obvious that without an unprecedented level of global cooperation, an emergency programme simply cannot be implemented. The alternative to a solution along these lines is probably a weak regime with little chance of preventing catastrophic climate change.

This will require a fundamental rethinking of many issues, be they political, social, or economic. However, as Einstein said, "The significant problems we face cannot be solved at the same level of thinking we were at when we created them." Indeed, societies both in the North and in the South have undergone rather rapid and radical changes many times, and will certainly be able to do so also in the future. Indeed, the negotiators whom we are tasking with the design of a viable and effective climate regime can only reasonably be expected to succeed if the necessary societal enabling conditions have been put in place (Kjellén, 2008).

Since efforts will be demanded of all of us, fairness, equity and justice, real and perceived, are essential prerequisites for success. But the core of the issue is about politics. As nicely as a right to development may accord with one's innate sense of justice, this is really a matter of hard-nosed politics. Climate change is a problem ...perhaps humankind's first problem of this kind; where poor and wealthy begin to understand that we all share a small planet and that we are all interdependent. It also gives a new dimension to the word solidarity: the survival of the wealthy depends on their solidarity with the poor. And intra-generational equity is a necessity for the inter-generational equity we are striving for. We are all responsible, but the responsibility is indeed differentiated. The climate regime ultimately has to ensure the rights of the billions of people far away from the conference halls: the unseen poor of the planet today, and the unborn, future generations. Therefore, in order to ensure our common survival through success in extremely difficult negotiations, the North will have to engage with the South in a way that recognises and honours its entirely legitimate development needs on this shared, finite planet.

## Acknowledgements

The authors would like to thank Eric Kemp-Benedict of the Stockholm Environment Institute, who has developed the GDRs calculator and otherwise been an invaluable help in all sorts of quantitative, methodological and data-related matters. We also thank several other reviewers for detailed and extremely useful critical readings of earlier reports on which this one was based.

We also acknowledge the support of the Heinrich Böll Foundation and Jörg Haas in particular, Christian Aid and Andrew Pendleton in particular, Oxfam, Norwegian Church Aid, the Climate Policy Research Program of the Foundation for Strategic Environmental Research (Mistra) and the Stockholm Environment Institute.

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# A BOTTOM-UP APPROACH FOR INDIA*

## Background Paper No. 2

## Prepared for the ECP Seminar on Positive Incentives 17-18 April 2008, Madrid

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***Abstract***

The IPCC and the Bali Action Plan emphasize the urgent need to cut global Greenhouse Gas (GHG) emissions. Global agreement to limit GHG emissions is a formidable task. Therefore, novel ways of involving different groups and Parties need to be identified and deliberated upon. This paper examines the issues and opportunities presented for India. The paper briefly presents a status and trend of economic development and energy use in India, potential mitigation opportunities across select sectors and issues and barriers therein. The paper also describes some of the policies and programmes initiated by the Government of India that are aimed at energy efficiency improvement and also have GHG emission reduction benefits. The paper also presents discussion on liberating barriers associated with various mitigation options so that they could be implemented. These options are discussed at three levels, namely domestic actions, additional funding or support from abroad and policies and measure that require a wider international policy support.

*Key Words: Low-carbon society, bottom up approach, climate policy*

* The views expressed here do not necessarily reflect the views of The Energy and Resources Institute or the Government of India.

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# A BOTTOM-UP APPROACH FOR INDIA

## Background Paper No. 2

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## 1. The climate change challenge and the need for action

The Bali Action Plan adopted during COP13 endorsed deep cuts in global emissions to achieve the ultimate objective of the Convention and emphasised the urgency to address climate change. The task of designing and successfully negotiating an agreement that will deliver these reductions is a formidable one. It seems clear that novel ways of thinking are needed in order to facilitate this process. This paper discusses how an approach based on reviews of specific mitigation options and the associated barriers to implementation may provide a common ground for negotiating parties and a more effective climate regime.

Proposals for coordinated international action on climate change can be divided into two broad categories: top-down approaches and bottom-up approaches. Top-down approaches, with the Kyoto Protocol being perhaps the most prominent example, impose greenhouse gas (GHG) emissions targets on a Party level and leave the details of implementation to the countries themselves. In contrast, bottom-up approaches focus on creating and designing (the right) incentives for concrete actions, mainly but not exclusively, at country level, in an internationally coordinated way.

New energy infrastructure investments in developing countries, upgrades of energy infrastructure in industrialised countries and policies that promote energy security can, in many cases, create opportunities to achieve GHG emission reductions. A bottom-up approach will ensure efficient utilisation of energy and resources in the infrastructure being added in developing countries along with addressing environment and climate change issues. The developing countries may be wary of a restraint on economic growth as a result of a top-down approach.

This paper discusses how a bottom-up approach to an international climate agreement may provide better incentives for India to engage in such a global agreement to combat climate change. The basic rationale is that such an approach could offer better opportunities to ensure that the mechanisms of the agreement are aligned with the priorities and at the country level in

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India. The paper has three sections. First, we briefly outline the economic status and trends in India. Second, we show the range of mitigation options at different cost levels in India, including the primary barriers and drivers for realising these options. Finally, we discuss what policies are required to overcome the barriers, and which parts of an international policy regime are particularly important in this context.

## 2. Status and trend of economic development and energy use in India

Energy is a prime mover of economic growth and development. This is critically important for developing countries like India, where economic development is on the rise. Simultaneously providing adequate and equitable access to basic amenities and services is the immediate priority of the policy-makers of the country. Energy will also be required to meet the targets set by these countries under the Millennium Development Goals (MDGs) for improving the condition of the world's poorest by 2015. Therefore, only economic development can provide a lasting solution to address the problems of the country.

Economic reforms, implemented by successive governments over the past two decades, particularly since 1991, have resulted in the Indian economy maturing in several important respects and integrating much more with the world economy. India has experienced impressive growth rates in the recent past with a GDP growth rate of 9.0% and 9.2% in 2005-06 and 2006-07, respectively.[1] While this performance reflects the strength of the economy in many areas, it is also true that large parts of the population of India are yet to experience a decisive improvement in their standards of living. For example, around 44% of the households in India do not have access to electricity.[2]

Realising the fact that the future social and economic development of the nation is premised on achieving a high rate of economic growth delivered with equity and social justice, the Government of India in its Approach Paper to the Eleventh Five-Year Plan has set several monitorable targets to bring about a general improvement in living conditions of its citizens. The approach paper also emphasises that rapid economic growth has to be an essential part of the country's strategy.[3]

The positive relationship between energy requirements and human development is well recognised. Figure 1 supports the relationship between human development and energy consumption from the empirical relationship between Human Development Indicator (HDI) and energy consumption for different countries.[4] Over the years, India has made substantial progress in social welfare with the HDI increasing from 0.515, in year 1990 to 0.619 in year 2005.[5] However, the 128$^{th}$ position of India in the HDI list reiterates the fact that country has to move upward significantly in human development.

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[1] MoF (2007), *Economic survey 2006-07*, Ministry of Finance, Government of India, New Delhi.

