INTERNATIONAL ENERGY AGENCY

Beyond Kyoto

IDEAS FOR THE FUTURE

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EXECUTIVE SUMMARY

Governments must act now to mitigate greenhouse gas emissions. Even if the Kyoto Protocol enters into force – and this is by no means assured – it would only control about one third of global emissions at best. Clearly, action needs to be taken, but policy makers face great uncertainty related primarily to the costs of mitigation and the extent and pace of climate change. What can be done?

Global action is mandatory. First, industrialised countries need increased encouragement to build and expand on measures taken thus far, looking beyond the Kyoto Protocol and plotting the next steps. Second, developing countries must be pulled into international mitigation. At the International Energy Agency, we believe that the most effective policies could include flexible instruments that adapt the amount of abatement to abatement costs. This objective is best achieved through market mechanisms.

Without prejudging countries' positions, the paper draws on analyses presented in the publication "*Beyond Kyoto – Energy Dynamics and Climate Stabilisation*" to explore further possible work on two prospective measures:

1. Price caps to limit the cost which will be born by the industrialised countries, coupled with non binding targets to draw the participation of developing countries;

2. Dynamic targets set through indices such as economic growth or other variables.

Whether the Kyoto Protocol enters into force or not, more action will be needed to stabilise GHG concentrations at acceptable levels. The Kyoto Protocol provides important elements – such as emissions trading – to move in that direction. However, it would not provide a sufficient and definite response to climate change at a global level. It would only control about one third of global man-made greenhouse gas emissions by 2008-2012. Developing countries have refused to take on fixed and binding quantified emission limitation and reduction objectives. The US will not ratify the Protocol – but it may still enter into force, pending ratification by Russia. Anyway, new options will become necessary in the future. Options such as dynamic targets, price cap and, for developing countries, non-binding targets will be needed to allow all countries to adopt sufficiently stringent targets to significantly tackle climate change.

A STRONG BUT FLEXIBLE ANSWER AT A GLOBAL LEVEL

Mitigating climate change will require profound changes in world energy production and use. At least 75 % of the global anthropogenic emissions of greenhouse gases, primarily carbon dioxide and methane, come from the burning of fossil fuels for energy purposes. While the full effects of climate change are not likely to be felt for decades, the need for action is immediate, for changes in greenhouse gas concentrations are almost irreversible. Solutions exist in the form of energy efficiency improvements, fuel switching to non-carbon sources, and carbon recovery and storage. But the long-term costs of mitigation and the precise extent and pace of climate damage remain uncertain. Policy-makers thus face the task of conceiving and implementing measures in a context of uncertainty – and in a world with uneven levels of development and wealth. They run the risk of taking either excessive or insufficient action. In a context of widespread pervasiveness of fossil fuels in the economy and in the lives of citizens, the costs of possible error in environmental policy are great.

Another, no less important, difficulty is the need to have as many countries as possible participating in the global action to mitigate climate change. Developing countries have so far adamantly refused to take on binding commitments to reduce or limit the growth of their emissions. They argue that their low per capita emission levels, lack of financial

resources and the possibility of having their economic development constrained by such commitments justify their position. Their full and rapid participation is nonetheless essential in order to stabilise GHG concentrations at relatively low levels – to limit the climate damage. While in theory the Clean Development Mechanism established by the Kyoto Protocol could drive some action in developing countries, intrinsic difficulties of project-based mechanisms will likely limit its scope.

Even more obvious is the need for all industrialised countries to participate. Yet the Protocol alone does not currently provide the necessary response to climate change at a global level. It needs to be reshaped, improved – or replaced in the future by a better agreement. The latter, however, should further elaborate on the Kyoto mechanisms – not reinvent the wheel.

Current commitments

The 1992 UN Convention on Climate Change committed industrialised country Parties to seek to return emissions to 1990 levels by 2000. The Kyoto Protocol, agreed in December 1997, committed developed countries to reduce all greenhouse gas emissions on average 5% below 1990 levels by 2012. According to IEA projections, this would have represented about 22 % below baseline for these countries, or 10 % below baseline for global CO_2 emissions.

