



Energy and Climate: Opportunities for the G-8

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More detailed documents on several of the specific proposals were prepared by the authors, as referenced in the text and published as:

- Carbon Trust (2008) Low Carbon Technology Centres.
<http://www.carbontrust.co.uk>
- Purvis, N. (2008) Narrowing the Transatlantic Climate Divide: A roadmap for Progress. German Marshall Fund Report.
<http://www.gmfus.org/publications/article.cfm?id=429>
- Muller, B. (2008) International Adaptation Finance: The Need for an Innovative and Strategic Approach. EV42. Oxford: Oxford Institute for Energy Studies, forthcoming July 2008. <http://www.OxfordClimatePolicy.org>

About Climate Strategies

Climate Strategies aims to assist governments in solving the collective action problem of climate change. It connects leading applied research on international climate change issues to the policy process and to public debate, raising the quality and coherence of advice provided on policy formation. Its programmes convene international groups of experts to provide rigorous, fact-based and independent assessment on international climate change policy.

To effectively communicate insights into climate change policy, Climate Strategies works with decision-makers in governments and business, particularly, but not restricted to, the countries of the European Union and EU institutions.

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Preface

With the rapid rise in oil prices, energy dependence and its economic consequences has again become a big issue. One form of energy insecurity, however, should not disguise the other and more fundamental insecurity associated with climate change. Emissions continue to rise and the immediate effect of high oil prices is to increase the consumption of coal on the grounds of cost and availability. That is already happening. Equally dangerous is the risk that the focus on prices will halt the momentum of the progress which is being made towards a global agreement to limit and reduce emissions and to keep the level of carbon in the earth's atmosphere within the margin of safety.

In reality the two challenges are linked and should be addressed as one. Real energy security can only be achieved when there are:

- diverse sources of supply which reduce the capacity of any single supplier to dominate the market or dictate prices (that diversity must include an ever-increasing proportion of supply from sources which produce minimal if any carbon emissions);
- diverse trade routes and infrastructure networks to eliminate bottlenecks and reliance on single, and potentially vulnerable links;
- a significant increase in the efficiency with which energy is used throughout the world, with technology transferred between countries to assist that process, and technologies such as Carbon Capture and Storage systematically developed in order to reduce emissions from hydrocarbon consumption;
- progress to reduce and where possible reverse trends such as deforestation which are contributing to the net growth of emissions.

None of these steps are beyond the reach of existing technology. We know what needs to be done and this paper, prepared for the Cambridge Centre for Energy Studies by Climate Strategies sets out some key steps that could and should be taken next. The focus of the paper is climate change but the impact of its recommendations would be to advance the agenda of energy security as a whole. Progress is attainable through international agreement around a series of rational steps.

The paper is addressed to the G-8 leaders meeting in Toyako, Japan, but its message deserves to be heard much more widely. Climate change and energy insecurity will not be resolved at any single meeting. An effective resolution must involve the major developing economies and must be based on an international agreement as practical and creative as Bretton Woods. We believe such an agreement is possible and that the G-8 could assist the process by taking specific steps to prepare the ground for a wider comprehensive agreement next year in Copenhagen.

Nick Butler
Chairman,
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Key Recommendations

The G-8 countries at the Toyako Summit must promote synergies between concerns about energy security and climate change. Rising food prices also highlight the need for long term, strategic management of climate impacts and adaptation. We identify five specific areas with associated specific recommendations through which the G-8 could turn the present crises into opportunities to invigorate the global effort:

I. Clarify the form of post-2012 mitigation and supporting commitments to be negotiated under the UNFCCC

Experience has demonstrated the importance of clear, legally binding commitments, agreed at an international level. Clear G-8 endorsement of this principle, and reference points for targets, will simplify the enormously complex task of negotiating, adopting and implementing an agreement under the UNFCCC:

Undertake to negotiate legally-binding but differentiated commitments to mitigate emissions significantly by 2020: developed nations should commit to fixed national emission targets which take account of both actions implemented and emission trends since 1990, whilst greater flexibility and technological and financial assistance will be needed for major developing country emitters to commit to quantified actions.

II. Accelerate technology development and diffusion

Technology is essential but efforts must span the whole chain of innovation, above and beyond R&D. A major challenge is to accelerate the commercialisation and international transfer and diffusion of better technologies globally:

Commit to establish and finance a network of Low Carbon Technology Innovation and Diffusion Centres, including in a range of key developing countries with support from industrialised countries, to accelerate the development and diffusion of energy efficient and low-carbon, non-oil energy technologies.

III. Reduce dependence on oil and associated emissions

The Summit must accelerate efforts to reduce dependence upon oil without increasing greenhouse gas emissions by adopting wide-ranging recommendations from the IEA and others on energy efficiency and the promotion of low-carbon sources, and take specific steps to address the most rapid source of global growth in oil consumption and emissions that currently falls outside all forms of regulation:

Support the introduction of specific, legally-binding international cap-and trade systems to limit the growth of oil consumption and emissions from international aviation and marine transport, and thus ensure that these activities pay for the costs they impose.

IV. Expand and restructure finance for adaptation

The rise of global food prices has exposed the vulnerability of global systems and in particular of many developing countries, foreshadowing the potential impacts of accelerating climate change caused by the accumulation of greenhouse gas emissions to date. These needs will grow over time and current financial levels and structures are inadequate to the task. The G-8 countries should:

Acknowledge that adapting to the adverse impacts of climate change will cost many billions of \$/€ annually, and that capacity to adapt requires long-term, strategic funding subject to appropriate international governance; consequently that G-8 countries will pursue new and innovative international financial mechanisms over and above traditional donor channels.

V. Develop the foundations for the global energy transition

Major economies need to develop a shared vision of the path towards sustainable, low carbon energy systems that provides global energy security, and to oversee implementation of agreed actions in this respect:

Seek to expand and strengthen cooperative structures, spanning all major economies, for shared analysis of the issues and options and potentially for managing appropriate dimensions of implementation at the request of the UNFCCC.

An expanded role for a restructured International Energy Agency, going well beyond its original oil focus and OECD scope, is one option that should be actively considered, and all participating economies should commit to implement more comprehensive systems of energy and emissions measurement.

Executive Summary

The G-8+ Summit in Toyako, Japan, offers an important opportunity for progress on energy and climate change. Responses to the oil shock are likely to define whether and how the world tackles climate in the long-term. Although high prices are driving greater energy efficiency, they are also leading to a surge of investment in more carbon-intensive fuels and resources like tar sands, oil shales and coal, all of which involve *more* CO₂ emissions. The response to the oil shock thus risks exacerbating, not alleviating, long-term emissions. Thus the G-8's central task is to promote synergies between the concerns about energy security and greenhouse gas emissions; its central outcome must ensure that responses to global oil prices support rather than undermine progress on climate change.

In addition, the G-8 should acknowledge the likely links between concerns about food prices, and the long term management of climate impacts and adaptation. In the final year of the US Administration and the first year of a new Russian President, it must also serve to advance their respective positions so as to maintain momentum, and thus help to create the conditions necessary for a successful outcome of global negotiations under the Bali Action Plan.

To these ends, we identify five key areas that should be addressed by the G-8 and under these areas offer specific recommendations that could be substantially advanced by appropriate commitment from G-8 countries at Toyako and after.

1. Form of mitigation and supporting commitments

To tackle climate change, governments must implement politically difficult domestic policy measures, sustained across successive administrations. To change their investments, companies must expect measures to be sustained, and have credible expectations about the strength of future action. In this context, experience has demonstrated the importance of clear, legally binding commitments, agreed at the international level. If ratified, these have far more impact on domestic policy formation than the purely domestic targets of any single administration, or voluntary agreements with business. In most countries, a firm legal basis is also required to give financial value to greenhouse gas emission reductions, for example through cap-and-trade systems.