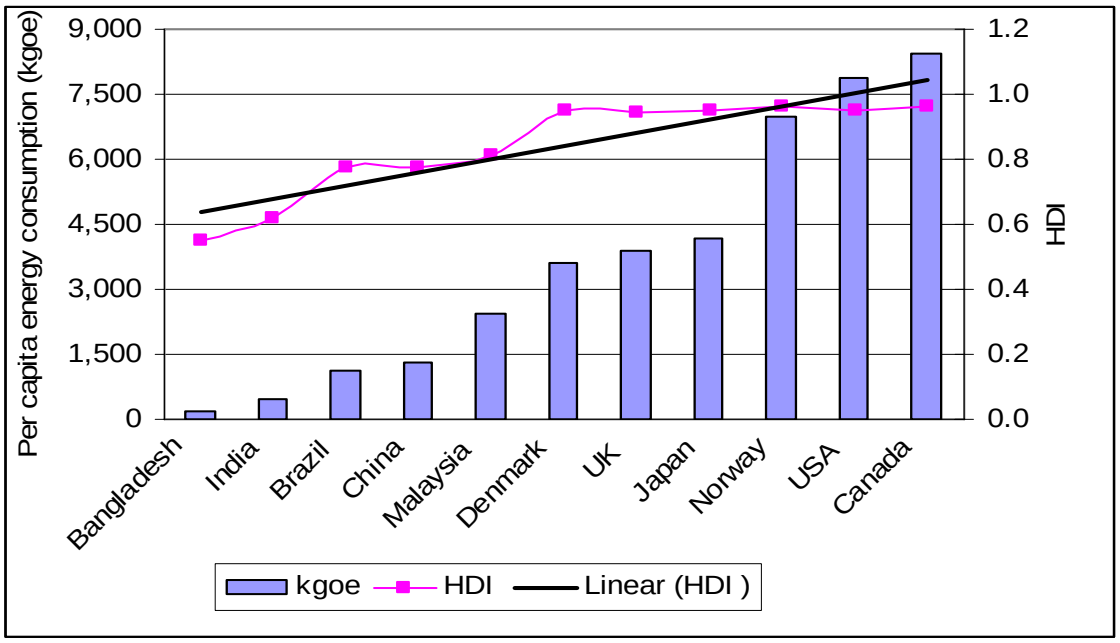
[2] Census of India (2001), *Final population: 2001 Census*, Office of the Registrar General, New Delhi.

[3] Planning Commission (2006), *Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan*, Government of India, New Delhi.

[4] UNDP (United Nations Development Programme) (2007), *Human Development Report 2007/08*, UNDP, New York, 2007 and IEA (International Energy Agency), *CO2 emissions from fuel combustion: Highlights (1971-2005)*, IEA, Paris.

[5] UNDP (2007), op. cit.

*Figure 1. Human development index and per capita energy consumption (for year 2005)*



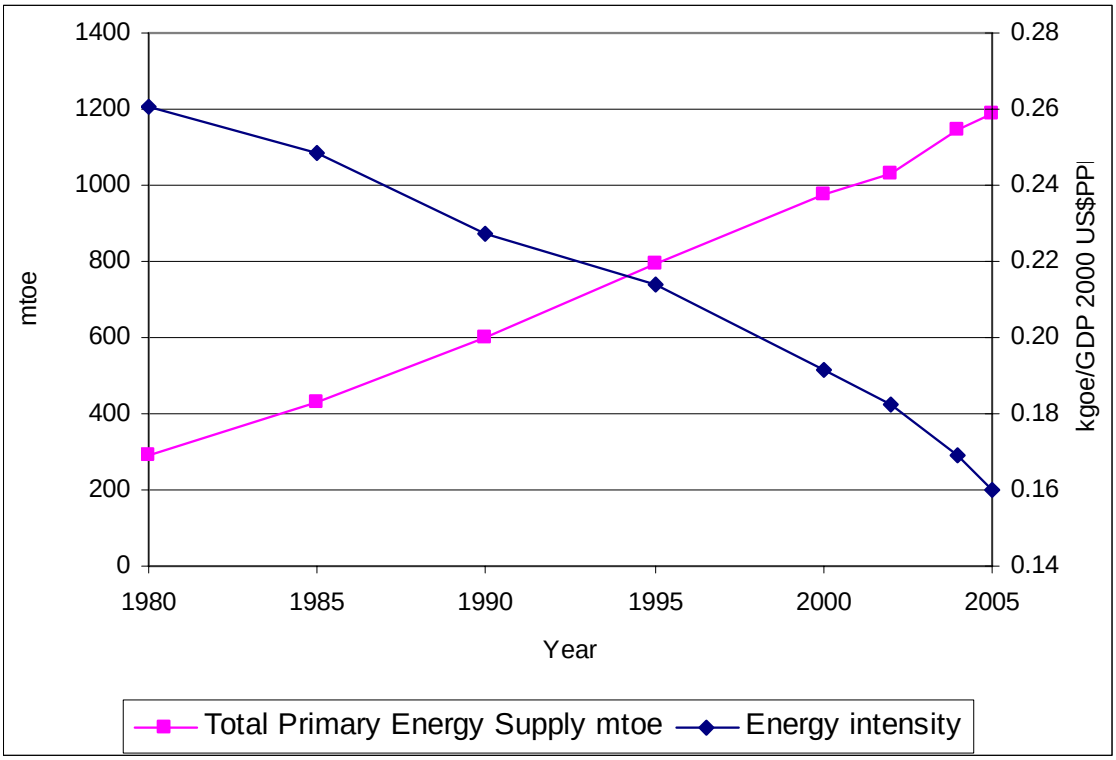

Growth in the Indian economy and consequently in the country's energy requirements is increasingly being seen as an important element in the future global energy scenario. At present, India ranks fifth in the world in terms of primary commercial energy consumption, accounting for about 3.9% of the world's commercial energy demand in 2006.[6] However, despite the overall increase in energy demand, per capita commercial energy consumption in India is still very low compared to other developed and major developing countries.[7] Furthermore, past trend shows that the energy intensity of economy is reducing continuously (Figure 2).[8]

[6] BP (British Petroleum) (2007), *BP Statistical Review of World Energy 2007* (available at www.bp.com/statisticalreview).

[7] IEA (2007).

[8] Ibid.

*Figure 2. Time trend of primary energy supply and energy intensity in India*




Latest commercial energy balance for India shows that coal is the highest contributor to the commercial energy supply followed by oil. During the year 2005-06 coal contributed for 53% of total commercial energy supply while oil had a share of 35% in the total commercial energy supply in the same year.[9] At the end use side, among all energy consuming sectors the industry sector remains the highest energy consumer followed by transport and residential sector. During the year 2004-05, the industry sector accounted for 44%, transport sector 17% and residential sector 14% of the final commercial energy use.[10]

Literature reveals that no country has substantially reduced poverty without massively increasing its use of energy.[11] Electricity, in particular, plays a crucial role in improving levels of human development and quality of modern life.[12] Given the strong correlation between economic activity and growth in energy and infrastructure, it is evident that energy requirements of the country would increase rapidly. The challenge facing India is to meet its energy needs in a sustainable manner.[13] This would require an introspection of energy conservation and energy efficiency improvement across different sectors. In order to promote the potential opportunities under different sectors, opportunities presented by the multi-lateral environmental agreements,

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[9] TERI (The Energy and Resources Institute) (2008), *TERI Energy Data Directory and Yearbook 2007*, TERI, New Delhi.

[10] Ibid.

[11] ADB (Asian Development Bank) (2007), *Energy for All: addressing the energy, environment, and poverty nexus in Asia,* ADB, Manila.

[12] Ibid.

[13] Planning Commission (2006), *Report of the Expert Committee on Integrated Energy Policy*, Government of India, New Delhi.

particularly the United Nations Framework Convention on Climate Change (UNFCCC) should be explored.

## 3. Potential mitigation opportunities – options and issues

As brought out in the previous section, energy requirements of the country will go up in order to meet the human development and poverty eradication goals. This would also mean an associated increase in the country's GHG emissions. It becomes very important for India not to ape the models of development adopted by the industrialised countries in the past but to follow a sustainable development pathway and keep its emissions controlled while continuing with its developmental priorities.

According to the first national communication of India to the UNFCCC, the aggregate emissions from the anthropogenic activities amounted to 1229 million tonnes of $CO_2$ equivalent.[14] On a sectoral basis the energy sector accounted for about 61%, agriculture 28%, industrial process 8%, waste disposal 2% and land use and land use change 1%.[15] The base year for the first national communication had been 1994 and since then the economy has expanded tremendously resulting into many-fold energy demand and GHG emissions.

