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CLIMATE MITIGATION: INTEGRATING APPROACHES FOR FUTURE INTERNATIONAL CO-OPERATION

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The ideas expressed in this paper are those of the author and do not necessarily represent views of the OECD, the IEA or their member countries, or the endorsement of any approach described herein.

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FOREWORD

This document was prepared by the OECD and IEA Secretariats in September and October 2005 in response to the Annex I Expert Group on the United Nations Framework Convention on Climate Change (UNFCCC). The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy-makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document are those listed in Annex I of the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Korea and Mexico, as OECD member countries, also participate in the Annex I Expert Group. Where this document refers to "countries" or "governments", it is also intended to include "regional economic organisations", if appropriate.

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OECD and IEA information papers for the Annex I Expert Group on the UNFCCC can be downloaded from: http://www.oecd.org/env/cc/

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1. Background and Objectives

At their March 2005 meeting, the AIXG delegates asked the Secretariat to investigate how different approaches to climate change mitigation, undertaken by various countries, could be "integrated" in the future. This paper is an attempt to shed some light on this question, define integration and explore its rationale, its possible mechanisms and implications.

Integration may have at least two distinct purposes in this context. One could be to enhance synergies between approaches adopted independently in different countries. Another could be to help the negotiating process to take into account preferred approaches by various countries in establishing future agreements, thus expanding efforts and participation. This paper addresses both purposes.

Approaches for future international action to mitigate climate change can be broadly classified into two categories: those that place quantitative objectives for greenhouse gas emissions, and those that do not. The first category itself divides into options for different target types, and options for different allocation methods. The second category includes international coordination of policies and measures, of carbon taxes, and international technology agreements (Philibert, 2005).

Published and unpublished work undertaken thus far under the AIXG auspices has focussed on options for future "quantitative" objectives[1], and international technology collaboration.[2]

Options for future commitment types were essentially considered in relation to emissions trading. Several other AIXG papers examined various aspects of linkages between existing or developing systems.[3] The linking of various emissions trading systems is certainly one possible type of integration, but integration can be broader, in particular when extended to fundamentally different approaches.

One aspect of integration may be how countries following different approaches with respect to their own emissions could collaborate in helping other countries reducing their emissions, and how help to others relates to the approaches taken by each country to mitigate its own emissions. For example, the Clean Development Mechanism, supposed to help developing countries achieving sustainable development, is based on the desire for Kyoto's developed countries to search for cheaper emission reduction possibilities in developing countries. Can it be "integrated" with support for technology transfers by industrialised countries following another approach?

This paper discusses first the various arguments favouring integration, and the likely effects of various possible forms of integration. As comparing approaches, either by comparison of efforts or comparison of results, appears crucial to any form of integration, the paper then considers in more details how different approaches can be compared, with respect to a country's own emissions as well as to its action to help other countries reduce theirs.

[1] E.g. see Pershing, 1999; Philibert et al., 2003; Willems and Baumert, 2003; Philibert and Reinaud, 2004; Bosi and Ellis, 2005; Ellis and Baron, 2005.

[2] E.g., see Philibert, 2003, 2004, and Justus and Philibert, 2005

[3] E.g., see Baron & Bygrave, 2002; Bygrave and Bosi, 2004, and Philibert, 2005b

2. Reasons for Integration and Likely Effects

Integration may take place when objectives are set and policies adopted, so each country's policy more or less stems from an international negotiating process; integration may also take place at a later stage, when national policies set up independently may be somewhat adapted to maximise synergetic effects at international levels. Ex-ante and ex-post integration may be inspired by the same motives; however, they may not entail exactly the same effects.