The Bali Action Plan refers to the need for 'quantified emission limitation and reduction objectives, by all developed country Parties'. It does not state that these should be legally binding, or even the result of a negotiated outcome as opposed to purely unilateral declarations, nor does it indicate the basis of these commitments. The Bali Action Plan also refers to the need for 'measurable, reportable and verifiable nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported by technology and enabled by financing and capacity-building.'

Developments since Bali have increased the scope to give clearer direction to these twin statements. The US has indicated willingness to consider an agreement based upon legally binding, negotiated national caps but sees the key in the involvement of all major emitters; Russia recently offered a similar view; developing countries have stressed in particular the centrality of financial and technological support. Whilst a final resolution is likely to form the core of the Copenhagen process, Tokoyo could remove a great deal of uncertainty if it agreed that:

***Recommendation 1.* The UNFCCC negotiations should result in all major emitting nations making legally-binding but differentiated commitments to mitigate their emissions significantly by 2020. Developed nations should commit to quantitative, legally binding, and fixed national emission targets, which take account of both actions implemented and emission trends since 1990. Supported and enabled by clear and specific G-8 commitments on technology, financing and capacity-building, major developing country emitters should commit to legally binding, nationally appropriate, quantitative national or sector-specific goals, such as numerical objectives for improving energy efficiency and carbon-intensity, strengthening technology performance standards and reducing emissions from deforestation.**

By agreeing to this now G-8 leaders could add momentum to global climate negotiations, increase the prospects for concluding a new climate pact next year and, importantly, significantly improve the prospects that the United States Congress would ratify the new agreement.

II. Technology

The world's energy and environmental problems cannot be solved without accelerating the pace of innovation in low-carbon technologies. There are a wide range of technologies that could contribute, at various stages of development. The International Energy Agency has made a number of recommendations to the G-8 for enhancing energy technology research and development, and the Joint Science Academies have made a specific call for a massively increased commitment to fund demonstration projects on carbon capture and storage.¹ We endorse these calls.

Effective innovation is a much broader process than just publicly-funded research and development, and is driven in part by private sector expectations about future regulation, which defines how companies engage in R&D activities. Most publicly-funded R&D remains concentrated in the G-8 countries and transfer to private sector investment, domestically and globally, is very slow. Faced with the scale and urgency of the energy-environment crises, a large part of the challenge is to accelerate the commercialisation and international transfer and diffusion of better technologies.

¹ Joint Science Academies (2008) Joint Science Academies' Statement: Climate Change Adaptation and the Transition to a Low-carbon Economy. Available from <<http://royalsociety.org/downloaddoc.asp?id=5450>>

In this area, a huge gap remains that requires a different approach from large-scale public funding of demonstration projects on particular 'big-ticket' technologies. The need is for publicly-funded organisations that can work across a wide range of technologies appropriate to the needs of host countries and engage local as well as multinational companies in the process of commercialisation and diffusion. Extensive experience – both in the energy sector, and other sectors has demonstrated that appropriate initiatives can achieve this, and also (where appropriate) ensure that legitimate protection of Intellectual Property Rights does not form a barrier to accelerated diffusion. Specifically, the G-8 should:

Recommendation II. Commit to establish and finance a network of Low Carbon Technology Centres², including in a range of key developing countries with support from industrialised countries, to accelerate the development and diffusion of energy efficient and low-carbon, non-oil energy technologies, and thereby also contribute to an enhanced agreement under the UNFCCC on technology development and transfer.

III. Oil and emissions

The summit must accelerate efforts to ***reduce dependence upon oil without increasing greenhouse gas emissions from other energy sources***. There is a significant risk that responses to high oil prices could increase greenhouse gas emissions, through resort to technologies such as coal-to-liquids which could double the carbon intensity of transport fuels. Response measures should include accelerating efforts on energy efficiency as recommended to the G-8 by the International Energy Agency, and in the UN Foundation Expert Report on Realising the Potential of Energy Efficiency submitted to the Heilegendamm Summit last year. In addition, the G-8 countries should provide technical and financial assistance to help developing countries move to renewable energy sources (see II).

The strongest source of growth in global oil consumption and associated emissions is in the transport sector. International aviation and marine transport alone account for almost 10% of global oil consumption and over 1 billion tonnes of CO₂/yr, and the climate impact of aviation is around two to four times its CO₂ emissions due to emission of other gases at high altitudes. Both have been growing rapidly at a historic trend of 3-6%/yr and are expected to continue to grow substantially. Notwithstanding temporary impacts of high oil prices, projected growth would place unsustainable pressure on global oil supplies and is fundamentally incompatible with managing climate change, and in particular the G-8's mid-Century goal to reduce global emissions by 50%.

Unlike surface transport, these huge sources of oil consumption and greenhouse gas emissions are currently explicitly exempt from taxation and do not fall under any meaningful international GHG regulation. More than ten years of efforts to address them through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) have proved entirely unsuccessful.

² Low Carbon Technology Innovation Centres (2008) The Carbon Trust. Available from www.carbontrust.co.uk

Specific sectoral approaches, as advocated by the Japanese G-8 Presidency, are appropriate for international transport, but if the concept is to have any credibility the time has come for governments to step in with decisive action. Whilst international taxation is prohibited under existing international regulations, the same is not true of emissions limits with trading, which could effectively cap the sector's growing emissions and oil consumption. Phasing in auctioning of allowances over time would avoid immediate additional pressure on costs but still generate an important and predictable source of international revenue over time. There are no technical obstacles to adequate monitoring and reporting required for such a system. Consequently, the G-8 should:

***Recommendation III.* Support the introduction of specific, legally-binding international cap-and trade systems to limit the growth of oil consumption and emissions from international aviation and marine transport, and thus ensure that these activities pay for the costs they impose.**

IV. Adaptation and finance

Whilst the industrialised countries have understandably focused mostly upon debates around emissions mitigation, developing countries have increasingly emphasised other dimensions of the climate change challenge. They have stressed that, with basic economic development an overriding priority and for several other reasons acknowledged in the UNFCCC, most will require financial and technological assistance to engage in more substantial mitigation actions. Most fundamentally however, they increasingly emphasise that the 'real and present danger' for them is coping with the impacts of climate change. The fact that this is caused by the accumulation of greenhouse gas emissions to date underlines their case that industrialised countries must assist them in efforts to adapt.

Present financial assistance from G-8 countries for adaptation is inadequate in scale and inappropriate in form. Long-term, predictable finance is required to enable developing countries to invest in the capacity to make good use of adaptation funding. That requires expenditure modalities that are strategic, rather than tactical; do not depend on the vagaries of ODA-type replenishment and the politics of economic and electoral cycles; and are subject to appropriate international governance in which developing countries have an adequate stake. This in turn also implies innovative funding sources – for example, linked to regulation of international transport fuels and/or issuing of emission allowances. Consequently, the G-8 countries should:

***Recommendation IV.* Acknowledge that adapting to the adverse impacts of climate change will cost many billions of \$/€ annually, and that developing the capacity to adapt requires long-term, strategic funding subject to appropriate international governance; consequently that G-8 countries will pursue new and innovative international financial mechanisms over and above traditional donor channels.**

V. Foundations for the global energy transition

Responding to climate change involves issues of ever-growing complexity. Success will depend on a combination of carefully targeted agreements and implementation programmes working in support of a common goal. The development of adequate information, trust, and effective institutional structures to manage, oversee and link these efforts is essential. Adaptation is intrinsically a global challenge; the focus of mitigation needs at least to encompass the major economies, and this will only be effective if they can develop a shared analysis and vision of how to foster a global transition away from fossil fuels towards a low-carbon global economy.

The Bali Action Plan call for “comparability of efforts, taking into account differences in national circumstances” poses complex challenges. Assessing comparability of effort in emission goals – including through international transfers - will be hard enough. Action on both production and consumption of relevant traded goods might be relevant. Comparison might also need to put some value on efforts which offer indirect rather than direct emissions reduction - such as investment in technological research, capacity and enabling infrastructure, the development of renewable energies, and product labelling. And assessing ‘comparability of effort’ is just one of many potentially huge and ongoing analytic tasks.