Various sectors of the Indian economy present opportunities for emissions reductions and the table below presents a list of such options. The drivers behind these options presently are other than climate change, namely energy conservation, energy efficiency improvement, etc., motivated primarily by energy security and energy prices concerns. However, keeping in view the challenges of climate change and the need for significant emissions reductions by all the countries as recognised by Intergovernmental Panel on Climate Change (IPCC) and the Bali Action Plan, it becomes important that these opportunities are up-scaled several fold and with climate change as the prime driver. The necessary resources for these options could be explored under the mechanisms and framework provided through the multilateral environmental agreements, including the UNFCCC. Table 1 below presents a quick listing of such options in the power, industry, transport, and residential and commercial sectors. The table also presents a broad potential of their contribution to addressing climate change as well as their cost categories.

*Table 1. Mitigation potential versus costs*

| **Mitigation potential** / **Cost** | **Low** | **Medium** | **High** |
|---|---|---|---|
| **Low** | Super critical<br>Advanced gas turbine<br>R & M | Small hydro<br>Labelling of consumer appliances<br>Green buildings | Industrial energy efficiency<br>Transport sector interventions (public transport, road to rail & efficiency improvement)<br>Efficient lighting |
| **Medium** | Renewable energy options | Ultra super critical power plants | |
| **High** | | Hybrid vehicle for city transport | IGCC<br>CCS<br>Hydrogen-based IC engine for transport |

[14] MoEF (Ministry of Environment and Forests) (2004), *India's Initial National Communication to the UNFCCC,* MoEF, Government of India, New Delhi.

[15] Ibid.

In Tables 2-4 these opportunities have been further categorised into negative or zero-cost options, low-cost options and high-cost options. The cost estimates are based on the ball park numbers available in secondary literature that are primarily based on the average cost data and test bench efficiency figures. In reality, cost figures may vary from project to project, and energy efficiency may also vary depending upon several other influencing factors. In addition to these opportunities, there could be certain high-end technologies such as Integrated Gasification Combined Cycle (IGCC) based on domestic coal, carbon capture and storage (CCS), hydrogen based IC (Internal Combustion) engines and hybrid vehicles for transport. The table also captures the issues in the adoption/implementation of these options.

*Table 2. Mitigation analysis for India: Negative or zero cost options*

| Option | Barriers | Drivers |
|---|---|---|
| **Power** | | |
| R&M of old plant | Technical limitation to improve efficiency, Financially sick state utilities, opportunity cost of capital, financing | Energy security air quality improvement/health |
| Advanced gas turbine | Availability of technology | |
| Coal super critical | High initial cost, confidence on technology | |
| **Transport** | | |
| Shift from personalised transport to public transport | High investment, myopic urban planning | Air quality improvement/health, reduction of urban congestion, access to transport services, connectivity, energy security |
| Shift from road to rail for freight and passenger transportation | High investment, stressed infrastructure | |
| Efficiency improvement in road transport | Lack of efficiency standard and huge investment required for improvement in road infrastructure | |
| **Residential & commercial sector** | | |
| Efficient lighting (CFL, electronic chokes, etc.) | High initial cost, consumer confidence, performance, quality of power | Energy (bill) savings, energy security, |
| Labelling of appliances | New initiative, awareness | |
| Energy-efficient building | Know-how, mindsets, applicable only in new buildings, building construction and facility management are done by separate entities | |
| **Industries** | | |
| Industrial energy-efficiency improvement | Opportunity cost of capital, know-how at small-scale level capital constraints, variety of raw materials and products | Energy (bill) savings increase in productivity and economic competitiveness |
| Higher share of fly ash and blast furnace slag blended cement | Limited applicability, high transport cost of fly ash and slag | |
| Higher share of Natural Gas based ammonia production | Natural gas availability | |

*Table 3. Mitigation analysis for India: Low-cost options (<$10/tCO2)*

| Option | Barriers | Drivers |
|---|---|---|
| **Power**<br>Coal ultra-supercritical | Access to technology, high capital cost, confidence in project developer (only 24 plants operating globally) | Energy security<br>Air quality improvement / health |
| **Renewables**<br>Small hydro | Dispersed (maintenance problems), limited potential | Access to energy services, quality of life, economic development |
| **Industries**<br>Cogeneration in cement plant | High capital cost, opportunity cost of capital, lower technical capability in small plants | Energy (bill) savings<br>Increase in productivity and economic competitiveness |
| Efficiency improvement in Industries* | High upfront cost of technology, large capacity plant | |

* Within the category of industrial energy efficiency, there are a large number of technological options ranging from negative to low-cost categories.

*Table 4. Mitigation analysis for India: High cost options (>$10/tCO2)*

| Option | Barriers | Drivers |
|---|---|---|
| **Power**<br>IGCC – imported coal | High capital cost, forex burden, confidence (only around 10 plants operating world wide), adoption of the Indian condition | Energy security<br>Air quality improvement / health |
| **Renewables**<br>Biomass gasifier<br>Solar PV<br>Wind | High capital cost, O&M<br>suitable technology development, limited potential | Quality of life, economic development |
| **Transport**<br>Biodiesel | Land availability, competition with food crops, penetration, cost, procurement policy, involvement of oil companies | Air quality improvement / health<br>Energy security |
| **High-end technologies**<br>IGCC – domestic coal | High ash content of the Indian coal, tech development, R&D cost, high capital cost | Energy security, air quality improvement / health |
| CCS | High capital and O&M costs, info on storage sites, confidence level | |
| Hydrogen-based IC engine for transport | High cost, hydrogen production, storage, transport, safety | Energy saving, competitiveness |
| Hybrid vehicle for city transport | Nascent technology | |

Almost all the options listed in Table 2 are happening in India, although keeping in view the large size of the country, the resulting impacts are much smaller. With increased awareness about energy security, environment and climate change, the activities have picked up recently and are expected to increase further. With appropriate enabling environments by the government of India, investment frameworks and international mechanisms, deployment of these options could be accelerated and large-scale benefit could be achieved. It is also perceived that successful implementation of these options in India would also trigger upscaling deployment of these technological options in other developing countries.

For example, in the power sector, the government of India has a massive plan for renovation and modernisation of old power plants for their efficiency improvement. However, certain state utilities are not able to implement this option at a fast pace due to their poor financial condition. Similarly for deployment of super critical coal power plants, the Ultra Mega Power Projects (UMPPs) were announced by the Ministry of Power in early 2006. These UMPPs have been conceptualised with the aim of developing large generation projects. Under this policy, projects of 4000 MW would be developed on a Build Own and Operate (BOO) basis at each of the identified locations to ensure economies of scale. This had immense impact on the power sector as almost three-fourth of the total coal-based capacity addition during the twelfth five-year plan period (2012-2016) is proposed to be through this super critical technology. It is expected that India will be able to develop indigenous advanced gas turbine technology by 2012.

In the transport sector the National Urban Transport Policy (NUTP) of the Government of India seeks to encourage integrated land use and transport planning in cities, and focuses on greater use of public transport. The metro projects have been initiated for a number of cities in India. NUTP incorporates urban transportation as an important parameter at the urban planning stage. While presenting the rail budget for the year 2008-09, the Minister of Railways emphasised increasing the share of railways in freight traffic by augmenting the capacity on high-density corridors to meet the growth in freight traffic, promoting greater multi-modalism as a means of integrating with competing modes, increasing railway productivity through improved signalling, synchronisation, etc. However, these interventions would require huge investment and integrated urban planning.

With regard to efficiency improvement in the road transport sector, the National Auto Fuel Policy 2003 provides a roadmap for achieving various vehicular emissions norms over a period of time and the corresponding fuel quality upgrading requirements. All India Bharat Stage II and Bharat Stage III are similar to Euro II and III norms, respectively. This resulted in major investment to be made by fuel suppliers and auto manufacturers. The efficiency standards are indirectly related to fuel efficiency improvement, but no efficiency norms have been issued by the government so far.

The reduction of actual fuel consumption would also be a factor of road quality and other infrastructure and improvements in that would mean substantial costs. The efforts are on in this direction with improvements in road conditions, addition of flyovers, bus rapid transport, and the Golden Quadrilateral project, etc. but there is a long way to go. It is important to mention that a large share of transportation in India is still non-motorised. Furthermore, within personalised transport, the largest share is that of two-wheelers. The cars in India are generally small in size, leading to lower fuel consumption per km in contrast to that in developed countries. Consumers' sensitivity to the fuel bill has forced the manufacturers to make continuous efficiency improvements over the years.