However, the full implementation of the Protocol would only have marginally slowed the build-up of CO_2 concentration in the atmosphere. With the agreement as originally envisioned, concentrations in 2010 would have been reduced a mere 2 parts per million – from 384 ppm to 382 ppm – and still an increase of 12 ppm above current levels.

The United Nations Framework Convention on Climate Change, adopted by over 180 countries, aims at stabilising greenhouse gas concentrations – at undefined levels and in an undefined timeframe. At whatever level, stabilising CO_2 concentration would ultimately require eliminating almost all energy–related greenhouse gas emissions within a few centuries. Most importantly, action during the next few decades will determine the long-term level of stabilised concentration. Theoretically, a full cost benefit analysis could determine the appropriate levels for

stabilising concentrations. In reality, uncertainties on both sides of the balance are such that this analysis will prove impossible to complete in the foreseeable future.

DEALING WITH UNCERTAINTIES

The IEA Secretariat proposes to explore new ways to move forward despite this uncertainty (see IEA, 2002, *Beyond Kyoto – Energy Dynamics and Climate Stabilisation* – on which this message elaborates). These mechanisms aim for stabilisation of CO_2 and other GHG at "low" (although not necessarily defined) levels and make achievement conditional upon actual abatement costs. Setting these levels could be a function of two elements: a stringent goal based on an optimistic assessment of the technical potential of abatement possibilities and costs, and a realistic assessment of the price societies would be willing to pay, capping the actual costs. Both the level and the willingness-to-pay would be periodically reviewed, leading to an interactive process in the development of the international regime.

Such an approach is coherent with economic theory, which provides guidance on which instruments should be chosen to address the climate problem. Abatement is linked to emissions, while benefits are linked only to concentrations in the atmosphere -- which change much more slowly. As a result, abatement costs grow faster (with the volume of abatement undertaken in any short period) than their additional climate change benefits. Thus, carbon taxes or flexible instruments that automatically adapt the amount of abatement to abatement costs should be preferred over fixed, quantitative instruments.

However, carbon taxes are politically difficult to introduce and do not provide an effective means of bringing countries with different levels of willingness-to-pay into a single framework. They thus provide little assistance in helping to broaden existing agreements. By contrast, cap-and-trade systems allow dissociating a cost-effective repartition of emission reductions from an acceptable allocation of assigned amounts. They allow the rich to pay for the poor – and governments to mobilise private money.

Technology agreements

Technology agreements could drive a concerted effort to promote a small number of selected backstop technologies, such as carbon capture and storage in the power sector and/or liquefaction of coal, off-shore wind power technologies, concentrating solar technologies, safe nuclear technologies, fuel cells and others. The focus would be on accelerating the "learning-by-doing" process to bring technologies more rapidly into the market and ultimately make them competitive. The direct subsidising of clean technologies could provide a second best option if taxes or quotas are both out of reach.

More international co-operation could enhance current efforts. The IEA hosts more than 40 implementing agreements, notably on energy efficiency, renewables, clean coal, hydrogen and CO_2 capture and storage. Participation from both businesses and developing countries has been facilitated in 2003.

However, new agreements focusing on technical change, such as standards-based protocols, can hardly substitute for more comprehensive tools. One issue is that of timing: in the near term, there is a need for energy efficiency improvements, through hundreds of end-use technologies, to achieve stabilisation at a low level. Furthermore, such instruments are unlikely to be cost-effective: standards are costlier than market-based instruments. Finally, focusing on a small set of technologies entails the risk of not choosing the most appropriate ones – markets usually make better choices than governments.

See Philibert, 2003, *Technology Innovation, Development and Diffusion*, AIXG Information Paper, OECD/IEA, and IEA, 2003, *implementing agreement hightlights*

Effectively dealing with cost uncertainty is the key to success. We propose to study three options to harness uncertainty. The first two apply respectively to developed and developing countries and are similar in nature: price caps and non-binding targets. The third option, dynamic targets, could apply to both developed and developing countries while allowing differentiation. All could be constructed in such a manner as to permit all Parties to participate in emissions trading.