The institutional needs to support implementation will be even more demanding. Countries cannot effectively manage their energy consumption and emissions without good, comparable data; the IPCC has established guidelines for national greenhouse gas inventories, but their application is limited particularly (but not exclusively) across developing countries. Developed countries will be unwilling to make large international transfers without commensurate confidence in the ability to track the use and effectiveness of those expenditures. Other measures, such as the network of innovation centres proposed, would benefit from international oversight. The management of linkages between domestic trading schemes will also pose new governance challenges.

Our contribution in this area underlines a number of principles upon which progress should be based. One of these is pragmatism – being willing to work with what can most effectively do the job. In this context, a key reality underpinning many of these issues is that they cannot effectively be addressed by the G-8 alone; yet nor can they realistically be conducted directly by the UNFCCC, which has the ultimate role in governance of global responses but which spans every country in the world. In an increasingly complex and globalised world, decarbonising energy systems need to be addressed by the world’s major economies working together. Where possible, responses should also seek to build upon the capacities of existing organisations, with relevant expertise but not at present directly focused on climate change. Consequently the G-8 should:

Recommendation V. Seek to expand and strengthen cooperative structures, spanning all major economies, for shared analysis of the issues and options and potentially for managing appropriate dimensions of implementation at the request of the UNFCCC.

An expanded role for a restructured International Energy Agency, going well beyond its original oil focus and OECD scope, is one option that should be actively considered. In addition, tackling key issues will require major economies to implement more comprehensive systems of energy and emissions measurement and reporting in accordance with established recommendations of the IPCC.

Introduction and Overview

Michael Grubb, Bernhard Schlamadinger³, Yuri Safonov, Yasuko Kameyama and Nigel Purvis

An old Chinese proverb holds that crises are also opportunities. In this year of unprecedented surges in oil and food prices, the central challenge for the world's richest economies is whether their governments succeed in turning these short-term crises into opportunities for addressing the biggest long-term problems that humanity faces. All their efforts this year to respond to current pressures will be ultimately futile if they do not also progress action for tackling climate change - both reducing emissions, and laying the basis for coping with impacts that are already unavoidable.

The report addresses five specific issues, on which we commissioned short analyses by leading experts from across the G-8, and develops associated recommendations. These cover the fundamental areas of: the nature of emission commitments; a strategy for accelerating technology innovation and diffusion; sectoral approaches to including the key omitted sectors of international transport; addressing the realities of climate impacts and adaptation needs; and the institutional basis for supporting a transformation of the world's energy systems.

The list of recommendations is of course not comprehensive – *Climate Strategies* is for example conducting a separate analysis of deforestation, in which the central actors are not G8 countries - but rather highlights a set of core issues that have to be addressed by the major industrialised nations if there is to be meaningful global progress. Thus the report explains opportunities which we believe can and should be seized at the Toyako G8 Summit, but these should also form a longer-term agenda for the G8+, and more widely.

Many governments have been privately sceptical about the prospects for any major advance on climate change this year. They question whether there is any significant political energy to address climate change when so much attention is focused elsewhere on the "more immediate" crises; and many openly suggest that it will be more productive to wait until a new US Administration is in place. This view is mistaken; the G8 Presidency under Japan, including the design of any follow-up process to the Toyako Summit that it may launch, presents a crucial opportunity.

First, responses to the oil shock are likely to define whether and how the world tackles climate in the long-term. Although high prices are driving greater energy efficiency, they are also leading to a surge of investment in more carbon-intensive fuels and resources like tar sands, oil shales and coal, all of which involve *more* CO₂ emissions. The response to the oil shock thus risks exacerbating, not alleviating, long-term emissions. This will only be avoided if the world's rich countries lead the

³ Research Director, Climate Strategies: for other author affiliations see inside cover.

way to emission controls and other policies that channel investment towards lower not higher carbon resources.

Time is short also in the global negotiating process for post-2012 action that was launched at the Bali Conference of Parties, which is due to culminate at Copenhagen in December 2009. Pushing off all major decisions until next year would jeopardise the internationally agreed upon goal of concluding a climate agreement in 2009. The post-2012 climate negotiations are politically and technically complex. Trying to resolve all major issues in the calendar year 2009 would strain the international process. The collapse of climate negotiations at The Hague in December 2000 demonstrated the risks of trying to resolve a large number of issues in a very short time.

Moreover through the first few months of 2009 at least, the United States will be unprepared to negotiate; there will not be a senior-level climate team in place until late spring at best, given the need for Senate approval of political appointees, and more time will be needed to develop a negotiating position and gain the support of Congress and key stakeholders. Resolving some key issues this year would keep the negotiations manageable and on track. Furthermore any G-8 consensus on principles endorsed by President Bush this year would help soften possible opposition from sceptics, including the many members of Congress who opposed the Kyoto Protocol. President Bush is the standard bearer for opponents of Kyoto and conservatives would have a hard time distancing themselves from him on this issue. Securing the support of Congress for climate action will not be easy and in particular, a climate deal negotiated solely by a Democratic President without any bipartisan backing could face very big hurdles in adoption and implementation. If the G-8 could agree some principles and specific steps this year to which President Bush could subscribe, it would help to reduce future obstacles within the US.

It is also vital, with the new Russian President Medvedev having already offered a significant contribution to the international debate, that Russia takes a full and constructive role in the negotiation process. Russia has a pivotal role in international energy relations, and past experience has also demonstrated the importance of Russia in the climate change process. The G-8 is a forum through which Russia can most effectively inject an integrated view of the energy and geopolitical challenges associated with tackling climate change.

Most fundamentally, a sound G-8 view on the core elements of the post-2012 climate system would make reaching a good international climate agreement easier. Of course the issues we address reach beyond the G-8 alone, and the G-8 is a political not a legal body. For example, our recommendation in respect of negotiated, legally binding emission targets reflects an underlying view that these are needed for several reasons:

- non-binding commitments will not have the force or credibility required to support governments in taking politically difficult implementation decisions through their legislatures;
- binding commitments provide a greater level of assurance that each country will implement what it promises;

- binding commitments are essential to overcome private sector scepticism about general policy declaration – helping to support company investment in low carbon solutions and indeed to resist short-term shareholder pressures to develop more GHG intensive rather than low-carbon energy resources;
- emission trading schemes strong enough to develop a significant price for carbon require a basis of legal commitments: the EU experience has already shown the crucial importance of this, with the Kyoto targets providing the legal basis through which the European Commission toughened up allocations under the EU's internal emissions trading scheme.

However, our analysis does not reiterate these arguments and our recommendation is not that such commitments should be adopted directly through the G-8; rather the analysis in this area focuses upon the political context, particularly *vis-à-vis* the US, in recommending that G-8 countries should seek to reach a political consensus in principle that can be carried forward to the UNFCCC negotiations. By signalling what G-8 nations are prepared to do and what they expect, G-8 leaders could give direction to global climate negotiations. This would help all nations – including major developing countries – align their international climate policies and manage their domestic political situations. Of course other nations would not accept a G-8 declaration in itself, but an appropriate G-8 consensus could provide a very useful starting point and impetus.

The G-8 is small and like-minded enough to offer the prospect of important political steps forward – and as G-8 leaders must cooperate on a broad range of global issues, they strive to find common ground whenever possible. Given the importance of immediate progress, the G-8 summit in July is the natural opportunity for progress this year, but it is not the only one. If the Toyako Summit itself is only able to agree on broad principles and long term goals, it will simply serve to highlight more sharply the gap between the common objectives, and the lack of specific actions. Numerous other studies have addressed the scale of the problem and the potential goals; this report is focused on core elements of solutions and the specific steps that need to be taken.

If Toyako cannot agree specifics, but can agree a follow-up to the Gleneagles process, these are items that should be firmly on the agenda. The issues and opportunities we identify will not go away; they will just get more pressing and more urgent the longer that action is deferred.