In the energy efficient lighting, Compact Fluorescent Lamps (CFLs) have been in the market for more than 15 years. During this period, costs have come down manifold, yet the technology has not been able to make a dent in the market. The concerns related to extreme power shortages have led the utilities to find innovative means for bringing down the CFL cost and their large-scale promotion. Many of them are now getting into bulk purchases and are offering that to the consumers at relatively lower prices thus bringing in the economies of scale. CFL promotion will get a further boost with incumbent performance guarantee and innovations in the product mix to cater to aesthetic aspirations of the affluent sections.

The residential and commercial sector offers enormous opportunity for intervention and in the recent past the Bureau of Energy Efficiency introduced the Energy Conservation Building Code. The purpose of this code is to provide minimum requirements for the energy-efficient design and construction of buildings that use significant amounts of energy. The code is mandatory for

commercial buildings or building complexes that have a connected load of 500 kW or greater or a contract demand of 600 kVA or greater. The code is also applicable to all buildings with a conditioned floor area of 1,000 $m^2$ or greater. For effective implementation of and compliance with this provision, technical skill, know-how development and long-term planning would be required.

With respect to improving the efficiency of consumer appliances, a scheme on Energy Efficiency Labelling has been launched by the Bureau of Energy Efficiency of the Government of India. Participation in the scheme is voluntary and currently applicable for the following equipments:

1. Frost-free refrigerators,
2. Tubular fluorescent lamps,
3. Room air conditioners,
4. Desert coolers and
5. Distribution transformer.

The scheme has been developed in collaboration with all the stakeholders, and aims at providing information on energy performance so that consumers can make informed decisions when purchasing appliances. The labelling of other equipment and appliances would be introduced in a phased manner. Informal feedback received from shopkeepers reveals a positive response by consumers to this initiative and demand for products with higher energy labels.

Due to the market de-regulation, high energy costs and the availability of efficient technologies, major industries in India are able to reduce their energy consumption by a great percentage. In fact, energy efficiency of the most efficient plants in some of the industries – namely cement, fertilizers and refineries – is among the best in the world. However, the medium and small-scale industries have a long way to go.

To summarise, the key barriers to the adoption of the options listed above could be grouped into lack of funding, access to technologies, confidence on technology, awareness generation, capacity-building, etc. Some of these barriers could be released through domestic policy interventions while for others additional support through bilateral collaboration may be helpful. There may still be some barriers, which would require wider international policy support.

The following section discusses some of these potential remedies.

## 4. Way forward

The potential mitigation opportunities listed in Tables 2 to 4 need to be reassessed to find out how these could be freed of the associated barriers and implemented in a successful manner through appropriate policy interventions or the introduction of programmes. Potential policy interventions and programmes could broadly be classified under following three categories:

1) those that can be released through domestic action;
2) those that require additional funding or support from abroad, e.g. through bilateral collaboration; and
3) those that require a wider international policy support.

## 4.1 Domestic actions

### 4.1.1 Improving energy efficiency in large industries

The market forces and government policies exist to a great extent for the large-scale industries. There is a need for up-scaling the activities in this category. The government of India enacted the Energy Conservation Act in 2001 to promote more efficient management of our scarce energy resources. The Act promotes competition, sharing of information, creating awareness and motivating stakeholders. It encourages a transparent and a self-regulating mechanism to promote energy efficiency. Under the Act, the government of India has notified nine energy-intensive industrial sectors, namely thermal power stations, fertilizer, cement iron and steel, chlor alkali, aluminium, railways, textile and pulp and paper, as designated consumers, who are required to employ a certified energy manager, and also conduct energy audits periodically. In addition, the designated energy consumers are also required to adhere to any specific energy consumption norms that may be prescribed. Further, for adoption of energy efficiency measures in the small- and medium-scale industries, it is imperative to promote energy audits in these units to come out with unit specific suggestive measures.

In order to bridge the gap between the industries with world-class energy efficiency, and those with poor performance, the government is initiating a programme to develop energy-efficiency improvement targets for industries within each sector. This would lead to a narrowing of the energy-efficiency bandwidth, as well as to a decrease in the sectoral average specific energy consumption.

### 4.1.2 Interventions in SMEs

The small and medium enterprise plays an important role in the Indian economy accounting for about 40% of the gross value of output in the manufacturing sector and contributing to over 34% of total exports from the country. The sector is plagued with the use of obsolete technologies, non-availability of ready-made technological solutions, a low level of awareness/information availability, non-availability of technology providers at local/cluster level and relatively high cost of technologies and poor access to finance and is thus faced with low energy-use efficiency.

As the technological and financial capacities of the SMEs are limited and they are not able to undertake technology upgrading on their own, the government has taken a few steps to support this requirement. Some of these examples include a Technology Upgrading Fund Scheme for textile industry, Credit Linked Capital Subsidy Scheme and Credit Guarantee Fund Scheme for Small Industries.

- Technology Upgrading Fund Scheme

  TUFS for textile industry was initiated by the Ministry of Textiles in the year 1999 with a view to sustaining as well as improving the competitiveness and overall long-term viability of the textile sector. The scheme intends to provide timely and adequate capital at internationally comparable rates of interest in order to upgrade the textile industry's technology level. This type of initiative could be of help to other industries as well.

- Credit Linked Capital Subsidy Scheme (CLCSS)

  The objective of the scheme is to facilitate technology upgrading of tiny and small-scale industry (SSI units) by providing 12% capital subsidy for the induction of proven technologies in a host of sectors.

- Credit Guarantee Fund Scheme for Small Industries

The government approved the Credit Guarantee Fund Scheme for Small Industries in May 2000, with the objective of making available credit to SSI units, particularly tiny units, for loans up to $ 25,000 without collateral/third party guarantees.

Keeping in view the large expanse of SMEs across a range of sectors, the schemes mentioned above are not sufficient and need to be scaled up several folds. The opportunities offered by the carbon markets and its potential variants and offshoots in the future should also be explored to support the upscaling. Further, the above schemes should have a linkage with the Clean Investment Framework for coherence between the international climate approach and domestic frameworks to realise the benefits on a large scale.

Most energy-efficient equipment requires higher upfront investment. In some of the renewable energy technologies, government provides for accelerated depreciation up to 80% in the first year. A similar kind of provision of accelerated depreciation on energy efficient equipment would definitely increase the deployment of such equipment. Further, a reduced rate of value added tax (VAT) on energy-efficient products would also help in reducing the high upfront investment to some extent.

### *4.1.3 Policy and regulatory regimes for promotion of climate change actions*

There is a need to review existing policies and programmes across various sectors to assess if they support climate change actions and encourage domestic industries to take a proactive approach in improving energy efficiency and addressing climate change. Further, such a probing and appropriate policy intervention would also help provide a healthy investment climate for promoting required investments. Appropriate government backing and investment flows would help develop the markets for energy efficiency.

### *4.1.4 Large-scale awareness generation*

Knowledge about energy efficiency and technological choices is increasing in India. Nevertheless, in view of the large size of the country, the information needs to be spread to all the different sections and to all the different parts of the country. An informed market and society will help the energy-efficiency and climate-change agenda to take off.

Moving on to the bilateral and international levels, Table 5 provides an overview of possible remedies to release the emissions mitigation potential in India at these levels.