While one could think of various reasons for integrating different approaches, most if not all relate to the presumption that this would create the necessary conditions for an eventual increase in the level of action. The various arguments are the following:

- *The public good argument:* climate stability is a public good. As such, it would be undersupplied by agents and countries acting in isolation, for countries would aim at equalising their marginal abatement cost with the marginal benefit they derive from their action alone. Provided free-riding can be avoided, collective or "integrated" action would drive higher level of mitigation, for countries would aim at equalising their marginal abatement cost with the (greater) marginal benefit they derive from the action of all countries;

- *The competitiveness argument:* Unilateral or uneven action against climate change may raise concerns about companies' competitiveness on global markets, and undermine emission reduction efforts of these companies while entailing emission leakage. Integration may help alleviate these concerns and facilitate increased level of action;

- *The fairness argument:* Unilateral or uneven action may raise perception of unfairness which could reduce policymakers and public's will to act; this argument may be compounded by the considerations made above about competitiveness;

- *The static cost-effectiveness argument:* If different approaches can be combined or linked in some way, it may improve the cost of effectiveness of the combined regime by making the whole greater than the sum of its parts. For example, integration of national emissions trading approaches, i.e., linking, could lead to greater economic efficiency and broader participation. It enhances economic efficiency by expanding low cost reduction opportunities. It could expand participation by reducing competitiveness concerns.[4] It could also help enhance technology transfer in providing some up-front financing for emission reductions in the countries part of the integrated scheme.

- *The dynamic cost-effectiveness argument:* Some clean technologies still in their early development would improve performances and reduce costs through learning by doing processes. Such improvements may be greater and happen faster if markets are broader; as collaboration may broaden these if approaches lead to broader participation and are linked. It could reduce mitigation costs faster; collaboration may also help share information, research and development costs; lower abatement costs would justify governments requiring lower emissions.

[4] Benito Müller (2005) writes that *"significant surplus permits for the most populous developing countries – would definitely* not *do the job*" of mitigating concerns about competitiveness and leakage, *"since, by definition, surplus permits do not impose a mitigation cost*". However, even surplus emission rights could, with proper domestic policy, create an opportunity cost for emissions. Such costs would certainly not affect the profitability of the companies in countries with surplus emissions as they may in countries short in emission allowances, but it would still deter increases in activity and emissions in the former countries, i.e. leakage, as a consequence of the carbon constraint.

- *The technology transfer argument:* Mitigating climate change will require improved or break-through clean technologies; most are in the hands of industrialised countries; collaboration between industrialised and developing countries help disseminating them more widely; integration of industrialised countries' efforts could lead to more technology transfers as the public good argument applies in this context as well.

How do these various arguments relate to each other? Obviously there are numerous synergies between them. Collaboration may simultaneously increase level of action, as suggests the public good argument, as a result of alleviating concerns for competitiveness, leakage or unfairness, in reducing short term and long term costs through market based instruments and technology development and transfers. However, combining approaches may induce conflicts not just lead to synergies. A complete assessment of options for integration would require a complete evaluation of the advantages and disadvantages. Such an assessment would be part of any future paper beyond this scoping effort.

One area deserving particular attention in analysing the integration of different approaches comparable may be that of timing. Some approaches, such as the Kyoto targets, have a clear short term focus. They may still have a long term impact, although less easy to evaluate, in particular as it strongly depends on what follows the first commitment period. Other approaches may have a longer term focus. This time dimension may be important, as for example efforts deemed comparable if expressed, say, in monetary terms, may not do much to alleviate competitive or fairness concerns.

3. Comparing Different Approaches

The successful integration of different approaches may result from rounds of negotiations and trade-offs, and never require nor rely on a transparent assessment and comparison of Parties' respective contributions. Such a process is not suited for analysis, as it requires an understanding of negotiating positions and Parties' preferences, all difficult to observe and likely to change over time, including during the negotiation process itself. The interaction with domestic policy-making is another complication for such analysis.

As an alternative, we seek to identify objective means of comparisons of countries' efforts, putting them in perspective to each other. This section offers a first examination of issues in comparing approaches directly.