And to return to our opening theme, the Japanese G8 Presidency occurs at a time of crises. This may make steps possible which would not have been countenanced before. It will be the test of the Japanese Presidency and the G8 more broadly, whether they are able to move beyond general rhetoric and goals to endorse specific actions, to ensure that responses to the oil and food crises do indeed make things better for the planet and its citizens – and not worse.

Supporting materials for key recommendations

1. International Aviation and Marine Fuels and Emissions

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Scale of the Problem

International aviation and marine transport together consume close to 10% of global oil consumption⁴ and emit 1000 to 1500 MtCO₂ divided roughly equally between the two.⁵ Emissions of other contaminants at altitude by aircraft exacerbate their climate impact by a factor of 1.7 to 5.1.⁶

Their oil consumption and emissions have been growing at an average of 3% to 6% per year for the past 15 years and are projected to continue to grow at rates in this range for at least the next 15 years with aviation's emissions growing more rapidly than those of international shipping. Based on CO₂ emissions alone international aviation and marine emissions would rank as the sixth largest emitter among the countries of the world, between Japan and Germany. If the effects of other aircraft emissions are included, international aviation and marine emissions would move ahead of Japan.

Due to the projected rapid growth of these emissions it will not be possible to significantly reduce global greenhouse gas emissions without regulating international aviation and marine emissions. In particular the G-8 goal of halving global CO₂ emissions by mid century would be unattainable.

Attempts to Manage the Emissions

Efforts to address emissions from international aviation and marine transport under the Kyoto Protocol have not been successful. The Protocol commits Annex I Parties to pursue limitation or reduction of emissions from international aviation and marine fuels through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).⁷

⁴ IEA data for 2004 show oil supply as 3,940 Mtoe of which international marine bunkers is 165 Mtoe, or 4.2%. The IEA data do not show international aviation separately. Since the CO₂ emissions from international aviation are about the same as those from shipping, and are growing more rapidly than total supply, total oil use by international aviation and marine transport would be 8% to 10% of global oil consumption.

⁵ Model-based estimates of carbon dioxide emissions by international aviation for 2000 range between 400 and 675 MtCO₂ (Den Elzen, et al., 2007, Box 2, p. 22). Inventory submissions to the UNFCCC are confined to industrialised countries, and suggest figures in the upper part of the range. Estimates of carbon dioxide emissions by international marine transport range between 425 and 900 MtCO₂ (Den Elzen, et al., 2007, Box 1, p. 18).

⁶ Sausen, et al., 2005 and Forster, et al., 2006. The ratio of the total radiative forcing from aviation to the radiative forcing associated with aviation CO₂ emissions is often called the 'uplift factor'.

⁷ Article 2, paragraph 2.

This led to discussions on how to allocate international aviation and marine emissions to Parties. In addition, consistent with the principle of common but differentiated responsibilities as applied to national emissions, it led to the presumption that the emissions attributed to Annex I Parties would be regulated while those attributed to non-Annex I Parties would not.

The following eight options were identified for allocating international aviation and marine emissions to Parties:⁸

1. No allocation.
2. Allocation of global emissions from international fuels to Parties in proportion to their national emissions.
3. Allocation to Parties according to the country where the fuel is sold.
4. Allocation to Parties according to the nationality of the transporting company, the country where the aircraft or vessel is registered, or the country of the operator.
5. Allocation to Parties according to the country of departure or destination of an aircraft or vessel or shared between the countries of departure and arrival.
6. Allocation to Parties according to the country of departure or destination of passenger or cargo or shared between the countries of departure and arrival.
7. Allocation to Parties according to the country of origin of the passenger or owner of the cargo.
8. Allocation to the Party of emissions generated its national space.

Options 5 through 8 are considered to be less practical because of data requirements or inadequate global coverage.

Despite more than ten years of discussions, there has been no progress on a method of allocating international aviation and marine emissions to Parties. Moreover, allocation of emissions to Parties followed by differential regulation of the emissions attributed to Annex I and Non-Annex I Parties can induce behaviour that reduces the effectiveness of the regulations. The scope for avoiding the regulations is greater for marine vessels than aircraft; the country of ownership or registration can be changed easily for vessels and vessels can purchase fuels where the costs, including regulatory compliance, are lowest. Since vessels do not ply the same route regularly, enforcement would be more difficult than for aircraft.

Managing the Emissions in a Post-2012 Agreement

A post-2012 agreement needs to adopt a different approach to regulating international aviation and marine emissions. These emissions should be treated as sectors with their own regulatory regimes. In effect this is option 1; no allocation. It is consistent with the accounting principle of the Convention that each country is responsible for the emissions that occur on its territory. The international aviation and marine emissions occur mainly in international territory and hence should be addressed separately rather than being allocated to Parties.

⁸ UNFCCC/SBSTA/1996/9/Add.2, pp. 20-22.

The principle of common but differentiated responsibilities can be addressed by establishing regulatory regimes that raise revenue – emissions fees or auctioned allowances. Most of the revenue raised will come from developed countries. Using the revenue for adaptation and/or mitigation in developing countries will address the equity concern much more effectively than differential regulation of allocated emissions.

Treating international aviation and marine emissions as two separate sectors provides uniform global regulation of each sector. There is then minimal scope for adjusting behaviour to avoid the regulation with the consequent economic distortions and emissions leakage.

Aviation and marine emissions are better regulated separately because the institutional structures (ICAO and IMO), the opportunities for emissions reductions, the compliance entities, the enforcement mechanisms, and the growth rates are different. It may also be feasible in the future to address the full climate impact of aircraft in the regulations for that sector.

The idea of 'sectoral approaches' has been strongly promoted by the Japanese G8 Presidency. For international aviation and marine transport, a specific sectoral approach is entirely appropriate. So far however, ICAO and IMO have not moved forward with concrete proposals that would stem the rise in their fuel consumption and emissions. If these are the 'litmus test' of sectoral approaches, much stronger action is required.

Regulating International Aviation Emissions

ICAO has studied alternative policies to regulate international aviation emissions. It has concluded that emissions trading with the option of buying additional credits from non-aviation sources, such as the CDM, is the preferred policy. ICAO has not been able to agree on steps to implement such a policy. At its September 2007 Assembly, ICAO initiated two more years of studies while avoiding any concrete action to reduce emissions.

International aviation is governed by the Chicago Convention (1944) and thousands of bilateral air service agreements. The Convention and most of those agreements prohibit the imposition of taxes, charges or levies on fuel consumed for international travel. For this reason, the EU has proposed to include the emissions from international flights arriving in and departing from Europe in the EU ETS.

An emissions trading system for international aviation implemented by ICAO or some other institution is technically feasible. An emissions cap would be established for the sector. Airlines could use international aviation allowances or other Kyoto units, such as CDM credits, for compliance. Countries would agree to collect data on fuel sales by airline for international flights and to cooperate with compliance

enforcement actions.⁹ Each airline would report its CO₂ emissions (based on its fuel use) and remit the necessary allowances and credits annually.

Some or all of the international aviation allowances could be auctioned. Revenue from the auction could be used to fund emissions reduction measures and low-carbon technology development in the aviation industry as well as adaptation measures in developing countries. The UNFCCC estimates that auctioning allowances equal to the projected international aviation emissions could generate revenue of US\$10 billion in 2010, rising to \$15 billion in 2020.¹⁰

An emissions trading regime for international aviation could provide special treatment for countries that would be adversely affected, such as small island nations highly dependent on international tourism. That is very different from exclusion of flights to/from all developing countries. Such exclusion would benefit mainly a small number of relatively wealthy countries including Singapore, Dubai, Hong Kong, Malaysia and Thailand.

Regulating International Marine Emissions

IMO also has studied policies to reduce greenhouse gas emissions from shipping but has not yet implemented any measures to reduce emissions. The Maritime Environmental Protection Committee (MEPC) aims to identify and further develop options to make recommendations to the 2009 IMO Assembly.