*Table 5. Possible remedies to potential barriers*

| **Barrier** | **Possible Remedy – Bilateral** | **Possible Remedy – International Climate Policy Collaboration** |
|---|---|---|
| Lacking funding | Venture capital<br>Collaboration on planning reforms<br>Funding programmes<br>Collaboration on institutional reforms; Assisted economic reforms | CDM or related project-based mechanism<br>Clean investment fund<br>Global price through emissions trading<br>Global price through harmonised national tax |
| Access to patents and technology | Joint research programmes<br>Joint ventures<br>Research collaboration | Sector agreement (with benchmark) for specific industries (e.g. cement or aluminium)<br>Research and technology agreement |
| Awareness and capacity-building | Joint venture | Joint information and education programmes |

## 4.2 Policies and measures that require additional funding or support from abroad, e.g. through bilateral collaboration

### 4.2.1 Clean Investment Framework and Funds

Most of the energy-efficiency improvement initiatives require high upfront investment and there is a need to explore various possible options to support such actions in developing countries. Various possible sources to contribute to such a fund include the following:

– *Financial support from Annex I countries for large-scale technology deployment and diffusion of established technologies*

  There is a strong need for large-scale deployment of established technologies in developed and developing countries. Cooperation among countries with regard to transfer of technologies can play an important role in the promotion of these technologies by a broad set of countries, thus making a significant contribution to climate change mitigation. Developing countries, due to their weak technological and financial capacities, depend on developed countries for their climate change mitigation actions. Realising this differential capability of countries, the UNFCCC called for Annex II countries to 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.

– *Mobilisation of public and private sector funding and investment, including facilitation of climate-friendly investment choices*

  The role of public sector in the transfer of Environmentally Sound Technologies (ESTs) becomes particularly important, as there happen to be weak pricing mechanisms or policies to incorporate environmental costs. The public sector typically engages in long-term and infrastructure investment projects. Initiatives promoting technology transfer have mostly taken the shape of Overseas Development Assistance (ODA) contributions. Overall, a downward trend has been seen in ODA, both in absolute terms and as a percentage of funding for projects.

  Private sector initiatives essentially require a strong macroeconomic and environmental framework to adequately support ESTs, so that they are financially viable. Even if this is the case, it may not cover other aspects of concern to financial markets such as the significance of climate change to their businesses or the risks involved. The private sector finds it most difficult to finance high-risk and long-term projects – the very nature of ESTs (low operating costs and high up-front expenditure).

– *Venture capital*

  For encouraging technology research and development, the role of venture capital could be explored. Venture capital for technology innovation is a special type of financing arrangement as its provisions are customised to the needs of the receiver and the skills of the provider. Venture capital for technology innovation could be used for the following purposes:

  - Seed financing – which could be given to the developer of the technology,
  - Start up financing – which could be given to the technology developer for product development and initial marketing,
  - First stage financing – which could be given for the technology transfer to take place and for initiation of production at a commercial scale and marketing,

- Second stage financing – for expansion of the scale of production from the technology and
- Later stage financing – for large-scale expansion of an enterprise that has been already profitable.

The use of venture capital through interaction between technologists, entrepreneurs would contribute towards taking the new technologies for climate change to the market. These funds could be used for purposes carrying high risks and hence the term-lending structure of these funds has to be designed in such a way so that the provider of the venture capital knows that the funds would be used for high-risk investments. So the funders would be ready to accept the high risks of failure, which has to be reflected in the interest rate structures (cost of capital). The returns from these funds could also be high and hence the providers of venture capital for climate change have to work in a high-risk-high-return framework of financing.

A broad framework for clean investment would encourage the developing countries to frame appropriate policies and initiate suitable programmes having linkages with such a framework. Further availability of funds through the options mentioned above would help in deploying and diffusing existing technologies to a great extent. The availability of such a fund may also trigger adoptions of certain technologies at the threshold of economic viability if the fund can support the upfront cost.

#### *4.2.2 Training and capacity-building*

Funding alone for technology transfer cannot ensure the success of a particular technology. It is the role of policy to provide instruments for capacity-building to absorb technological intervention to make the transfer effective. Strengthening technological know-how will also help to review and upgrade national strategic approaches. Timely and regular review of actions and programmes will help to ensure regular upgrading by identifying the missing linkages. However, inadequate spending by the government undermines such actions.

### *4.3 Policies and measures that require a wider international policy support*

#### *4.3.1 Carbon markets and carbon funds*

The carbon markets – CDM, JI, the EU ETS, etc. provide a boost to the introduction of clean and environmentally sound technology-based projects. CDM, which is the presently available carbon market for India, by design envisaged technological transfer to developing countries from Annex I countries and financial resources through carbon trading. Participation in CDM provides an opportunity to developing countries to get these resources for complementing their sustainable development efforts.

India has been quite proactive in the CDM field and has the distinction of having the maximum number of projects registered with the CDM Executive Board. More than 500 million CERs are expected out of these projects, amounting to more than $18,000 million.

Continuity of the carbon market post-2012 and a sizeable market will encourage further actions. Further, the CDM projects so far have been individual projects whereas there is a need to transform sectoral activities or activities under a policy or programme of the government of India into CDM projects. This will have the dual benefit of sectoral improvements and environment and climate change.

### *4.3.2 Intellectual property right (IPRs)*

Intellectual property rights are often cited as a barrier to the transfer of technologies. It is difficult to arrive at a conclusion with respect to the exact amount of impact that IPR has on technology transfer either by way of reduced access or increased prices. In order to ascertain this, there is a need to carry out a detailed product-by-product and country-by-country analysis. However, there is some level of agreement in regard to IPRs having an impact on technology diffusion. In light of this, there have been many suggestions in the recent past to address IPRs as a challenge in efficient transfer of technology that is useful for mitigating climate change. These range from trying out compulsory licensing to joint ownership to technology acquisition and knowledge repository funds.

### *4.3.3 Technology transfer and adaptation to suit Indian conditions*

Technology transfer should be considered in its true sense i.e. not merely the transfer of the equipment but also training and capacity-building in the know-how. It is commonly observed that during the process of technology transfer, the know-how is transferred but know-why is an area that is relatively ignored and needs to be addressed. Unless these components are also a part of the technology transfer, the benefits gained would not be substantial. Further, there would also be a need for customisation of the technologies to adapt to Indian condition so as to work at the optimum efficiency. This should, therefore, be an integral part of any collaboration on technologies.

### *4.3.4 Collaborative research and development*

Joint research and development is suggested to be another means to address the issues related to intellectual property rights. The viability of such proposals, however, needs to be examined through some pilot projects. The future climate regime should be designed in such a manner that it provides incentives for technology development and transfer, through enabling collaborative R&D and/or transfer as part of commitments by Annex I countries.

## 5. Concluding Remarks

This paper presents an overview of some of the large development challenges India still faces. Even though economic development is the primary concern of the country, many climate change mitigation activities are being undertaken, albeit often with a view to addressing energy savings and security issues, Furthermore, a bottom-up analysis of various sectors shows that the Indian economy offers significant opportunities for GHG emissions reductions even as it continues to grow. The learning from a bottom-up and sectoral approach needs to be integrated into the current discussions of a new international climate change regime to a larger extent than it has been in the past. A future climate regime should contain mechanisms for releasing barriers to specific technological and institutional measures at the international level and provide incentives for interventions at the country or even local level.

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## Acknowledgements


This paper is an outcome of the CLIPORE programme of the MISTRA Foundation. Authors express their deep sense of acknowledgement to the MISTRA Foundation for their support.