PRICE CAPS AND NON-BINDING TARGETS

A price cap could take the form of the issuance of supplementary permits, in unlimited quantity, at an agreed price. To maximise environmental performance, the price would be set in the upper range of cost expectations. If actual costs are as expected or lower, countries would simply meet their objectives. If costs are higher, countries (or agents) would pay a fixed price for emissions above their assigned amounts.

There are many possible ways of using the money (if any materialises) from these payments. Additional funding of adaptation, or R&D efforts in carbon-free technologies are perhaps the most appealing options. Restoring the full "integrity" of the targets would not be an option, for in this case there would not be enough reductions still available for the cap price. The targets would thus be relaxed.

One of the advantages of such a price capping mechanism is that it allows the target to be made more stringent – as the worst possible outcome (unexpectedly high mitigation costs) is entirely foreclosed *a priori*.

In operationalising this concept, a number of elements must be observed. For example, to allow full, international emissions trading, all Parties must adopt a common price – or the lowest price would dominate. An agreement on a price is possible even if willingness-to-pay differs from one country to another, for what matters most is the level of effort induced by the assigned amounts, which could be differentiated.

However, it may be possible to ensure environmental integrity in trading between zones with different price caps provided the selling countries' actual emissions are below their assigned amounts. Obviously, these countries could not be allowed to buy supplementary permits at one price and resell them at a higher price.

A frequently raised concern about such an approach is that it does not ensure the environmental integrity of an agreed quantitative target. If the price cap is exceeded (due to higher than expected mitigation costs), the target is, as we have seen, automatically relaxed. However, higher-than-expected abatement costs fully justify higher emission paths and eventually higher stabilisation levels. Apart from this fundamental justification, if costs are excessive, countries may be more likely to withdraw from the obligations in the absence of a price cap. Excessive costs have been advanced by the United States as one of its reasons for not ratifying the Kyoto agreement.

Non-binding targets would be an application of the price cap principle for developing countries. Under such a regime, the cap price could simply be set at zero. Assigned amounts could be set on baseline emission levels (perhaps after some share of the "win-win" options have been factored in). This would open the door for full – and profitable – emissions trading, and provide an incentive to achieve non-binding targets. The system could evolve over time by making the targets progressively more stringent and/or by setting a positive, though low, cap price for have-not countries as they develop.

Some graduation in stringency could be achieved through raising the price cap level: this might be adopted immediately by some of the more advanced developing countries and some economies in transition. This would make the agreement more complex. However, cost-effectiveness or leakage prevention would not be restricted by multiple ceiling prices, except if some countries stopped trading after having exceeded their assigned amounts.

DYNAMIC TARGETS

With dynamic targets, emissions would not be capped in absolute terms. Assigned amounts would be defined on the basis of agreed indices such as economic growth or variables such as population, immigration, trade in specified commodities, etc. These assigned amounts would then be adjusted *ex post* according to the variable in question. Dynamic targets should be an option for both developing and developed countries. Emissions trading may also be easily accommodated within a dynamic target regime, for what matters is not the assigned amount itself but the difference between the actual emissions and assigned amounts.

Differentiation can be accomplished easily using dynamic targets. It can be done both through differentiating the initial assigned amounts and through the development of indexation formulas. Intensity targets (emissions per unit of GDP) represent a special case – that of a fixed relationship between assigned amounts and GDP. There could be various reasons to shape dynamic targets differently – for example, increasing the level of effort if the economy grows more rapidly than expected. Another is to avoid "double pain" in the case of economic recession – as basic needs do not shrink with the economy. The circumstances of individual countries would have to be taken into account in this exercise.