Comparisons can be made either on the efforts (to be) accomplished, or on the results (to be) achieved. The first option would need methodologies to translate efforts-oriented approaches[5] into result-oriented approaches, using comparable metrics. In both cases it would be to account for efforts and results relating to one country's own emissions and those relating to assistance provided to other countries emissions reductions – especially, but not exclusively, to developing countries.

3.1 Comparing domestic efforts

A possible comparison metric is costs. Costs might be evaluated ex ante or ex post, or both. Comparisons should involve costs for the governments and costs for emission sources, i.e. administrative and mitigation costs. Some approaches may be more able to reveal costs than others, however.

[5] Or "input-based approaches", as opposed to "output-based approaches", to adopt the terminology of Heller and Shukla, 2003.

For example, carbon taxes would provide ex ante a straightforward indication of marginal costs, but evaluating total costs will require evaluating ex ante or ex post the amount of abatement achieved, not to mention possible interaction with the existing or evolving fiscal basis in each country. If this can be done, a good approximation can be given of total costs from marginal costs and volume, although the cost schedule can entail different total costs.

A broad emissions trading system would also reveal much ex post information on actual unit costs for mitigation. Changes in entities' or countries' registry accounts, indicating net trades, would be useful indicators of countries' costs incurred – or benefits received – internationally through trading mechanisms. In the absence of underlying price information, a strategic information for private stakeholders, average prices over the period could be acceptable substitutes. Comparison of baseline trends and targets would provide useful information. Emissions trading system with price cap would ease ex ante assessment of total costs, although presumably the multiplication of the estimated emission reductions and the price cap level provides only an upper estimate.

However, even a single price resulting from linking several emissions trading systems may hide large differences in costs resulting from differing features in the systems involved, such as rules for closure or treatment of new entrants. Moreover, emissions trading schemes are likely to interfere with many other policies and measures. While some would simply aim at making markets more efficient, others would be inspired by the willingness to develop some specific technology responses, as illustrates the EU renewable directive, which coexists with the EU emissions trading system. Countries' policy mixes already "integrate" different approaches, which may or may not facilitate the integration of approaches at the international level.

As a matter of fact, costs associated with technology approaches may be even more difficult to assess, at least ex ante. Spending from public and private partnership on R&D can usually be estimated with some precision. Costs associated with standards are more difficult to assess ex ante, and ex post information may be difficult to gather. The history of environmental regulations shows that ex ante cost estimates are often several times higher than ex post assessments. This was notably the case for the strengthening of the environmental standards for fuel in both North America and Europe (see, e.g., Harrington et al., 2000).

Estimating costs of environmental programmes has proven difficult. However, past programmes – with limited sectoral and geographic scope – were relatively simple compared to the multiple measures that greenhouse gas mitigation programmes may involve. According to the IPCC, effective GHG mitigation may imply "hundreds of end-use technologies" (Metz et al., 2001) when energy efficiency is the primary lever for action.

Further, climate change mitigation will involve actions that have multiple benefits and costs. Saving fuel, reducing local pollutants, reducing urban congestion, reducing fatalities from traffic, are but a few examples of actions, where either the climate or the other benefits could be considered ancillary to each other. This is one well-known difficulty in project-based mechanisms, as additionality is often difficult to demonstrate when non-climate benefits exceed costs. When non-climate benefits are other externalities, it is even more difficult to decide if these benefits must be taken into account in the analysis – this would be equivalent to bet whether and when policies able to internalise these costs would be implemented..

Another difficulty is that public-private partnerships may tend to give national companies some competitive advantage over others. Therefore, other countries may be reluctant to take associated costs into consideration. Although not a methodological issue, this may have negotiating implications.