# SECTORAL APPROACHES TO ADDRESS CLIMATE CHANGE:

## *WHICH MODEL(S) IS (ARE) THE MOST PROMISING?*

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**Background Paper No. 3**

**Prepared for the ECP Seminar on Positive Incentives**
**17-18 April 2008, Madrid**

**Christian Egenhofer (Lead Author)**

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# SECTORAL APPROACHES TO ADDRESS CLIMATE CHANGE: *WHICH MODEL(S) IS (ARE) THE MOST PROMISING?*

## Background Paper No. 3

**Christian Egenhofer[♣] and Noriko Fujiwara[♦]**

## 1. Introduction

Since 2005, there has been increasing interest in 'global sectoral approaches' to address climate change. Key developments have been the 2005 OECD high-level roundtable on transnational sectoral agreements for climate policy and the July 2005 G8 Gleneagles Plan of Action. In parallel, there have been calls for the analysis of sectoral dimensions, including 'competitiveness' issues and sectoral approaches within the negotiations of the UN Framework Convention on Climate Change (UNFCCC). Sectoral approaches have been prominent during the global climate change negotiations in Bali, Indonesia in December 2007. The Bali Action Plan includes a specific reference to sectoral approaches, thereby ensuring that they are part of the negotiations for the post-2012 agreement. One of the earliest examples of sectoral approaches can be found in the sectoral task forces organised under the Asia-Pacific Partnership on Clean Development and Climate.[1]

Within the EU, the Communication on climate change prepared by the European Commission (2007a) for the March European Council, which subsequently adopted the EU integrated climate and energy policy, made explicit reference to "sectoral approaches" albeit within the context of "action in developing countries". The European Commission's High-Level Group on Competitiveness, Energy and the Environment in its fifth report (European Commission, 2007b, p. 3) calls for a "roadmap … to set out the route to operationalise sectoral approaches". Finally, the Commission's proposal to revamp the EU Emissions Trading Scheme post-2012 in Article 10b (European Commission, 2008, p. 26), which deals with "measures to support certain energy intensive industries in the event of carbon leakage", states that any "binding sectoral agreements … subject to mandatory enforcement arrangements" shall be taken into account if measures countering carbon leakage are designed.

## 2. Why sectoral approaches?

Even in absence of an agreed global long-term target, the urgency of addressing climate change is now accepted. This has been reiterated by the Gleneagles and Heiligendamm G8 summits, the Major Economies Meetings and through the reference in the Bali Action Plan to the work of the IPCC Fourth Assessment Report. At the same time, global $CO_2$ emissions from energy production and use are expected to grow rapidly. For example, the 2007 *World Energy Outlook* issued by the International Energy Agency (IEA, 2007), representing all OECD countries, projects that if governments stick with current policies, the world's primary energy needs would grow by 55% between 2005 and 2030, at an average annual rate of 1.8% per year. As fossil fuels are expected to remain the dominant source of primary energy, accounting for 84% of the

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[1] See APP (2007) and Fujiwara (2007).

overall demand increase, global energy-related $CO_2$ emissions between 2005 and 2030 are projected to grow too. $CO_2$ emissions are expected to rise by 57% between 2005 and 2030. Developing countries, whose populations and economies are the fastest growing, would contribute 74% of the increase in global primary energy use in this scenario. If greenhouse gas (GHG) concentrations are to be stabilised at a level that would prevent dangerous interference with the climate system, there is no doubt that urgent action is needed.

As Baron et al. (2007) note, implementation of binding emissions reduction targets such as in the EU and other developed countries has led to the search for a solution to issues such as competitive distortions and carbon leakage due to asymmetric carbon policies. Sectoral approaches are currently been explored, as they are seen as capable of:

- moderating competitiveness concerns in trade-exposed industries, e.g. by engaging sectors on a more global basis; thereby
- enhancing the scope of greenhouse gas mitigation, especially in emerging economies, through sector-specific objectives and instruments, and
- building commitments (e.g. targets) from a bottom-up sectoral analysis, which is regarded as being potentially more equitable.

Some industrial sectors are concentrated to such a degree that even a small number of companies represent a significant share of global emissions (see Box 1). A focus on major companies in a limited number of sectors holds out the promise to cover a relatively large percentage of emissions with one single policy that would apply across borders while assuaging concerns over competitiveness.

*Box 1. Candidates in industry for sectoral approaches*

| | |
|---|---|
| **Aluminium** | 0.9% of world GHG emissions (2004) |
| | 10 biggest producers = 54% of the world market |
| **Cement** | 4.6% of world GHG emissions (2005) |
| | 10 biggest producers = 25% of global output |
| **Steel** | 5.22% of world GHG emissions (2005) [direct emissions only] |
| | 10 biggest producers = 26% of global output |
| | 20 biggest producers = 35% of global output |

Other potential candidates include other energy-intensive industries such as float glass, a few heavy chemical industries, paper and pulp.

*Sources*: Vieillefosse (2007) and Baron et al. (2007).

## 3. Typology of sectoral approaches

There are several sectoral approach and models, which can be distinguished as follows:

- Bottom-up, government-led developing *country commitments*, possibly combined with 'no-lose' targets,[2]

[2] Under a system of 'no-lose' targets, developing countries would accept voluntarily a reduction target, and any reduction units that go beyond the targets would be 'credited' and allocated to either industry or governments, which can then sell them into carbon markets.

- Top-down *sectoral crediting* as an incentive mechanism, e.g. a sectoral Clean Development Mechanism (CDM).
- *Global sectoral industry approaches*, e.g. transnational industry-led approaches that aim at engaging a sector on a broad international basis or global sectoral industry approaches ("Sector-wide transnational industry approaches" according the IEA typology).

Each model is described briefly below.

## 3.1 Government-led sectoral approaches

The discussions about global sectoral industry approaches have been fuelled by a number of concepts involving elements of general sectoral approaches. Most of these approaches emphasise the role of a government.

- One model is the 'no-lose' target concept developed by the Center for Clean Air Policy in Washington, D.C. (see Schmidt et al., 2006). It describes a bottom-up method for encouraging sector-wide actions in developing countries, mainly emerging economies. Developing countries voluntarily accept a reduction target, expressed in either absolute or relative terms. Reductions that go beyond the targets will be 'credited' to either industry or governments and can be sold into carbon markets. The incentive for reducing GHG emissions is the potential reward in the form of credits. A CCAP (2006) study has identified what are claimed to be cost-effective emissions reductions for Brazil, China and India for electricity, cement, transport, paper and steel industries from 17 to 29% below business as usual levels in 2020.
- The Washington-based PEW Center on Global Climate Change has explored a concept that focuses on linking voluntary 'bottom-up' commitments to a common global framework. Such International Sectoral Agreements in a post-2012 Climate Framework foresee multilateral agreements in which governments commit to actions intended to moderate or reduce GHG emissions from a given sector via i) one or several stand-alone sectoral agreements, ii) a series of agreements linked under a common framework or iii) sectoral commitments as a complement to a comprehensive global climate change agreement (see Bodansky, 2007).

## 3.2 Sectoral crediting

Another model focuses on incentives for developing countries – emerging economies and others – to take on a unilateral commitment, motivated by the Clean Development Mechanism (CDM) of possible new crediting mechanisms. This could include the bundling of projects or the definition of a sectoral benchmark that allows crediting of all projects below the benchmark or crediting for policies that reduce emissions such as a congestion charge or refurbishing of houses. Theoretically, a programmatic CDM could allow for programmatic crediting, i.e. several projects undertaken and submitted to the CDM Executive Board by intermediaries. Closely related to this is sectoral crediting, which has been explored in-depth by the OECD/IEA (see Baron & Ellis, 2006). This approach foresees the sale of certified emission reductions (CERs) into a carbon market, such as the EU emissions trading scheme.

## 3.3 Global sectoral industry approaches

If judged by participation, momentum or public exposure, industry initiatives to date are the most relevant sectoral approaches.

