

## Kyoto Greenhouse Gas Emissions Reduction Targets: Economic Issues and Prospects

by Y. Hossein Farzin

The first report of scientists through the Intergovernmental Panel on Climate Change (IPCC) in 1990 indicated a likely rise in global temperatures and its potentially serious consequences. This led most participants at the 1992 Earth Summit in Rio de Janeiro to sign the United Nations Framework Convention on Climate Change (UNFCCC), by which they undertook to reduce their emissions of the main greenhouse gas, carbon dioxide, to 1990 levels by 2000. However, by 1995 it became evident that few countries had managed to reduce their emissions. This failure, together with a second IPCC report warning that global warming had already begun and was on the rise prompted the need for legally binding emissions targets for greenhouse gases (GHG) and timetables for achieving the targets, leading to the Kyoto Protocol signed in December 1997.

Under the Kyoto Protocol, 39 industrial countries (Annex I countries) committed themselves to reduce their total emissions of six greenhouse gases by 5.2 percent below 1990 levels between 2008 and 2012. However, to allow for the differences among the committing parties, the protocol sets different emissions reduction targets for different countries to achieve this overall target. Accordingly, the reduction targets for the European Union (EU), the United States, and Japan are 8 percent, 7 percent, and 6 percent, respectively. The protocol permits a number of other countries to increase their emissions over the period. Iceland's emissions will be permitted to rise by 10 percent from 1990 levels, Australia and Norway will also be allowed to increase their emissions by 8 percent and 1 percent, respectively. Importantly, Russia and Ukraine are required only to stabilize emissions at 1990 levels. In 1997, Russia's emissions were 30 percent below its 1990 levels, due to decline in economic activity and electricity usage since 1989. The protocol does not commit developing countries to any specific reduction targets.

### U.S. Participation Issue

The Kyoto protocol will become a legally binding agreement 90 days after it is ratified by 55 countries whose CO<sub>2</sub> emissions are at least 55 percent of total emissions by the Annex I parties in 1990. However, a major unresolved issue impeding the progress of the protocol toward becoming a legal agreement is U.S. participation. Since the United States is the largest producer of greenhouse gases (more than 1/3 of the emissions by Annex I countries in 1990), it is highly unlikely that without U.S. participation the protocol will come into force, or even if does, that it will succeed in stabilizing and reducing GHG. On the other hand, U.S. compliance with its Kyoto target implies a noticeably large reduction from its business-as-usual baseline projected emissions (for example, about 28 percent below its baseline forecast for 2010). A study in November 1998 by the U.S. Business Roundtable (whose members include Exxon, General Motors and Chase Manhattan Bank) estimated that compliance



*Automobile pollution clouds the skies of urban centers throughout the world. Developing countries, lead by U.S. and Japan, are the major GHG emitters.*

with the Kyoto target by reducing domestic emissions would lower U.S. GDP by 1.2 percent (or 60 billion dollars a year) from the baseline forecast for 2020. Accordingly, without further incentive to reduce compliance cost, the likelihood of the U.S. ratifying the protocol is very little, noting particularly that the compliance by European Union (EU) will require only 2.6 percent reduction from its baseline projected emissions for 2010 compared with 28 percent reduction by U.S. In turn, the asymmetry in compliance costs between U.S. on the one hand and EU and developing countries on the other, and hence the U.S. participation issue, has raised a number of other difficult issues that render the progress of the Kyoto protocol uncertain. The next sections highlight some of the issues.

### Flexibility Mechanisms

To reduce compliance costs for all parties, and in particular to provide incentives for U.S. participation, the protocol allows the use of several flexible mechanisms. These mechanisms are:

- Trading CO<sub>2</sub> emission permits across countries;
- Joint Implementation (JI) projects among Annex I parties: through this mechanism countries or companies can invest in joint projects to reduce emissions where it is least costly to do so;
- Clean Development Mechanism (CDM), whereby Annex I countries can invest in emissions-saving projects in the non-Annex I (i.e., developing) countries and obtain certified emissions reduction to offset against their own reduction obligations.

The uncertainty about the rules and procedures that should govern these mechanisms will continue to be a major obstacle in the way of bringing the Kyoto protocol into force. In particular, an important unresolved issue is the extent to which the three flexibility mechanisms should be allowed to be used to meet countries' abatement obligations as against using strictly domestic measures.