Technological approaches based on standards and norms are likely to be more costly than cap-and-trade approaches. For example, Edmonds and Wise (1999) stated that their technology approach would cost about 30% more than a cap-and- trade approach to achieve a similar environmental outcome. Comparing

efforts may thus over estimate the significance of efforts where governments take less effective policies than others. However, these expenditures may also provide more emission reductions in the long run. Indeed, one possible difference between efforts-oriented and result-oriented approaches is that they may lead to different emission reduction profiles over time. All these issues move the focus from assessing the efforts to assessing the results, and will be examined below.

If comparisons are to extend to domestic efforts by developing countries, an array of new issues will appear. Should one use exchange rates or purchase power parities as the basis of these cost comparisons? Should one focus on monetary values themselves, or on the welfare derived from expenditures?

In any case, one might still consider global, direct comparisons between the policies and measures undertaken in different countries. Thomas Schelling (2002), for example, considers that the Marshall Plan and the North Atlantic Treaty Organisation (NATO) could offer *"a model for what might succeed the Kyoto Protocol if it fails or evolves into something else"*, adding that *"their procedure is one that the main developed nations might pursue prior to any attempt to include developing nations."*

NATO's 'burden-sharing exercise' *"included targets for national military participation, conscription of soldiers, investments in equipment, contributions to military infrastructure and real estate, and so on. (...) the process was one of reciprocal scrutiny and cross-examination, with high-level officials spending months negotiating."* As Schelling views it, *"NATO has been an enormous success; member nations made large contributions in money, troops, and real estate. They did it all voluntarily; there were no penalties for shortfalls in performance. And, without explicit trading, they practiced the theory of comparative advantage (in geographical location, for instance, or demographics, or industrial structure). It was an example of highly motivated partnership, involving resources on a scale commensurate with what a greenhouse regime might eventually require."*

Schelling thus suggests that not all countries need to do exactly the same things, and that broad and direct comparisons of levels of efforts implied by various policies and measures remain possible. One question is the potential complexity and necessary time of such negotiations in the case of climate change, if these comparisons are to serve some of the purposes assigned to integration in section 2. Climate change, on the other hand, is a long term issue. Another difference between NATO and possible future climate negotiations is that NATO involved essentially direct governmental expenses, while climate mitigation would involve efforts from all – governments, regional or local authorities, companies, individuals.

3.2 Comparing efforts in helping others

Costs comparisons may be a better metrics of effort when applied to assisting other countries to address their emissions. Capacity building costs can be estimated, as travel costs, costs of equipment transfers, patents offered or waived, workers trained and the like.

It would be useful to distinguish donor technology purchase requirements, often the case in bilateral agreements, when making comparisons with aid forms such as contributions to the Global Environment Facility (GEF). In practice however making this distinction in expense comparisons may be difficult, as these economic returns might be difficult to assess.

For somewhat similar reasons, it may not be easy to take into account facilities given to technology exporters through development banks or export credit agencies. One may also wonder what types of projects should be considered as "helping others to address their emissions". Should one take into account the whole cost of a more efficient coal fired power plant, for its emissions per kWh would be lower than those existing in the host country? Or should the reference be the more recent and efficient similar investments? Should one take into account the costs of natural gas pipelines, or LNG terminal, for similar

reasons? Should nuclear power projects be taken into account? Could projects to halt deforestation be considered? Very likely the same issues than those currently discussed about project-based mechanisms will have to be considered here even if the needed precision might be lower in this case than what is required to support market mechanisms. However, crediting emission reductions need not be an inherent part of such efforts, which would reduce the monitoring cost of these efforts from what they would be under a crediting mechanism.

Annex II countries are fulfilling part of their obligations under the UNFCCC in financing climate programmes of the GEF, which funding evolved from voluntary contributions to more organised "replenishment" procedures (Sjöberg, 1999). Countries could simply do more by increasing their contribution to the GEF. This is, for example, Schelling's preferred approach, as he explains (Schelling, 2002): *"Eventually, to bring in the developing nations and achieve emissions reductions most economically, the proper approach is not a trading system but financial contributions from the rich countries to an institution that would help finance energy-efficient and decarbonised technologies in the developing world."*

Annex II countries, however, also have bilateral or "plurilateral" agreements – the most recent being the G8 Climate Action Plan adopted at Gleneagles and the Asia-Pacific agreement announced in Vientiane, both in July 2005. If and when these agreements trigger significant financing targeted to climate change mitigation, whether directly or through technology cooperation, participating countries may want these efforts to be accounted for in any future comparison.