An emissions trading regime, similar to that described above for aviation, could be established for international shipping. Fuel payers, typically charterers, would be responsible for remitting allowances for the CO₂ emissions calculated from the fuel used. Data on fuel use would be provided independently by the ship managers and/or fuel suppliers. The UNFCCC estimates that auctioning allowances equal to the projected international marine emissions could generate revenue of US\$12 billion in 2010, rising to \$13 billion in 2020.¹¹

An alternative regime proposed for international shipping is the International Maritime Emission Reduction Scheme (IMERS). IMERS would implement a charge on the CO₂ emissions from international shipping based on fuel use.¹² Ship managers would report fuel use for voyages ended during the previous month. The fees would be collected monthly from the fuel payers, typically charterers.¹³ The fees would go to a fund established under the IMO and be used to:

- fund maritime industry greenhouse gas emissions reductions;

⁹ Data on fuel sales by airline from the fuel suppliers would provide an independent check of the emissions reported by the airlines. If an airline fails to comply, one or more countries may support enforcement measures such as impounding aircraft.

¹⁰ UNFCCC, 2007, Table 2, p. 204.

¹¹ UNFCCC, 2007, Table 2, p. 204.

¹² Stochniol, 2007.

¹³ Separate emissions limits and fees could be established for different types of ships -- container ships, bulk carriers, passenger ships. This would reduce the impact on developing countries since much of their ship traffic (food imports and exports) uses bulk carriers and they are growing more slowly than the total, so the fee for these ships would be lower than that for container ships.

- purchase CO₂ credits equal to the actual emissions in excess of the established emissions cap; and
- contribute to climate change adaptation in developing countries.

A fee of US\$10 per tonne of CO₂ would raise about \$3 billion annually and raise shipping costs by about 3%. Assuming a market price of \$25 for CDM credits about half of the revenue would go to adaptation.

The Oil Crisis

At a time of record oil prices, advocating action that would add to the costs of international aviation and shipping does not appear politically attractive. However, burgeoning transport demands place additional strains on oil markets, and any response in practice will take some years to implement. Moreover, under an emissions trading approach, the strength of the cap and the degree of auctioning can be adjusted over time, taking account of the cyclical nature of oil markets.

International fuels have been an anomaly, being formally exempt from either taxation or CO₂ emissions regulation. This has encouraged galloping consumption and emissions and for economic rents associated with high oil prices all to flow to the producing nations. More equitable would be a move towards levies and emission caps with auctioning, with monies used for example to help developing countries adapt to climate change. Removing the anomaly of exempting these sectors is thus long overdue.

Conclusions

International aviation and marine fuel consumption and emissions are too large and growing too rapidly to be ignored. Attempting to allocate the emissions to Parties as a basis for regulation has failed. Instead, emissions can be regulated by treating them as separate sectors and implementing a global emissions trading or emissions fee (in the case of shipping) regime for each sector.

In a technical workshop on emissions from international aviation and maritime transport held in Oslo in October 2007, it was concluded that no technical obstacles related to monitoring and reporting of emissions remain that can not be solved. The absence of global policies is thus due to lack of political will rather than technical difficulties.

A global approach is the most effective and fair. Those policies can be implemented in ways that minimize adverse impacts on vulnerable developing countries, which is very different to exempting all developing countries. Such policies can also raise substantial funds for emission reduction measures and for adaptation measures in developing countries. Most of the funds will come from developed countries and will benefit developing countries. The issue has been deadlocked for 10 years. Breaking that deadlock could be the single most valuable outcome of the G-8 Summit at Toyako.

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2. Low Carbon Technology Innovation and Diffusion Centres for Developing Countries¹⁴

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Introduction

Reducing dependence on fossil fuels and avoiding the worst impacts of man-made climate change, by making the transition to a low-carbon global economy, is a goal shared by most developed and developing countries. Achieving it will require combined action to accelerate and significantly increase the level of investment in the development and deployment of clean energy and low-carbon technologies. This chapter outlines how developed and developing countries could work in partnership to achieve this goal through the establishment and operation of a network of Low Carbon Technology Innovation and Diffusion Centres.

Networks of Low Carbon Technology Centres: Concept and Rationale

These Centres would be set up in key developing countries either as new entities or building on appropriate existing entities where these exist. They would serve as focal points for action to develop low carbon technologies and deploy them in home and overseas markets. They would be linked through a low carbon technology network coordination organisation which would capture, codify and disseminate best practice. Similar approaches have been successfully used to date. One example of such an approach from other fields is the Consultative Group on International Agricultural Research (CGIAR), consisting of fifteen centres, mostly but not exclusively in developing countries with a mission of reducing poverty through agricultural science. The world now needs an equivalent effort on energy and environment.

The rationale for the proposed approach is that energy demand and carbon emissions are rising fastest in developing countries and the transition to a low-carbon world will not be achieved unless developing countries are helped and encouraged to develop their own low-carbon economies. Low Carbon Technology Centres will: accelerate the development and deployment of low carbon technologies in, and for, developing countries; help them win economic value from clean energy technology investment; and give them confidence that they can commit to measurable and verifiable action on carbon emissions.

Internationally, we face a huge challenge to move towards a low-carbon global economy by reducing greenhouse gas emissions and tackling climate change. We will need to deploy existing energy efficiency and low-carbon technologies; and we will need to develop new low-carbon technologies and infrastructure on a hitherto unprecedented global scale. The most effective way to address this challenge is to develop a policy and market framework which stimulates and drives low-carbon

¹⁴ This contribution is published in a fuller form as: The Carbon Trust (2008) Low Carbon Technology Innovation Centres. <http://www.carbontrust.co.uk>

investment at scale. One element of this endeavour will need to focus on using mix of public and private funding to drive down the cost of emerging low carbon technologies, reduce the commercial risk, and begin to leverage the much greater private sector funding required to bring forward low carbon technologies. Figure 1 overleaf illustrates how current multi-lateral support for the developing world is concentrated on later stage support, and is small relative to the scale of the challenge.

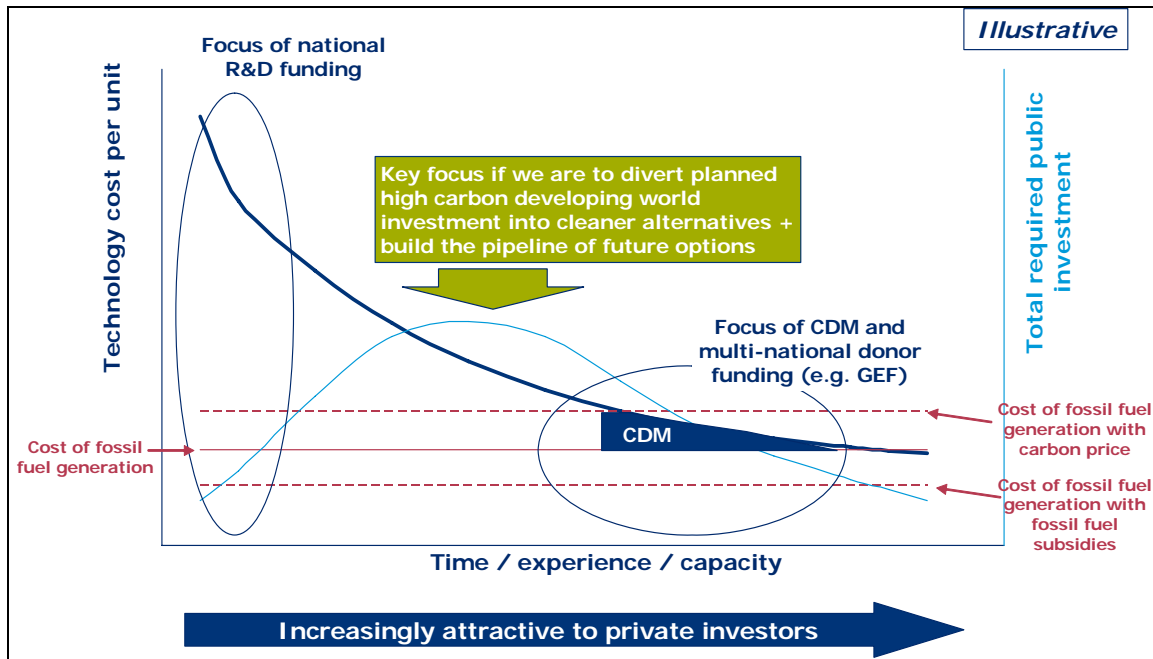


Figure 1: Role of public funding to accelerate development and deployment of low-carbon technologies

Working with the developing countries and their emerging economies is an essential part of the challenge because carbon emissions are rising fast and there is a real risk that these countries will become “locked-in” to a high-carbon economy. In addition, helping developing countries move with confidence to decarbonising their economies, whilst at the same time not impeding economic growth, is an essential component of the negotiation of a post-2012 agreement to further greenhouse gas emissions reduction globally.