- Discussions are currently taking place within the cement sector in the context of the Cement Sustainability Initiative (CSI) under the auspices of the World Business Council for Sustainable Development (WBCSD). The initiative first focused on a data-gathering exercise called 'Getting the numbers right', including a data base for existing technologies in the sector and a benchmarking system. In a second step, the CSI is moving towards policy proposals entailing possible country or regional baselines, negotiated with governments to form the basis of intensity-based objectives and a crediting system. Governments of emerging economies could engage through no-lose targets (see below), which then most likely would be broken down into sectoral sub-targets. The initiative examines as well how a cement sectoral approach could fit in with EU climate change priorities and notably the EU ETS.
- The International Iron and Steel Institute (IISI), representing some 200 steel-producing companies, including those from China, Russia and India, covering more than 70% of global steel production, proposed to replace cap and trade emissions trading regimes in May 2007 with a sector-specific framework that, among other things, encourages the phase-out of obsolete technologies. The IISI has invited governments to support the steel industry's long-term research initiatives for radical new technology solutions by encouraging demonstration and to engage with industry to develop reporting procedures (Jitsuhara, 2007). According to Baron et al. (2007, p. 60), under the APP and with bilateral support to China in particular, steel companies have launched a data-gathering exercise to establish indicators for the two main production routes.
- The most comprehensive initiative is the Asia-Pacific Partnership on Clean Development and Climate (APP), formally launched in January 2006. It consists of seven partner countries – Australia, Canada, China, India, Japan, the Republic of Korea and the United States. The initial six partner countries, i.e. excluding Canada, account for 45% of global GDP, 50% of GHG emissions and 48% of global energy use (Government of Australia, 2007), and produce about 65% of the world's coal, 48% of the world's steel, 37% of the world's aluminium and 61% of the world's cement. As a multilateral and a regional public-private partnership between industry and governments, APP focuses on the one hand on industry sector cooperation across countries to develop and deploy advanced technologies and on the other, on regulatory reform to remove identified barriers to technology development and deployment. The backbone is sectoral task forces where business, government and scientific researchers cooperate. The APP covers data-gathering and benchmarking exercises for three energy suppliers (cleaner fossil energy, renewable energy and distributed generation, power generation and transmission) and five energy-intensive sectors (steel, aluminium, cement, coal mining, buildings and appliances) (see Fujiwara, 2007 and APP, 2007).
- In the aluminium sector, participants in the sectoral approach of the International Aluminium Institute (IAI), a group of major aluminium producers worldwide, have set themselves a voluntary objective of achieving an 80% reduction of PFC (process) emissions and a 10% reduction in energy intensity, compared to 1990, by 2010. Having nearly reached the PFC reduction objective already, the IAI is considering setting more stringent targets for 2020. Discussions are being pursued within the industry on the potential applicability of a global sector crediting, no-lose model. The approach is based on an externally audited, comprehensive data-gathering system, under an IPPC-recognised protocol, from which the sector benchmark is developed (Porteous, 2007).

Additional initiatives exist such as the IEA's benchmarking exercise in the context of the implementation of the Gleneagles Plan of Action (GPOA).[3] Some stakeholders in the power sector are exploring the potential for a coordinated sectoral approach to mitigate GHG emissions.[4]

- A different model aims at setting global standards of specific products such as appliances, insulation or cars (e.g. $CO_2$ emissions or fuel efficiency). Examples are renewable energy quotas or feed-in tariffs but also EU or global energy efficiency or car efficiency standards.
- Other schemes aim at developing international cooperation on the special transport modes of aviation or maritime transport, which have been excluded from the Kyoto Protocol (see WBCSD, 2004; Åhman, 2008; Zetterberg, 2008).

Since industry-led approaches are the most developed among the initiatives under consideration, the following analysis will concentrate on this category.

## 4. Global sectoral industry approaches: Common elements

Without a doubt, the different industry-led models as well as all other sectoral approaches will evolve and develop as work on sectoral approaches within sectors and governments progresses. Irrespective of which model is preferred, there are a number of central elements that are common to all sector-wide industry approaches to date, as discussed below.

- Transparency, i.e. respect for confidentiality, collection of information and data (verified) about the status of a sector, e.g. benchmarking in different forms such as i) setting the sector boundaries, ii) documenting current industry performance on agreed simple metrics or key performance indicators and iii) identifying best-practice, i.e. comparing performance of equipment, plants or countries to this best practice, which in the longer-term could help identify common medium-term goals.
- Sharing and spreading of best practice within companies to increase operational efficiency, including diffusion of technology within the sector, typically to improve performance of the least efficient installations.
- Engaging governments and notably big installations of major industries in emerging economies, which is where most of the emissions growth and the reduction potential lie. Incentives to major industries can take many different forms.[5]

There are potential and actual additional benefits from sectoral approaches, although they do not apply to all initiatives and models.

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[3] The IEA was tasked by the Gleneagles G8 summit to identify best practice and indicate potential for improvements in energy efficiency in buildings, appliances, transport and industry. As a result, the IEA has embarked on an in-depth analysis of indicators to provide state-of-the-art data and analysis on energy use, efficiency developments and good policy practices.

[4] For example work undertaken by the Japanese power industry (Tachibana, 2007) focuses on i) keeping energy efficiency in existing plants, ii) deploying best-available technology to new power plants and iii) accelerating research, development and deployment.

[5] They can include, for example, technical assistance to improve operational efficiency or carbon management to exploit no-regret options, access to improved technology through speeding up of technology diffusion (of off-the-shelf technology/know-how) and/or developing sector-based GHG credits, e.g. through sectoral crediting or sector-based (CDM) crediting. They could also consist of threats for regulation.

- Sharing of best-practices of *governments* in order to remove regulatory and other barriers to rational energy use and technology diffusion. By definition this element is limited to initiatives that involve governments in some form. This element is most prominent in the APP.
- Joint learning between governments and business to better understand each other and jointly solve the problems of climate change.
- In some cases, sectoral approaches include cooperation in development of new breakthrough technologies such as the case of the $CO_2$ breakthrough programme of the International Iron and Steel Institute (IISI).

As a side-effect, the use of benchmarks, which are at the core of sectoral approaches, could add a rational element for definition of national goals and commitments, cap-setting and allocation (in the event that free allocation is chosen as an allocation methodology). Data definition and collection from sectoral approaches will provide governments with a more thorough base for abatement potentials in a given sector to allow them to set targets in a more equitable way while also ensuring that targets are achievable.

## 5. Main challenges for global sectoral industry approaches

In order to live up to expectations, however, sector-wide industry approaches as well as sectoral approaches at large will need to meet a number of tests. We have identified four crucial challenges that global sectoral industry approaches will need to meet in order to go forward.

### *5.1 Data definition, collection and use*

As a micro-level analysis, benchmarking is very data-intensive. Existing transnational industry approaches are designed as bottom-up schemes to collect information about the status of a sector, e.g. performance benchmarking. Therefore, there is rich experience regarding data collection and use within existing global sectoral industry approaches such as the ones initiated under the auspices of the World Business Council for Sustainable Development (WBCSD) CSI, the IAI and the IISI in addition to APP. The CSI for example has started a data-gathering exercise – "Getting the numbers right". Participating companies will need to provide data for all their plants, for the years 1990, 2000, 2005, as a start. In parallel, the APP task force on cement is also collecting energy and $CO_2$ data in partner countries. Both initiatives use the WBCSD Cement $CO_2$ protocol. Similar initiatives are being taken by the IAI and the IISI.

### *5.2 Risk of anti-competitive behaviour*

Global sectoral industry approaches almost by definition represent a form of sector-wide coordinated activity. This in return may raise anti-trust concerns in different national or regional jurisdictions. There is a risk that the potentially expanded roles of industry groupings or associations may raise antitrust concerns not only because they represent a sizable part of the global market but also because the cooperation moves closer to issues that relate to how the market functions. This can be solved by the use of independent 3rd parties to protect confidentiality of participants' information.

### *5.3 Incentives to emerging economies industries*

A precondition for global sectoral industry approaches to achieve one of its two main objectives, namely enhancing the scope of greenhouse gas mitigation, is the participation of

major companies of key energy-intensive industries in emerging economies, where most of the additional emissions will come from. However, developing country governments may see sectoral approaches as a means to push them to binding commitments.

Engaging companies in emerging economies will therefore depend on offering suitable incentives. These could include on the one hand transfers of funding through crediting mechanisms between developed and developing countries and on the other, sector-level cooperation to focus on improving the performance of the least efficient companies.

Yet even if these incentives work, they depend on a number of preconditions, as listed below.