Those Annex II countries that participate to the Kyoto Protocol may also acquire certified emission reductions under the Clean Development Mechanism, or Emission Reduction Units under Joint Implementation, or Removal Units. Under future agreements, this may extend to buying emissions allowances from developing or transition economies under various forms of emission targets. These countries may be willing to have these action credited to them in this comparison of efforts to help others. In this case, however, they should not take also into account these reductions against their own targets, or this would amount to double-counting.

3.3 Comparing domestic results

The other main option to make approaches comparable is to balance their results. For countries under a quantitative emission target approach, determining emission reductions would be relatively straightforward in comparing baseline trends and actual emission levels. It is likely to be more difficult with other approaches based on a variety of policies and measures and technology programmes, although this will depend on their exact form.

In case of approaches focusing on R&D programmes, estimating resulting emission reductions may prove rather difficult and controversial. Moreover, the results may be expected on longer timescales than in the case of quantitative targets – although, for example, fifteen years separate the adoption of the Kyoto targets from the end of the first commitment period. Some technology programmes, as well as other policies and measures, still have a longer term horizon. For example, carbon capture and storage is not expected to provide significant reductions before 30 years, neither is photovoltaic, let alone nuclear fusion. Strengthening building codes has little short term effects, as the built capital stock rotates slowly, but important cumulative long term effects.

How important is that difference in the timing of emission abatements? At first glance, it may appear of relatively second order importance, as climate change is a cumulative issue. With respect to long term concentration levels, emissions taking place later may even seem to matter more than those taking place earlier, thanks to the natural decay of carbon or methane in the atmosphere.

Climate impacts, however, are a different matter. Reducing carbon dioxide and methane contributions to climate change at a late stage may have long-lasting impacts on the rate of climate change, if not its eventual extent. Moreover, reaching earlier some unknown thresholds in concentration levels can trigger positive feedbacks, such as the thawing of permafrost releasing more methane emissions, or the drying up of tropical forests weakening the terrestrial carbon sink. In sum, feedbacks and non-linear cause-effects relationships make the comparison of emissions at different points in time very complex (e.g., see SBSTA, 2002), and possibly controversial.

There is another obvious difficulty in comparing the results of approaches that would lead to emission reductions at significantly different points in time: such comparison must be done on the basis of estimates – or be performed only years or decades after the action took place.

For approaches based on norms and standards, comparison with results-oriented approaches may be easier. As already noted, technology approaches based on standards would be similar to quantitative approaches based on sector-wide output-based targets. More generally, if results of standard-based approaches could be assessed in quantitative terms of emissions avoided, all forms of quantitative approaches come close to them – close enough perhaps to allow tradability and close enough probably to ensure the other possible benefits expected from integration. In this case, standard-based approaches would share with indexed targets and important characteristic: actual emissions would remain dependant on economic scenarios. Moreover, trading regimes based on indexed targets can be linked to trading regimes based on fixed and binding targets and other target types; therefore, it is conceivable to integrate and perhaps efforts-oriented approaches based on performance standards to any kind of result-oriented approaches – and even perhaps to link them to each other in the sense of linking emission trading regimes.

Still, the issues of the timing of emission reductions, and the sheer number of technologies involved may be obstacles. The only simple standard-based approaches found in the literature are rather comprehensive, focusing on supply side and, perhaps as a consequence, on long time-scales. For example, Edmonds and Wise (1999) suggested a protocol requiring all new power plants in industrialised countries to be zero emitting by 2020, all existing power plants by 2050, and similar plants in developing countries when they reach the same level of per capita GDP expressed in purchasing power parities. In fact, the ex ante assessment of the outcome of such approach suffers from the uncertainties inherent to a "technology-forcing" approach – for technology development always remains unpredictable at least in part (Philibert, 2003).