The specification of the ceiling on the use of flexibility mechanisms has profound economic implications for all parties, and hence significantly affects the likelihood of an agreement to bring the protocol into effect. Specifically, the lower the ceiling on the use of the flexibility mechanisms (i.e., the larger the percentage of abatement obligations that must be met through domestic measures), (i) the larger the overall cost of meeting the Kyoto emissions targets, (ii) the larger the differences in compliance costs across the regions/countries (specially between the high-cost countries like the U.S. and Japan on the one hand, and the EU on the other), and (iii) the larger the divergence between the domestic marginal abatement cost and the

international price of permits for the countries with high abatement obligations, such as U.S. and Japan, implying smaller gains for the purchasing countries from trade in emissions permits. Thus, for example, it is estimated that, with no limits on use of the flexibility mechanisms, U.S. total cost of meeting its obligations will be reduced by as much as 85 percent from that if no emissions trading is allowed. The corresponding estimated figure for Japan is even higher, about 93 percent, while for EU as a whole it will be less than 1 percent, reflecting EU's negligible projected abatement obligation (about 3 percent of its projected 2010 emissions), because of the burden-sharing among the member states and various emission saving measures implemented since 1990.

A question of particular interest may be the impact of the Kyoto emissions targets and flexibility mechanisms on the economy of California. Clearly, an informed answer to this question entails a comprehensive benefit-cost study that, among other things, takes into account the likely share of California in the U.S. total emissions reductions burden under the Kyoto Protocol, the scope for California to use the various flexibility mechanisms to meet its share of the emissions target, and other state or federal policies (specially those pertaining to the energy sector and environmental standards) that may affect California's future GHG emissions.

Also, a key consideration in such a study will be the expected long-run economic losses that California's economy could incur in a business-as-usual scenario, or, equivalently, the benefits it could reap from reducing GHG emissions. Given California's dominant share in U.S. energy consumption, its expected high growth rate of energy consumption in the next decade, and its heavy dependence on fossil fuel for transportation and electricity generation, it seems reasonable to speculate that (a) California's share of the total U.S. emissions reductions targets will be large, so that (b) the use of flexible mechanisms could considerably lower the costs of meeting its emissions reductions burden. Further, given the leading role of California in mandating and practicing high environmental standards, together with its advanced agricultural and industrial technological base, it is quite possible that compliance with Kyoto abatement targets will in the long-run encourage faster innovation and diffusion of clean technologies, thereby giving California a comparative advantage in supply of such technologies and thus indirectly boosting its economy.

In any event, the vastly unequal national gains from the flexibility mechanisms places the U.S. and Japan diametrically against the EU in defining the ceiling on the use of the mechanisms. In particular, under the

pressure from industry groups and with the backing of Australia, which advocates carbon sequestration through land use practices and forestry activities (the so called “land-use change”) as an additional flexibility measure, the U.S. is anxious to have maximum use of the flexibility mechanisms to allow for 85 percent of commitments to be met through them. The EU, under pressure from environmentalist groups, is worried that other industrialized countries, especially the U.S., will evade their abatement obligations by resorting to these mechanisms. It has therefore proposed that the use of flexibility mechanisms be limited by requiring that at least 50 percent of the obligations be met through individual country domestic action. However, it is uncertain that this proposal will be accepted by U.S., as it most likely raises her compliance costs by a significant factor. The EU proposal may also encounter opposition from developing countries (especially China and India), since they will be the other major beneficiaries (aside from the U.S. and Japan) from the full use of the flexibility mechanisms.

### Hot Air Loophole

Another hindering issue, related to the ceiling on use of flexibility mechanisms, is that of the so called “hot air loophole.” Hot air pertains to countries whose assigned emissions under the protocol exceed their anticipated emissions even under any emission limitation, thus generating an emissions surplus. Although the total size of this surplus (hot air) is highly uncertain (estimates range from about 90 metric tons of carbon to about 375 MtC), Russia and Ukraine will most likely be the two principal sources of hot air. If emissions trading is allowed with no limitation, the major GHG emitters, such as U.S. and Japan, will be able to meet part of their obligations by buying hot air, thereby increasing the total emissions level from what it would be in the absence of emissions trading in general (or hot air trading specifically), although the level will not exceed the aggregate Kyoto targets.