Technology Innovation and Diffusion

New technology is not an idea followed simply by uptake: it is a complex journey with many stages and expanding circles of learning by innovators, manufacturers, financiers, customers and the wider society into which better technologies are over time adopted. Low carbon technologies span an enormous range, and the ‘big ticket’ items such as CCS are but the tip of an iceberg of new ways of producing and consuming energy in more environmentally acceptable ways.

In moving along the innovation journey, from concept to the availability of a commercial product (ie: un-subsidised, with a warranty and becoming the technology of choice), a diverse range of technology, business, market and regulatory barriers need to be overcome. These include: high or uncertain costs of

new technologies; limited or uncertain suitability of technologies for local conditions; limited business capacity or skill base to identify useful technologies, adapt them for local use, and provide installation and maintenance services; uncertain market demand; limited access to capital due to a conservative banking sector and very thin and highly sector specific venture capital and private equity sectors, and; unfavourable regulatory and political climates including competing priorities, vested interests, market distortions and subsidies in favour of fossil fuels.

Although at a high level, for a given technology, many barriers are common across countries, the differences in the political, economic and regulatory landscapes means these often manifest themselves in different ways and/or to different extents across countries. The nature of these challenges will depend on a variety of factors, including access to energy or electricity, the extent of urbanisation and industrialisation, infrastructure development and the natural resource base. For example, some countries will warrant a focus on the decarbonisation of the existing energy infrastructure and catalysing the established industrial and business opportunities to take action, while others would need to concentrate efforts on ensuring the development of appropriate new low-carbon systems.

The Role of Low Carbon Technology Innovation and Diffusion Centres

A network of Low Carbon Innovation and Diffusion Centres in developing countries could help accelerate low carbon development and deployment by enabling multi-lateral donor funds to be cost-effectively deployed at the national level, using public money to reduce the risks facing private sector investment. They would address both international and local barriers and help create a favourable national policy and regulatory framework for low carbon, avoiding lock-in to high carbon development pathways. The network would also enable lessons learnt to be codified and promulgated across developing countries to accelerate the process effectively.

The network would comprise of a number of national Low Carbon Technology Innovation and Diffusion Centres in key locations, structured to suit local conditions, supported by a Secretariat that maintains a global perspective, agrees plans and monitors progress for the Centres and other initiatives and ensures knowledge transfer across these. A range of approaches, shaped by the characteristics of the host country and appropriate to different stages of the technology and market cost curve, could be utilised by the Centres. These could include the following activities:

- applied Research and Development, to build local intellectual property in areas of comparative advantage;
- technology acceleration programmes that apply new technologies at scale in national and regional markets, to demonstrate their viability, learn lessons and overcome various technology and market barriers;
- seed funding and business incubation to develop commercial capacity;
- enterprise creation to fill market gaps for low carbon businesses;
- venture capital activity and other measures to help grow low-carbon businesses;
- advice services and financial support to accelerate the deployment of energy efficiency and renewables projects;

- capacity building, to enhance skills and capability; and
- development of independent insights for business and policymakers.

Factors for Success

There are a few key factors, crucial to the success of such a network.

Governance: The Centres must have a partnership approach between developing countries and donor countries, which must include agreed goals, terms of donor support and success criteria. There must be appropriate local ownership of the Centre, with establishment of local governance and local control of project prioritisation.

Funding: Public funding must be on a scale and committed time horizon sufficient to allow planning and implementation of complex projects, including sufficient public funding to undertake pre-commercial activities. An effective collaborative relationship with government and the private sector would be needed to leverage additional funding, without compromising the abilities of the Centre to provide an independent viewpoint on the policies needed to contribute to the agreed goals.

Implementation: Clear criteria for project prioritisation, based on both environmental and economic potential, are needed. The Centres should span a full spectrum of activity from R&D to deployment, tailored to local needs, with the Centre acting as a focal point for low-carbon activity and knowledge sharing. Eventually, as the Centres become embedded and prove their worth, they could transition towards greater private sector and/or funding from host governments. What matters, however, is to get started with this concrete step to accelerate the process of low carbon technology innovation and diffusion.

3. Narrowing the Divide: A Roadmap for Progress on Mitigation Commitments by the G-8¹⁵

Nigel Purvis

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Introduction

The latest scientific evidence suggests the world may have one last clear chance to avoid unacceptable risks of catastrophic climate change. The greenhouse gas emission reduction commitments in the Kyoto Protocol expire in 2012, and new international agreements that the United States, Europe, and other major emitters can support are urgently needed. Despite competing global issues that may dominate the G-8 agenda (including record oil prices, soaring food prices, a weakening economies, and volatile financial markets), there is reason to be hopeful that G-8 leaders can close ranks on climate change this year.

The G-8 is small and like-minded enough to make the task of hammering out a newsworthy climate statement manageable. As G-8 leaders must cooperate on a broad range of global issues they strive to find common ground whenever possible. And despite the real global political shift away from climate change, several developments in the United States may make the Bush administration eager to find common ground with its G-8 partners in 2008. Consider what has happened since January alone.

- First, unless President Bush changes posture on climate change emissions regulation, he will end his tenure on the wrong side of history. The next U.S. president will advocate enactment of a domestic “cap-and-trade” bill—both remaining major party candidates have said so. The next Congress will be more tightly controlled by the Democratic Party and more likely to muster the votes needed to enact such legislation.
- Second, on April 16, 2008, President Bush announced that the United States would seek to stabilize emissions by 2025; in other words, he proposed allowing U.S. emissions to rise well above today’s levels. While Europe and other nations were unimpressed with this goal, it is the first fixed (non-indexed) quantitative emissions target endorsed by the Bush administration.
- Third, the Bush administration has changed course on the question of whether it would accept making new U.S. climate commitments legally binding internationally. In his April 16, 2008, climate speech, President Bush said “we’re willing to include [the U.S.] plan in a binding international agreement, so long as our fellow major economies are prepared to include their plans in such an agreement.”

¹⁵ This contribution is published in a fuller form as: Purvis, N. (2008) Narrowing the Transatlantic Climate Divide. A roadmap for Progress. German Marshall Fund Report. <http://www.gmfus.org/publications/article.cfm?id=429>

Open Issues

The G-8 countries face a handful of unresolved issues on mitigation commitments. They include:

- The types of mitigation commitments developed nations should have (national targets, sector-specific goals, or other approaches).
- The level of global mitigation to occur by 2050 and the level of mitigation to be achieved by developed nations by 2020.
- Whether developed country mitigation commitments should be legally binding internationally.
- The extent to which developed country mitigation commitments should be paired with (or conditioned upon) mitigation commitments that are comparable in legal character by China, India, and other major developing country emitters.

The positions of the transatlantic parties on these issues going into the July 2008 G-8 summit are relatively straightforward. Europe would like G-8 leaders to commit their nations to internationally negotiated, legally binding national emission reduction targets that would reduce emissions from developed nations by 25 to 40 percent below 1990 levels by 2020, with a view to reducing global emissions 50 percent by mid-century. Europe wishes to see major developing countries make new climate commitments too but it has yet to concretely characterize its expectations regarding the stringency, form or legal nature of such commitments.