Other, less ambitious approaches, would need much greater levels of detail to target the *"hundreds of technologies"* at end-use level quoted by the IPCC (Metz et al., 2001), and to achieve significant results. This may lead to rather complicated negotiating processes.

Would the NATO example be of some help in this case? As Schelling (2002) underscores, *"One striking contrast between NATO and the Kyoto Protocol deserves emphasis: the difference between "inputs" and "outputs," or actions and results. NATO nations argued about what they should do, and commitments were made to actions. What countries actually did -- raise and train troops; procure equipment, ammunition, and supplies; and deploy these assets geographically -- could be observed, estimated, and compared. But results -- such as how much each NATO nation's actions contributed to deterring the Warsaw Pact -- could not be remotely approximated."* But what could not be approximated with respect to NATO's non discrete objective could possibly be approximated in the case of climate change where emissions can be observed and reductions estimated. One such example may be found in the Methane-to-Markets Partnership, which sets a specific target of a 50 million metric ton equivalent of carbon reduction by 2015.

Thus, a negotiating procedure following NATO's example, while focusing initially on comparing efforts, could still allow some rough comparison of results if efforts are formulated in terms of norms and standards for some, in quantitative emission terms for others. This would need to estimate the likely results

of each and every action, unlikely to be easy task. Real and comprehensive emissions trading, however, may be out of reach – although some trading may take place at sectoral level, for sufficiently accountable activities.

3.4 Comparing results in helping others

On a project basis, when one only investor intervenes, estimating the results is not beyond possibilities – this is what is undertaken in the project-based mechanisms framework. However, estimating more globally the effects of the efforts of each country in helping another may be hopeless. These effects may be difficult to distinguish from those due to the domestic efforts of the country receiving help, and from efforts undertaken by other countries in helping the same country – not to mention the role possibly played by multilateral institutions to which all Annex II countries contribute.

4. Conclusions

Integrating options for GHG mitigation with fundamentally different structures and designs is very difficult, although not necessarily impossible. This is especially the case between approaches addressing emissions in a quantitative and comprehensive manner and those establishing output-based standards for well-identified sectors on the basis of best available or forthcoming technologies.

With respect to domestic efforts to mitigate climate change, comparisons can be based either on efforts, e.g. through expense evaluation or detailed policies and measures examination, or on results, e.g. measured in emissions or emission reductions. With respect to efforts to help other countries mitigating climate change, comparisons may be far from straightforward. Any comparisons may best be based on efforts, preferably through common institutions.

Such comparisons of approaches could help countries engage in more action, as the public good theory predicts, and in alleviating concerns about free-riding. In some cases, such as technology approaches or other policies based on standards, the structure of such approaches could be similar enough to allow emissions trading, provided the time frames of the different approaches are comparable. This high level of integration would enhance cost-effectiveness, which could in turn raise the level of action. In some other cases, the deployment of similar policies in different countries could help increase cost-effectiveness in accelerating learning-by-doing processes in the development and deployment of new climate-friendly technologies.

Technology approaches focusing exclusively on research and development programmes are less easy to compare to result-oriented approaches. Integrating such fundamentally different approaches would be difficult. However, as R&D approaches tend to have a longer time horizon than all other approaches, they could be seen as complementary to these other approaches. The relevant issue may thus be integrating different approaches in individual countries, as well as integrating different approaches followed by different countries.

Comparisons of efforts in helping others could also increase technology transfers, and this would likely enhance all the positive effects of integration of approaches in broadening the scope of international action.

All these comparisons, however, are likely to more complex, time and resource-consuming than comparison between quantitative emission objectives.

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