- Sectoral crediting and/or the no-lose target concept depend(s) on data availability and collection, especially for the initial baseline data in industry in emerging economies.
- A second concern is developing country governments' capacity to deal with the complexities of crediting. Already the CDM in some cases tested the capacity of developing country governments. Sectoral crediting would be even more challenging.[6]
- Crediting would reinforce the advantageous competitive position of big companies of emerging economies vis-à-vis companies in Annex I countries. Many industry sectors in developed economies regard 'massive' crediting as a subsidy to their competitors in emerging economies, which thereby may reinforce rather than reduce competitiveness impacts on their business. Again, some sort of political deal would be needed, e.g. a departure from 'pure' crediting by setting more ambitious baselines (e.g. beyond business-as-usual) or to set a sunset clause or to develop a graduation threshold for developing countries beyond which they cannot claim credit for undercutting business-as-usual emissions. Whether this would generate sufficient incentives is an open question.

## *5.4 Governance*

Sectoral industry approaches face various governance[7] challenges, notably at the level of industry itself, in developing countries/emerging economies and within the UNFCCC secretariat. Another critical issue is the administrative capacity in some developing countries, i.e. how governments in emerging economies and developing countries in general can implement not only monitoring, reporting and verification but also baseline-setting and enforcement. A precondition for governance challenges to be met is that the UNFCCC secretariat or another organisation that is tasked as secretariat for a global climate change agreement will be able to handle the technical complexities surrounding sectoral approaches. Negotiations under the UNFCCC to date are political negotiations, whereas negotiations on technical issues tend to be delegated to other bodies. Many existing non-Annex I delegations

[6] Establishing a proper methodology can be technically tedious while politically contentious. Baron et al. (2007) assume that because of diversity among countries and sectors and complexity, sector-wide crediting will require a political deal at country, i.e. party level to set up the effort based on which credits would accrue. Such a deal could be made within or outside the UNFCCC framework.

[7] All sectoral approaches reviewed here could theoretically be conceived either as a separate, i.e. stand-alone pillar in an overall global policy framework, e.g. sectoral industry agreements as part of the post-2012 framework or as a complementary, perhaps cross-cutting element of national, regional or international policies and frameworks. Ultimately, the two may even converge. A third possibility is to regard sectoral approaches as an intermediate step between now and the agreement of a comprehensive global agreement. Given that sectoral approaches are very data-intensive and complex, it is unlikely, however, that government and stakeholders would engage in such a time-consuming exercise for a transition period only.

might find it difficult to handle the technical complexities that a sectoral approach for cement, aluminium or steel involves (see Baron et al., 2007; Bradley et al., 2007]).

## 6. Global sectoral industry approaches under the UNFCCC

To date global sectoral industry approaches are mainly bottom-up approaches that attempt to formulate sector-wide commitments. They are only starting to deal with the thorny issue of how to fit them into a global climate change agreement. To date, initial global sectoral industry approaches have the potential to put both national policies and measures and international negotiations onto a firmer footing. This can take various forms, e.g. i) identifying win-win mitigation options, ii) interpreting "common but differentiated responsibilities", iii) discovering abatement potentials that could unlock the reluctance of some negotiation partners, iv) realising cost-effective solutions, based on a good industry understanding, or v) making efforts comparable. Global sectoral industry approaches could also become a tool for the development and deployment of technologies. The IISI $CO_2$ breakthrough programme is the best-known example of such an approach. This could also include the development of a joint protocol to be approved by the UNFCCC, as has been the case with the aluminium protocol.

Any link of sectoral approaches to a global agreement will most likely need to rely on a high degree of both intergovernmental and industry cooperation with enforcement ensured by national governments. This could either be done within a 'pledge-and-review' model or possibly even combined with some sort of inter-governmental cooperation framework.

Another issue, which has been explored in greater depth by the OECD/IEA is the risk of creating sectoral '$CO_2$ havens'. One of the fundamental principles of global climate change policy is to ensure equal costs on different emitting activities. Different marginal abatement costs between sectors increase the overall economy-wide costs in achieving a given climate change target. A solution will need to be elaborated in the way sectoral industry approaches are linked to GHG emissions trading schemes or more generally, to the global carbon market.

## 7. Global sectoral industry approaches in an EU perspective

If sectoral approaches will be taken further in the EU, they will need to fit into EU policy priorities. The potentially strongest link between sectoral approaches and EU policies are with the EU ETS and the global carbon market. Benchmarks could play a useful role for cap-setting (i.e. agreeing the overall target) and/or allocation, i.e. distribution of allowances among the installations, for the development of global carbon markets and finally as a means to engage developing countries.

- If sectoral benchmarks – understood as a rate of $CO_2$ emissions per unit of intake – production or activity are based on 'best practice' or best-available technology in a sector, they can be used for setting the cap.
- A second possible application of sectoral benchmarks is for allocation, provided that free allocation continues. While initial free allocation of the EU ETS Directive has been based on grandfathering (i.e. based on historical emissions), the draft Directive foresees the use of benchmarks, if applied in a harmonised way across the EU. Global benchmarks would do away with EU efforts to develop them.
- A third potential application of benchmarks relates to 'linked carbon markets'. For the period 2013-20, before a single global carbon market is expected to be in place, the EU foresees the development of a global carbon market through linking of the EU ETS with other domestic emissions trading schemes. Linking however may require adjustment in

design options between different schemes. It may be facilitated and accelerated in as much as central design options such as MRV,[8] cap-setting and (free) allocation are converging. Sectoral approaches, including benchmarks, could facilitate such convergence.

- Experiences from data collection and benchmarking exercises under sectoral approaches could possibly become a tool to give a concrete meaning to the Bali Developing Country Paragraph. Both "measuring, reporting and verification" of "actions" to which developing countries have signed up in the Bali Action Plan and "measurable and verifiable" assistance in financing and technology transfer by developed countries – a commitment since the UNFCCC and discussed in greater detail in Background Paper No. 1 – may be more easily implemented at sectoral level.

## 8. Final remark

Irrespective of whether global sectoral industry approaches as we know them will successfully address the challenges that have been identified in this report, through their bottom-up and cooperative nature and data gathering, they already now positively affect the depth, speed and direction of the post-2012 discussions in at least two major ways. First, global sectoral industry approaches have the merit not only of improving hard data on emissions, abatement potentials and costs, but also of illustrating successful ways to increase energy efficiency and to speed up the diffusion of existing technology and the development of new technology. Therefore, they are likely to lead to real GHG emissions reductions. Second and perhaps even more important is the fact that global sectoral industry approaches represent a cooperative approach to a thorny, global, long-term problem. A growing number of people maintain that cooperative approaches to politically difficult, technically complex and long-term issues such as climate change are more appropriate than the traditional adversarial approach that has been dominant at least in the western world. Sectoral approaches offer perhaps the ideal way to develop a cooperative approach to climate change mitigation. It is increasingly clear that governments alone will not be able to achieve climate change objectives. Government efforts need to be combined with efforts by other stakeholders, notably industry and increasingly financial institutions.

[8] Monitoring, reporting and verification of emissions.

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## ECP Steering Group



## About the European Climate Platform (ECP)

The ECP is a joint initiative of the Climate Policy Research Programme (Clipore) of the Swedish Foundation for Strategic Environmental Research (Mistra) in Stockholm and the Centre for European Policy Studies (CEPS) in Brussels. Established in 2005, the ECP aims to facilitate interaction within the policy research community, mainly but not exclusively in Europe. Its working methods consist of bringing together a select number of policy-makers, negotiators and experts to vigorously debate key topics in the area of international climate change policy and to widely disseminate its conclusions. The ECP actively seeks dialogue with policy-makers and other stakeholders while being dedicated to academic excellence, unqualified independence and policy relevance. The ECP is governed by a steering group, drawn from government and academia. For further information, see: http://www.ceps.eu/Article.php?article_id=484 .

## About the Climate Policy Research Programme (CLIPORE)

Clipore is an international research programme that aims to stimulate policy-oriented research that contributes to moving forward global efforts to combat climate change. A steady and integrated process of research and dialogue with stakeholders lies at the foundation of the Clipore programme: spawning, developing, sharing, scrutinizing and refining ideas. The programme is comprised of two large climate policy research projects, independent university positions and the Clipore Policy Forum. For more information see: http://www.clipore.org

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