The United States would like G-8 leaders to agree that developed nations should set their own nationally-determined emission reductions targets and only agree to make them legally binding internationally if all major emitters and rapidly industrializing developing nations also agree to mitigation commitments that are comparable in legal character.

Russia, Japan and Canada have all expressed views on these issues as well, but the immediate challenge is the 'transatlantic divide'.

Let's Make a Deal

A meaningful, albeit partial, breakthrough may be possible—one that moves Europe and the United States substantially closer to each other, engages the rest of G-8 and locks in a sound architecture or legal framework for ongoing climate change negotiations.

The transatlantic divide on the desired architecture for global climate cooperation has already diminished. While Europe and the United States remain too far apart on the pace of mitigation to negotiate numerical mid-term targets this year, the allies could break new ground in Hokkaido. More specifically, they could jointly state that the next global climate agreement should contain quantitative national emission targets for developed nations and nationally appropriate mitigation commitments for major emitters in the developing world, and that all of these commitments should be legally binding internationally. The Hokkaido G-8 Summit provides an important opportunity to firmly establish and highlight such a transatlantic rapprochement while also improving the prospects for a strong new climate agreement that all

major emitters would join. Specifically, a G-8 deal along the following lines seems feasible.

Core Proposition

The key proposition can be summed up through the following. All major emitting nations should make quantitative and legally binding commitments to mitigate their emissions significantly by 2020. Developed nations should commit to quantitative, legally binding, and fixed national emission targets. These targets should be based on 2005 emission levels. Supported and enabled by technology, financing, and capacity-building, major developing country emitters should commit to legally binding, nationally appropriate, quantitative national or sector-specific goals, such as numerical objectives for improving energy efficiency and carbon-intensity, strengthening technology performance standards, and reducing emissions from deforestation. The commitments of all major emitters should be derived by calculating the mitigation potential of economically and technically feasible actions in each sector of the economy, taking into account specific national circumstances and sustainable development goals, while also reflecting the contributions needed from each major emitter to meet important global emission mitigation objectives. All commitments should be based on the principle that nations have common, but differentiated responsibilities and capabilities.

Rather than waiting for a new US president, transatlantic policymakers should strive to make as much progress this year as possible.

4. International Adaptation Finance: The Need for an Innovative and Strategic Approach¹⁶

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The Problem

Although existing estimates of adaptation funding needs in developing countries are still very vague, they all indicate that it is and will be in the tens of billions €//\$ per annum. At the same time, many developing countries presently do not have the relevant 'absorptive capacity', i.e. the capacity to carry out the adaptation measures needed, even if the funding were available. Most are and will unnecessarily have to suffer adverse impacts of climate change that could be avoided under an improved adaptation regime.

These impacts are linked to the accumulation of greenhouse gases in the atmosphere, the vast majority of which have been from industrialised countries. For this and other reasons, developed countries shoulder a particular responsibility for helping adaptation globally.

Moreover, the growing impact of climate change has placed the issue of adaptation front and centre of developing country concerns. A global agreement will simply not be possible unless this is acknowledged and adequate responses are developed.

The lack of certainty about the adaptation funding needs of developing countries and their lack in absorptive capacity are not reasons to postpone a debate of the thorny issue of international adaptation finance. The two issues are intricately linked, and there is an urgent need to look into ways of scaling up *simultaneously* the provision of adaptation funds for developing countries of the appropriate kind, *and* the absorptive capacity to use these funds meaningfully. While this paper focused on the former, this is not meant to imply that the debate on how the funds are best spent on the ground is of lesser importance.

At present, all international funding instruments – except the recently operationalised Kyoto Protocol Adaptation Fund – are replenished through ODA-type bilateral donations. The level of international funding (even including the Adaptation Fund) is woefully inadequate to meet the projected needs. The current bilateral donation instruments are unlikely to ever be able to generate the required levels of funding, especially as it is meant to be additional to ODA (experience with the Monterrey 0.7% GNI commitment for ODA). Moreover, adaptation funding is seen by most developing countries not as a matter of 'donations' but as one of coping with damages caused by developed country emissions, and as such as debt incurred by

¹⁶ This contribution is published in a fuller form as: Muller, B. (2008) International Adaptation Finance: The Need for an Innovative and Strategic Approach. EV42. Oxford: Oxford Institute for Energy Studies, forthcoming July 2008.
<http://www.OxfordClimatePolicy.org>

them. Accordingly, neither of the traditional ODA funding modes (grants or concessionary loans), are seen to be appropriate payment modes.

Funding is expected, and must be 'innovative,' in the sense of being not only appropriate, but new and additional, predictable, equitable, and adequate.

International Adaptation Finance

Innovative Sourcing: Further innovative financing mechanisms apart from the CDM Adaptation Levy are needed to fill the adaptation 'funding chasm.'

The most plausible new financial sources are those linked to emissions, as the source of the problem. The first recommendation to G-8 made in this report is to break the deadlock on the control of international transport fuels and associated emissions. Cap-and-trade schemes for these fuels would generate significant revenues through increased auctioning of emission allowances over time; revenue could similarly be raised directly by a levy, as with the IMERS proposal for marine emissions.

In addition, the issuing of allowances for domestic emissions in industrialised countries could be subject to a adaptation levy, in the way that generation of Certified Emission Reductions under the CDM already attracts a 2% levy for this purpose.

Strategic Allocation: Internationally, funds for adaptation need to be allocated on a strategic basis and not involve international micro-management at the project level. The strategic allocation of international adaptation funds should not attempt to re-invent the wheel. It should use the existing international bodies and initiatives to allocate funding streams, and not try to duplicate them under a 'climate change banner.'

Domestically, as mentioned above, there is a need to enhance 'absorptive capacity' not only at the project level, but more importantly – following the Paris Declaration – at the level of domestic policy ('adaptation mainstreaming').

Governance: The governance of the recently operationalised Kyoto Protocol Adaptation Fund represents a milestone in the evolution of international funding mechanisms, since for the first time developing countries have taken genuine ownership of such an instrument.

In the case of adaptation funding, developing country ownership and public transparency of decision making is not only desirable but a pre-requisite for success, particularly in the context of mainstreaming activities. Given this, the Adaptation Fund should be the main instrument for the purpose of raising and managing of international adaptation finance for developing countries.

5. Development of Foundations and Institutions for the Global Energy Transition

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Introduction

The response to climate change is complex. It requires significant shifts in energy systems. Success will depend on a combination of carefully targeted programmes working in support of a common goal. The development of effective institutional structures to manage, oversee and links those programmes is essential.

In institutional terms, overall international responsibility for the issue rests and should remain with the UNFCCC. Completion of the current round of negotiations will focus attention on the details of implementation to ensure effective management of the numerous complex issues involved including:

- the establishment of a comprehensive and accurate data base - gathered through a simple but effective reporting system;
- the development of distributed targets within any overall objective along with timetables and milestones;
- the deployment of a new and more extensive CDM mechanism building on the work of the CDM Executive Board;
- establishment of the trading element of any cap-and-trade system building on the European and other existing trading mechanisms;
- supervision of resource deployment for instance in respect of technology transfers, taking forward the work of the UN Expert Group in that area;
- monitoring and verification of delivery against the commitments being made;
- the coordination and in some cases the channelling of funding in science and technology, for instance in support of work on Carbon Capture and Storage;
- the development of an improved understanding of the potential local impacts of climate change and the design of an international programme in support of the adaptation measures necessary; and
- the regular evaluation of national and international programmes.