Concerns have been raised that such targets might lead to declining intensities – but to increases in absolute emissions. While this clearly depends on the stringency of the targets (also the case with fixed targets), it misses the core point: as dynamic targets would remove a large part of the abatement cost uncertainty, they could allow developed countries to adopt relatively more stringent targets than if they were fixed. Another concern – perhaps more difficult to address – is that of accurately assessing GDP. For this kind of agreement to work, further efforts would be needed to better understand the measurement of GDP and its potential margin of error.

While dynamic targets would not remove all cost uncertainty, they do address the uncertainty in expected future growth in emissions. Arguably it is one of the most important obstacles, especially in developing countries. However, it may be that a non-binding target option is more palatable to many developing countries as it provides a higher degree of certainty in protecting economic development.

Non-binding dynamic targets could be a valid option for developing countries as they are more likely to be effective than fixed non-binding targets if economic performance differs much from what was expected when the targets were set. Combining price caps and dynamic targets may also be an option for developed countries, although the increased complexity of the agreement may outweigh the advantages in a context of relative economic certainty.

Development first?

One critical issue in considering the development of climate change policies – particularly in developing countries – is how new emissions reduction programmes fit into broader development strategies. In the current jargon, this is commonly known as the linkage between climate and sustainable development. This framework suggests that the three elements of sustainable development – economic, social and environmental – must all be improved through policies, and that policies solely directed at climate change, without incorporating these other elements, will not be politically sustainable. All efforts should therefore be made to capture synergies among environmental policies, and between them and objectives like growth and equity. Energy-efficient technologies, for example, reduce various environmental impacts and can lower the pressure on energy investments, enhance energy reserves and facilitate access to energy services.

However, while policy integration is needed at all levels, the climate change negotiating process should not necessarily have to be merged into a broader sustainable development agenda. Mitigating climate change requires urgent and specific action. Its solutions cannot be made dependent on solving all other pressing needs. Action cannot wait for all development problems to be solved in developing countries. But co-operating to solve climate change at the global level might also provide an opportunity for sustainable development and help build more confidence in international relationships.

TIMING AND ALLOCATION

If quantitative instruments remain the preferred option for future climate agreements, agreeing first on some basic rules, guidelines or principles may help in reaching effective and fair negotiated outcomes. Such agreements may also tackle the issues of timing, allocation and form.

One option is to focus on the issue of timing and only bring developing countries into an agreement after developed countries have taken on commitments. While a fixed delay period is possible, a more often quoted alternative is to phase in a country's commitment once it has reached a certain level of development. Metrics could include per capita income, or

emissions per unit of GDP. One should note that close to 40 developing countries have a higher per capita GDP than that of the lowest Annex-I Party, and about 25 have higher per capita emissions than those of the lowest Annex I Party. However, analyses suggest that neither of these staged approaches would achieve particularly low levels of CO_2 concentrations. Ways must be found to accelerate the phase-in of commitments.

Allocation too can be differentiated. Framing the issue in terms of a "resource-sharing" paradigm has led some analysts to consider "equal per capita" allocation as the only fair option. Recognising that such per capita levels may not be immediately achievable, others have argued for a long-term convergence – what has been termed "contraction and convergence". Allocation would be based on an interpolation between the current situation and the future equal per capita emission allowances. However, in the short term, such allocation schemes would provide large quantities of surplus emissions, most likely leading to a significant reduction in the efficiency of mitigation efforts from developed countries. And – future binding targets following this scheme may be felt unfair by developing countries, whose emissions would be bound at much lower levels than those enjoyed by industrialised countries in the course of their development. Thus, while contraction and convergence seems more efficient for achieving low concentration levels than the graduation approach described above, the exchange of immediate hot air against the promise of future binding efforts may not prove particularly effective either.

Framing the issue in terms of a "cost-sharing" paradigm may be more effective. For example, a "no-harm" rule could be developed that would stipulate that poor countries pay nothing for climate change mitigation. If these countries based any mitigation targets on staying below the "business-as-usual" trend (i.e., uncontrolled emission baselines), using a trading system, they could profit from certain "win-win" activities, as well as have any additional cuts financed by the more advanced countries.