Obviously, the size of available hot air to be used to offset abatement commitments depends not only on projections of economic growth, and hence of emissions growth, for Russia, Ukraine, and several East European countries, but also on the agreed ceiling on use of the flexibility mechanisms. With no ceiling, hot air supply will be used fully, since it involves zero abatement cost. This could allow the U.S. and Japan to increase their domestic GHG emissions by 5-10



*Refinery emissions are targeted for mandatory reductions under the Kyoto Protocol. California's heavy dependence on fossil fuel will demand faster innovation and diffusion of clean technologies.*

percent over the next 15 years. Importantly, if trade in hot air is not allowed, then the total size of offsets available from the three flexibility mechanisms will be smaller, thus leading to higher international prices of permits, and greater resort to domestic actions and the flexibility mechanisms (including JI and CDM) that involve *real* abatement.

Therefore, a proposal to disallow trade in hot air may obtain the support of developing countries (particularly China and India) in addition to the support of the EU and environmentalist groups, but may see opposition from Russia, Ukraine, U.S., Japan, Canada, Australia, and New Zealand (the so called “umbrella group”) and industrial groups.

### Developing Country Participation

Another major impediment to bringing the Kyoto protocol into effect is the United States' insistence on extending emissions reduction targets to developing countries. In fact, U.S. Congress has made this a condition of ratification of the protocol. Developing countries (particularly China and India), through G77 Group, have strongly opposed the U.S. demand, arguing that the industrial countries, lead by the U.S. and Japan, are the major GHG emitters, while for the majority, developing countries' emissions are much lower than those of the industrial countries. Even China, the second largest GHG emitter, has per capita emissions only one-seventh those of the United States. Whether the thorny issue of developing country participation in emissions reduction targets will be resolved to pave the way for the U.S. ratification of the protocol remains highly uncertain.

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## Issues Facing the Implementation of Flexibility Mechanisms

As the foregoing discussion makes clear, the prospects for the Kyoto Protocol to enter into force depend crucially on successful implementation of the flexibility mechanisms, particularly CDM. There are, however, a number of important implementation issues that ought to be resolved if the perceived gains from flexibility mechanisms are to materialize. One of the notorious issues facing CDM is that of the “additionality” test. According to the Article 12.c of the Kyoto Protocol, only projects that cause “[r]eductions in emissions that are *additional* to any that would occur in the absence of the certified project activity” can generate emissions reduction credits under CDM. However, there is so far no agreement on the definition of standards, and hence of the baselines, for determining “additionality”. Such baselines are likely to vary both across developing countries with different technological conditions and as technologies change over time.

A project-by-project verification of claimed emissions reduction credits and establishment and execution of punitive rules for false claims can formidably increase the CDM transaction costs. The distribution of benefits from CDM poses another difficulty. How should the benefits of CDM projects be equitably distributed between host developing countries and investing countries? Does the sovereignty of host countries entitle them to larger shares? Will the opportunities for CDM investments be equitably distributed across developing countries, or would the investors prefer the more developed countries over the least developed ones?

A further issue is the role of private sector and government in initiating and implementing CDM projects: Who could initiate and/or finance CDM projects? How should one distinguish between the projects that, as a by-product, would reduce emissions but the government would have undertaken them anyway, and the projects that generate additional reductions? Can a developing country’s own government and/or private sector initiate, finance and execute emissions-saving projects? Given the scarcity of public sector resources, and hence the important role for the private sector, what are the incentives for the latter to invest in such projects? What role should international financial institutions such as the World Bank play? Would Annex-I countries’ assistance for CDM replace their foreign aid?

Clearly, some of the issues noted above also apply to international trading of emissions permits. For example, establishment of rules for compliance, monitoring and enforcement (to prevent under-

reporting of emissions, for instance) seems essential for the success of emissions trading. In turn, this necessitates the establishment of an independent coordinating authority to facilitate international trades in permits by reducing barriers to trade, such as imperfect information about costs and benefits of trading and transaction costs involved in buying and selling permits.

## Conclusion

This article has emphasized the important role of flexibility mechanisms in bringing together various parties of differing interests and approaches to reach an international agreement to stabilize global emissions of greenhouse gases over the next decade. It has also highlighted some of the many major issues that render the progress of the Kyoto protocol uncertain. Nevertheless, at this stage of negotiations, the key to the success of the protocol seems to lie in an agreement among the negotiators to start a period of experimentation with the CDM and trading permits in order to demonstrate the benefits of these flexibility mechanisms to the participating parties and also to allow the mechanisms and markets to become established and countries to become more familiar with their operations.

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