In addition, the concept of comparability of efforts raised in the Bali Action Plan but as yet lacking detailed substantiation will need to be developed. The reference to "measurable, reportable and verifiable nationally appropriate mitigation commitments or actions, including quantified emission limitation and reduction objectives, while ensuring the comparability of efforts.. taking into account differences in national circumstances" poses complex challenges. This includes the impact of trading (which can establish a distinction between "where to reduce" and "who makes the reduction'), the impact of economic globalisation (which can

separate the location of production from that of consumption) and the need to put some value on efforts (including indirect emissions reduction efforts such as investment in technological research, the development of renewable energies and product labelling).

Successful implementation of any agreement will require the development of a detailed and practical approach to all these issues.

Common Principles

What matters most is that simple, common principles are applied to ensure that an overall system is created which matches the particular needs of the issue.

First, the governance structure must be designed to build trust around new and largely untested programmes of action. Cap-and-trade systems, agreements to limit deforestation, major programmes to share technology with emerging economies and an extension of the CDM all entail substantial transfers of resources from one country to another. Such transfers, which are likely to grow over time, will require processes to establish credible data, to verify delivery of the promised actions and to confirm that the resources are being used as intended. Proposals to extend the use of Carbon Capture and Storage will equally require firm evidence to confirm the integrity of the storage systems. Monitoring and verification are by their nature intrusive processes, but are essential if public acceptance of the financial transfers necessary to achieve a sustained reduction in emissions is to be won and then maintained.

Secondly, the process of transition in energy systems and low-carbon development must allow for change in response to advances in knowledge and shifts in circumstances. Atmospheric science continues to advance. So too does the science and engineering around the potential ways forward including sequestration and the development of lower carbon sources of energy supply. In many areas, we are still at the experimental stages in the development of new technology. Economic circumstances could alter the level of emissions and the geographic distribution of their source.

Thirdly, there must be a careful balance between those elements of any agreement which are centralised and those which are devolved to local decision. The setting of aggregate targets and the distribution of those targets across countries and through time, are political decisions which can only be achieved at the international level. The mechanics of delivery, however, can and should be left to local determination reflecting local economic and physical circumstances. This element of decentralisation should also be used to encourage innovation and technical progress. Targets are essential, but prescriptive solutions should be avoided. One size need not fit all.

The fourth principle for the design process is a degree of pragmatism. The initial agreements should be delivered where possible through existing structures, building incrementally on accumulated experience and knowledge.

Short to Medium Term Institutional Developments

For the immediate future the task will be to build on the skills already established in existing international institutions including the UNFCCC itself. On the science of climate change, for instance, the IPCC has achieved a remarkable degree of credibility and trust over the last two decades. That work should continue.

Adaptation of other organisations, not at present directly focused on climate change could also be beneficial. The International Energy Agency for instance has extended its capabilities beyond its initial crisis management role and is now an authoritative source of data and projections. The scope of the IEA's work has moved well beyond its original OECD base reflecting the changes in the world's energy economy over the last thirty years and the Agency has become an authoritative and respected commentator on the energy markets of China and India. The IEA's original focus on oil has broadened to include all the other forms of energy supply.

In particular, as emphasised throughout this report, a key challenge is to ensure that the response to global energy supply concerns are consistent with the climate change challenge. A shared vision based upon common analysis is required, of how to go about a major transformation of the world's energy systems. Analysis that is to be effective must be conducted and shared amongst all the key countries that have to act if the problems are to be solved. This is beyond the structure of the IEA as it stands. A new structure based upon the IEA that includes all the major economies fully participating would involve widening the IEA's current membership and giving the organisation a new remit; but no other international institution holds such analytical skills in the energy area. Such a reformed and restructured IEA could also play a key role in implementation - for instance providing the platform and secretariat for the proposed International Partnership on Energy Efficiency Cooperation.

Over time the multiple strands of implementation required may create the need for a newly established International Climate Agency – a body established by and responsible to the UNFCCC – but with powers comparable to the existing major UN agencies. That is for the future. For the moment the challenge is to ensure that a hard won agreement is matched, line by line with effective process of shared analyses and effective implementation.

At Gleneagles in 2005 the G-8 was instrumental in raising the profile of the climate change challenge. The G-8, working with the wider networks provided by the G-20 and comparable groupings could now initiate the process of designing the institutional structures which will be required. The decisions on that design should be part of the dialogue under the UNFCCC in the run up to the Copenhagen meeting next year. But work should begin now, and the initiation of such work would confirm the G-8's important catalytic role in the climate change debate.

Box 1. Comprehensive reporting and monitoring of energy and emissions data

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An old saying holds that 'you can't manage what you don't measure'. Measuring energy use and emissions is fundamental to managing energy systems, both for countries in themselves, and in developing international understanding and trust. Making available reliable, relevant and timely data is essential input to informed negotiations, framing suitable policies, and devising actions for a global response to climate change post-2012. Concerns expressed by China that a significant portion of its emissions are associated with exports to western consumers is an example in which any discussion will need grounding in robust data.

Presenting such data to policy decision makers and stakeholders enables dynamic reviewing of a national situation, better explain a country's role and/or responsibility on the global scene and reduce perception-based stands of different negotiating parties. It also helps in examining mitigation opportunities and their cost-effectiveness; assess vulnerabilities; evaluate policy measures (ex ante and ex post priorities and trade-offs); and underpins the credibility of policy instruments including carbon markets.

Due to the multiplicity of emission sources, comprehensive and continuous monitoring, reporting and verification of energy and green house gas data is a complex and painstaking effort. Developing and managing a national GHG emissions data base requires physical, human

(Box 1. Continued)

and institutional capacity. For example it requires the establishment of statistical systems for compilation of emission inventories, resources for collecting and categorising data and a system of inventory quality control.

There remains scope for improvement in some aspects of industrialised country emissions monitoring and reporting. The biggest gaps are in developing countries, where lack of data can be an additional obstacle to formulating and monitoring of policy priorities (including adaptation responses). The problems are most severe in countries with poor fossil fuel accounting systems or a high share of domestically produced fuel in their fuel consumption. The lack of a dynamic data on energy and emissions across countries hinders development of domestic measures to ensure sustainable economic development, improve energy security and climate security. Reliable data is also a pre-requisite for international transfers of carbon credits and global measures to address carbon leakage and increasingly important in the context of carbon labelling on consumer products.

Under the UNFCCC, developing countries receive support for preparing National Communications. One continued issue is funding. Article 4.3 of the UNFCCC states "The developed country Parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country parties" (in preparing their NatComs). Yet many Non-Annex 1 countries have voiced concerns that GEF's existing funding arrangements are not in accordance with this. For example, Brazil received just \$3.4 million from the GEF, out of the full cost of \$12 million. Most receive \$420,000, the maximum amount granted under expedited procedures delegated to UNDP and UNEP. The system needs review to ensure more targeted and adequate support where it is most needed, whilst grounded in recognition also that major countries have self-interest in ensuring they understand adequately their own energy use.

Secondly is the need for technical and institutional capacity building. Preparations of NatComs broadly require focus on three areas: assessing the activity level data, estimating the emission factors for each activity and inventory quality control. Hence, for presenting a complete picture, NatCom preparations require multidisciplinary collaboration, collection of disaggregated data from various sectors, training the activity data generating institutions, and improving of scientific understanding and develop robust statistical systems. More focus is also required on small scale and unorganised sectors, municipal waste generation and LULUCF to better present the National GHG inventories. All these capacities are available only to a limited extent in developing countries at present.

Further, drastic modifications in reporting, monitoring and enforcement regimes is also required for some countries e.g. shifts from "pseudo-monitoring" (i.e. verifying that devices are installed to actual monitoring of emissions); changing definition of monitoring from a static to a dynamic model, measured in units of time; give authorities legal enforcement powers and use of self-reporting with random monitoring where appropriate.

Recognising its benefits as an intrinsic part of an effective global response to climate change post-2012, there is scope for leadership to drive a coordinated effort to accelerate capacity building to enable comprehensive reporting and monitoring of energy consumption and GHG emissions in robust and verifiable ways, through full implementation of existing guidelines and providing financial and technical assistance where appropriate for developing countries.

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